



for Woodworking Machinery Safety Requirements

American National Standard

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American National Standard for Woodworking Machinery - Safety Requirements

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Wood Machinery Manufacturers of America®

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Forward (This forward is not part of American National Standard O1.1-2004)

Historical Perspective

The revision of the original Safety Code for Woodworking Machinery was approved in 1944. The Standards Committee was reorganized in 1952, and the scope of the standard was changed. A comprehensive revision of the section on cooperage machinery was completed and a new section dealing with radial-type saws was included. The resulting standard was issued in 1954 and reaffirmed in 1961. In 1969 the Standards Committee was again called and revised the 1954 (R1961) standard. The 1971 revision corrected and clarified several issues related to guarding and incorporated as a section of the standard an important head note in Section 6.1 of earlier versions of this standard.

The standard was again revised and issued in 1975. In 1979 an amendment was made to the 1975 edition.

In 1980, the Committee was again convened for the purpose of updating and revising the standard. The committee determined that the format to be used in the new version would be the left hand column for requirements and the right hand column for explanation and clarification. Cooperage and veneering were removed from the standard, as were other provisions found to be included in other standards. Clarification of responsibilities was another important accomplishment of this edition, published in 1992.

In 1993 the committee set about correcting editorial errors in the current version. This process was completed in 1999 and submitted to ANSI for publication.

Changes Found In This Version

Also in 1999, the committee determined that a complete restructuring of the standard was needed. The standard was becoming complex, it included obsolete machines, and many machines were not covered. The committee also wished to create a standard that could be normalized to developing world wide standards.

The committee therefore decided to develop an umbrella standard under which all machine specific standards could be further developed. This version of O1.1 became the umbrella standard. Future machine specific standards are to be developed as part of the O1 system. With this structure, any machine for which there is no machine-specific O1.x standard can be developed using the general hazards portions of this standard. Machine specific standards are to be written with the intent of superseding their respective portions of this standard. For historical continuity, those portions of the prior version relating to specific machines were brought forward without change into this version, with the intent that new machine specific standards would also supersede those provisions.

Throughout the past few decades other standards existed for machines that were mentioned in this standard. To resolve the conflict, the committee changed the scope of this standard to clearly delineate between industrial/commercial machinery and others, and to exclude machines which are not industrial/commercial.

As worker safety continues to be prominent in this standard, the committee sought, and gained, more active participation from the Occupational Safety and Health Administration. First initiated under the direction of the Assistant Secretary of Labor for Occupational Safety and Health, Charles Jeffress, then continued under his successor, John L. Henshaw, this standard was developed with the following resolution:

Resolved: As the standards developed by this committee are relevant to the health and safety of workers

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in the wood working industry, and as this committee is charged with developing such standards and recognized for its expertise in wood working industry safety and machinery, it is the intent and expectation of this committee that newly published versions of standards developed by this committee be adopted by the US Department of Labor as regulations under the United States Occupational Safety and Health Act.

It is also anticipated by the committee that this adoption process will take time, and that the machines, uses and applications covered by this standard can not, as a practical matter, be updated contemporaneously with the publication of the standard.

Suggestions for improvements to this standard are welcome. They should be addressed to the ASC O1 Committee Secretariat, Wood Machinery Manufacturers of America®, 100 North 20th Street, 4th Floor, Philadelphia, PA 19103-1443.

This standard continues to be maintained by the Accredited Standards Committee (ASC) O1 in accordance with the consensus Committee method as described by the American National Standards Institute's Procedures for Development and Coordination of American National Standards. Committee approval of this standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the ASC O1 had the following members:

Michael L. Gilliland, Chairman

NAME	STATUS	AFFILIATION
Jim McDonald	Member	Accu-Router, Inc.
Joe Harrill	Member	American Furniture Manufacturers Association
White Watkins	Alternate	American Furniture Manufacturers Association
Michael McKee	Member	Tropp & Company
Chuck LeRoux	Member	Andersen Corp.
Al Weaver	Member	American Society of Safety Engineers
Neal Gowney	Alternate	American Society of Safety Engineers
Walter Painter	Member	Member at Large
Mat Ros	Alternate	Member at Large
Lou Brickner	Alternate	Member at Large
Jim Jones	Member	Member at Large
David Coble	Alternate	Member at Large
Bill Pritchard	Member	Kitchen Cabinet Manufacturers Association
Max Green	Member	Mereen-Johnson Machine Co.
Jim Laster	Member	Newman Whitney
Frank Smith	Alternate	US Occupational Safety and Health Administration
Wayne Hill	Member	Power Tool Institute
Dan Montague	Alternate	Power Tool Institute
Nathan Sauder	Member	Sauder Woodworking Co.
Steve Jones	Member	Stiles Machinery, Inc.
Jack Hyde	Member	System Safety Society
Joe Durst	Member	United Brotherhood of Carpenters and Jointers of America
Michael Belcher	Member	Underwriters Laboratories, Inc.
Barrett Wilson	Alternate	Underwriters Laboratories, Inc.
Heinz Schmidt	Member	Woodworking Machinery Industry Association
Giordano Checchi	Alternate	Woodworking Machinery Industry Association
Dan DeLong	Alternate	Wood Machinery Manufacturers of America®

In addition to the above membership, the committee wishes to acknowledge the participation of others during the process. These included:

Cole Sumners, Accu-Router, Inc.
Jon Parish, American Furniture Manufacturers Association
Craig Karasack, Alliance of American Insurers
Andy Shook, Biesse Group America
Richard Sauger, US Occupational Safety and Health Administration
Judy Goodrich, US Occupational Safety and Health Administration
Greg Dix, Power Tool Institute
Dennis Cope, Underwriters Laboratories, Inc.
Bill Politsch, Wood Machinery Manufacturers of America®

American National Standard for Woodworking Machinery – Safety Requirements

STANDARD REQUIREMENTS

1 SCOPE, PURPOSE, AND APPLICATION

1.1 Scope

This standard covers the safety requirements for the design, installation, care and use of wood-working machinery and accessory equipment, used in industrial and commercial applications, having a total connected power of 5 hp (3.7kw) or greater, or having 3-phase wiring.

1.1.1 Machine types excluded

Power tools intended to be handheld in use, assembly machines, finish application equipment, primary panel product manufacturing machinery, cooperage machinery, sawmills, and machinery covered by other American National Standards are excluded from this standard.

1.2 Purpose

The purpose of this standard is to establish the safety requirements for the design, installation, care and use of woodworking machinery and accessory equipment covered by this standard.

1.3 Applications

EXPLANATORY NOTES

(These notes are not a mandatory part of this standard)

E1.1 Scope

Design of products outside of the scope of this standard and not specifically excluded in paragraph 1.1.1 are referred to ANSI/UL 987 or other standards covered by individual requirements.

Governmental, educational, and similar institutions as well as business establishments are considered commercial applications in this standard.

E1.1.1 Machine types excluded

Primary panel product manufacturing machines are referred to as panel mills or board mills. Panel products as identified in this standard are plywood, particle board, medium density fiberboard, chip board, straw board, oriented strand board, pressed board, and similar products made from wood, wood chips or wood fiber.

E1.3 Applications

This standard should be applied to machines for which there is no machine-specific standard within this ANSI O1 series. If such standard exists, it supersedes this standard.

1.3.1 New applications

Woodworking machinery and accessory equipment manufactured after the approval date of this standard are considered new applications.

1.3.2 Old applications

Woodworking machinery and accessory equipment ordered or manufactured prior to the approval date of this standard are considered old applications.

2 Descriptions of woodworking machines

The purpose of a machine description is to categorize and identify certain generic type machines that fall within specific categories.

2.1 Band/jig saw

Appropriate construction and safeguarding requirements for each type are given in clauses 4 and 5.2.1 Band/jig saw.

2.1.1 Band saw

A machine using as its primary cutting tool a continuous thin band of steel with cutting teeth on at least one edge and two or more wheels supporting the band, one of which drives the band. The machine has guides to control the location of the band and a work support means, fixed or capable of being tilted.

2.1.2 Jig saw

A machine using as its primary cutting tool a thin band of steel with cutting teeth on one edge. This tool is commonly known as a jig saw blade. The machine reciprocates the blade vertically to permit a cutting action. The machine has a fixed or tilting work support means.

2.2 Circular saw

A machine designed to use a work support means and a thin disc, commonly known as a circular saw blade, as its primary cutting tool.

E1.3.2 Old applications

Normally an employer can seek and receive the assistance of a manufacturer, modifier, or rebuilder in bringing the machine, or accessory equipment, or both, into compliance with the requirements.

E2 Descriptions of woodworking machines

E2.1.1 See illustration 1.

E 2.1.2 Jig saw

A saw of this type is also known as a scroll saw and may or may not have an upper set of gripper jaws to help support the blade.

E2.2 Circular saw

Generally machines in this class can use other arbor mounted tools such as dado and molding heads, abrasive cut off wheels, and similar tools for specific operations.

2.2.1 Cut-off saw

A machine designed to use a work support means and using a rotating circular saw blade moving along a single plane to cross-cut the workpiece to the desired length. Machines of this type are not designed to ripcut stock.

2.2.1.1 Overhead swing cut-off saw

A machine with a work support means using a powered arbor and circular saw blade that pivots about a point located above the saw arbor.

2.2.1.2 Straight line cut-off saw

A machine with a work support means and powered arbor that uses a multiple link mechanism or other means to simulate a straight line motion of a saw arbor.

2.2.1.3 Inverted swing cut-off saw

An inverted swing cut-off saw has a work support means and utilizes a powered arbor on an arm that pivots about a point located below the saw arbor.

2.2.1.4 Jump saw

A machine that utilizes a work support means, a powered arbor on an arm that pivots about a point located behind the saw arbor at approximately the same height and a work hold down means. At rest position, the saw blade is below the workpiece.

2.2.1.5 Miter saw

A miter saw is a cutoff saw that has a work support means and utilizes a powered arbor on an arm that pivots about a point located behind the saw arbor at approximately the same height. The saw arbor may also slide vertically. In the at rest position, the saw blade is above the maximum capacity workpiece.

E2.2.1 Cut-off saw

Examples of manually fed cut-off saws are manually operated pull, chop, miter and swing arm saws. Examples of power fed cut-off saws are jump, chop, straight line cut-off and similar saws where power feed is by electrical, hydraulic or pneumatic means. See illustrations 2 and 3.

E2.2.1.1 Overhead swing cut-off saw

See illustration 2.

E2.2.1.5 Miter saw

Machines of this type are known by various names such as chop saws, pull through miter saws, and vertical miter saws. They are used to do straight cut-off, mitering and, on some saws, compound mitering operations. See illustration 3.

2.2.2 Panel saw

A machine designed to cut panel or sheet products with one or more circular saw blades. The arbor and saw blade are mounted in a carriage that traverses over or under a stationary workpiece clamped on a work support means.

2.2.3 Radial arm saw

A machine having a work support means, a rear fence, overhead arm and a saw carriage. It can be used to do at least crosscutting and mitering with an unlocked saw carriage and is capable of ripping with the overhead arm locked at 90 degrees to the rear fence and the carriage rotated and locked 90 degrees to the arm.

2.2.4 Rip saw, power fed

A machine designed to use a singular or multiple circular saw blade(s) to ripcut a workpiece. It has a powered means for feeding the workpiece into the blade(s) and has a stationary or moving work support means. EXCEPTION: Table saws with universal feeders mounted on them are not considered power rip saws in this standard.

2.2.5 Table saw

A machine designed to use a circular saw blade mounted on an arbor below the work support means. The work support means can be stationary or moving or a combination of both. A guiding means is used for all operations when manually feeding the stock. The arbor or its support means can be fixed, or be capable of being tilted at an angle to the work support means of less than 90 degrees to each other.

2.3 Cylindrical cutter machine

A machine designed to use cylindrical rotating cutting tool(s) to process a workpiece. EXCEPTION: This classification excludes circular saws, drilling and boring machines and lathes using cylindrical cutters. (See 2.2, 2.4 and 2.5)

E2.2.2 Panel saw

These machines are commonly called over-table or under-table, over and under beam, horizontal and vertical panel saws. They can be further classified as having hand or power feed and manual or power clamping. See illustration 4.

E2.2.3 Radial arm saw

On saws of this type the carriage can be either manually or power fed. See illustration 5.

E2.2.4 Rip saw, power fed

Saws of this type are known as gang saws, straight line rip saws, or other similar names. See illustration 6.

E2.2.5 Table saw

Saws of this type are known as buzz, variety, rip, crosscut, table, tilting table, tilting arbor, sliding table and similar names. On some saws of this type the arbor may be raised or lowered. Saws of this type can have an arbor or a table which can be adjusted at an angle for beveling and compound miter cuts. Some machines of this type may use dado or molding cutters and other arbor mounted tooling. Table saws may be manually fed or power fed using universal feeders. See illustration 7.

E2.3 Cylindrical cutter machine

A machine in this classification may be called a planer, jointer, shaper, router, engraver, dovetailer, profiler, tenoner, molder, sticker, matcher and similar names. Machines of this type use cutter heads with inserted knives, solid or inserted cutting tools, and similar cylindrical cutting tools.

2.3.1 Dovetailer

A machine that has its cutter(s) in a horizontal plane, operates in a semi-automatic mode and is designed to use rotating or reciprocating tooling mounted in one or more fixed or moving spindles to produce the form of a self-locking joint known as a dovetail on a clamped stationary or moving workpiece.

2.3.2 Jointer

A machine of this type has a cylindrical cutterhead with more than one knife or cutting edge. It has an adjustable infeed work support means or an adjustable cutterhead or knives. A fence or other workpiece guide is provided.

2.3.3 Molder/multi-head planer

A machine that uses more than one arbor mounted cylindrical rotating cutting tool and a power feeding means which once engaging a workpiece carries it linearly through the balance of the intended operations without further action on the part of the operator. Operations can be performed on all surfaces of a workpiece. Workpieces can be hopper or hand-loaded and are fed ribbon-style into the machine.

2.3.4 Profiler/engraver/carver

A machine that has one or more spindles with rotating cylindrical tools used to form decorative or functional contours on a stationary or moving workpiece. A template and stylus are used to control the contour of the workpiece in three dimensions.

E2.3.1 Dovetailer

Machines of this type are used to produce dovetails, mortises, tenons, and other type joint cuts.

E2.3.2 Jointer

A machine of this type with a horizontal cutterhead is usually equipped with a fence that can be adjusted at angles other than 90 degrees to the table in order to produce bevel cuts. The primary purpose of a jointer is to produce either a flat surface or a flat surface at a desired angle to another flat surface. This type machine can also be called a jointer/planer, or a jointer/edger. See illustration 8.

E2.3.3 Molder/multi-head planer

Typical uses would be in making molding and other straight line, contoured or dimensional workpieces. See illustration 9.

E2.3.4 Profiler/engraver/carver

Many machines use 3-dimensional templates and are semi-automatic such that once the cycle is started, it continues until the workpiece is complete. Typical parts are Queen Anne chair legs and gun stocks.

2.3.5 Planer

A machine that has at least one cylindrical cutterhead with one or more inserted knife or cutting edge. It has at least a cutterhead mounted over a work-supporting means and uses either an adjustable work support or cutterhead to size the stock. The workpiece is usually power-fed.

2.3.6 Router

A machine with one or more vertical spindles with a cylindrical cutting tool(s) used to machine decorative or functional contours on a stationary or moving workpiece. A workpiece support is provided and the cutting action is controlled by a guide, template, numerical control, or similar means. The contour machined can be two or three dimensional. The spindle(s) can be mounted above or below the work support means but is more commonly above the workpiece.

2.3.7 Shaper

A machine that uses one or more fixed or tiltable vertical spindle(s) usually with an arbor mounted rotating cylindrical cutter(s), used to form decorative or functional forms on a manually or power fed workpiece. The workpiece is supported on a stationary or moving table. A guide, fixture, or template is used to control the operation. The spindle can be mounted above or below the work support means.

2.3.8 Tenoner/trim saw

A machine designed to use two or more cylindrical cutters or one or two circular saws, or both, to size or prepare, or both, the ends of a workpiece. The workpiece is supported on a table or conveying means. A means for clamping the workpiece is provided.

E2.3.5 Planer

A machine of this type is also known as a surfacer and is used to produce parallel surfaces on stock. See illustration 10.

E2.3.6 Router

Machines of this type can be fed manually as on a pin router or semi-automatically as on a template router or a numerically controlled router. See illustration 11.

E2.3.7 Shaper

A machine of this type may be single or multiple spindle manual type, straight line, or rotating table swing arm. Some manual shapers have spindles that can be at an adjusted angle to the table top. Some also use sliding tables for straight line shaping. See illustration 12.

E2.3.8 Tenoner/trim saw

A machine may be single or double ended. Its basic function is to prepare the tenon(s) for a tenon/mortise joint. It is also commonly used for sizing stock to length. See illustration 13.

2.4 Drilling/boring/mortising machine**2.4.1 Drilling/boring machine**

A single or multiple spindle machine that uses a rotating cylindrical tool(s) such as a drill(s), a counterboring tool(s), and similar tool(s) to produce a hole(s), blind hole(s), counterbore(s) counter-sink(s) and similar cavities in workpieces. A work support means is provided to feed the tool into the workpiece or the workpiece into the tool.

2.4.2 Mortiser

A machine designed to produce a square or rectangular cavity by use of a moving, forming or reciprocating tool(s). Means are provided to clamp and support the stock, and either move the stock into the tool(s) or the tool(s) into the stock.

2.5 Lathe, wood**2.5.1 Manual lathe**

A machine designed to be used to generate a cylindrical surface on a workpiece with a cutting tool that is moved along the axis of the workpiece. Cutting can be done either free hand using a tool rest or by using a template and a tracing attachment. The machine is normally equipped with a work driving means and a work supporting tail-stock.

2.5.2 Copying/tracer lathe

A machine similar to a manual lathe designed to use a template to determine the shape of the rotating workpiece. A means is provided to keep a template stylus against the template during the cutting action and a means to feed the tool along a path to generate the desired shape and diameter. A copying/tracer lathe can operate in a semiautomatic or automatic mode.

E2.4.1 Drilling/boring machine

Machines of this type can be called a drill press, a multiple spindle drill, a boring machine, a counter-borer/sinker and similar names. See illustration 14.

E2.4.2 Mortiser

A machine of this type is also known as a chain, hollow chisel or reciprocating mortiser. See illustration 15.

E2.5.1 Manual lathe

A machine of this type is also known as a wood turning lathe. Hand tools used are called gouges, chisels, skew chisels and parting tools. See illustration 16.

2.5.3 Back knife lathe

A machine similar to a manual lathe designed to use a shaped knife-like tool, in a guillotine fashion, to move downward past the rotating workpiece shaping it into the desired contour. The machine operates in a semiautomatic or automatic mode.

E2.5.3 Back knife lathe

See illustration 17.

2.5.4 Swing-head lathe

A machine designed to use a fixed, rotating cylindrical cutting tool and a pivoting work-supporting, rotating and feeding means that brings the workpiece into contact with the cutting tool. The feeding means can be manual or powered and the mode of operation manual, semiautomatic or automatic.

E2.5.4 Swing-head lathe

Machines of this type are also called rotating cutterhead lathes. See illustration 18.

2.6 Sanders**2.6.1 Belt sander****2.6.1.1 Manual belt sander**

A machine that uses an abrasive belt as the cutting tool and uses two or more drums to drive and track the belt. A work supporting means and a means of tensioning and tracking the belt is provided. Manual pressure on the workpiece or fixture is used to cause the sanding action.

E2.6.1.1 Manual belt sander

A machine of this type is known as a belt, stroke, oscillating sander. A pad or platen is generally used to apply or support the sanding action. See illustration 19.

2.6.1.2 Power feed belt sander

A machine that uses an abrasive belt(s) as the cutting tool. A powered moving belt table is used to carry the workpiece past the abrasive belt. A spring loaded hold down(s) is used to help to reduce risk of kickback and to keep stock on the moving belt table. The moving belt is backed by a vertically adjusted platen that is positioned to size the workpiece.

E2.6.1.2 Power feed belt sander

These machines are generally called wide belt sanders.

2.6.2 Disc sander

A machine that uses a circular abrasive disc mounted on a circular rotating backing plate and has a work support means. Manual pressure through the workpiece or workpiece holding fixture against the abrasive disc causes the sanding action.

2.6.3 Profile sander

A machine that uses either a shaped abrasive wheel or block and an abrasive belt to produce a contour on the surface of the workpiece.

2.6.4 Drum sander

2.6.4.1 Oscillating drum sander

A machine that uses vertically mounted interchangeable abrasive surfaced drums of various diameters to allow for inside sanding of picture frames, "U" form and similar parts. A work supporting means is provided which can be tilted with respect to the drum. The drum is automatically oscillated vertically.

2.6.4.2 Horizontal drum sander

A machine that uses an oscillating or stationary drum(s) covered with abrasive material as its cutting tool. A powered belt or feed rolls are used to carry the workpiece past the drum(s). Spring loaded holddown rolls are used to help reduce risk of kickback and to keep the stock in contact with the moving conveyor belt or feedrolls. A moving conveyor belt, when used, is supported by a vertically adjustable platen or table which is positioned to size the workpiece.

2.7 Gluing, Laminating, and Assembling Machines.

2.7.1 Surface Gluing Machines

A machine that applies glue to one or both sides of panels.

E2.7.1 Surface Gluing Machines

The glue can be contained in a reservoir between rolls, run in a pan of coating material or coating material can use a flow system over the roll with a blade to meter the material. The larger panels are pulled through the machine by the rolls. For smaller machines coating product on one side only, the pieces may be laid by hand on a single powered roll.

2.7.2 Edge Gluing Machines

A machine that applies glue to the edge of panels or narrow material.

E2.7.2 Edge Gluing Machines

The rolls may be mounted with the shafts at 90° from each other and using beveled rolls to meter the material that one roll picks up by running in a pan of coating material. The product is supported by a conveyor or table system and the product is run through the machine by hand or by a feed system.

2.7.3 Pressing Machines

A machine that uses pressure to combine two or more materials that have adhesive covered surfaces.

E2.7.3 Pressing Machines

The machine may apply pressure with pneumatic, hydraulic, or mechanical means.

2.7.3.1 Vertical Clamping Platen Presses

A machine with flat platens top and bottom designed to press and hold materials together during the bonding cycle.

E2.7.3.22 "High pressure" Roll Type Press**2.7.3.2 "High pressure" Roll Type Press**

A machine using high pressure rolls to combine materials as they are pulled through the machine.

Sometimes called Laminating Machines, can have heated rolls and may apply pressure with pneumatic, hydraulic, or mechanical means. The equipment sometimes includes a mounting for large rolls of laminating material to be pulled through the machine as it is laminated to a substrate.

2.7.4 Assembling Machines

A materials rack or conveyor system that supports or conveys materials for assembly with other materials.

E2.7.4 Assembling Machines

Sometimes called laminate indexing machines or laminate indexing station, usually works in conjunction with a scissors lift, glue spreader and combining press. The arrangement enables parts to be indexed correctly with the components to be added to the assembly and permanently combined.

3 Definitions

The definition of a term in this standard is for the purpose of the standard and is not to be construed as universal in its application.

3.1 A

3.1.1 abrasion

Source of possible injury as a result of wearing, grinding, or rubbing by friction.

3.1.2 accessory

An item(s) mounted to, or used with, a woodworking machine to allow an intended operation or maintenance procedure to be accomplished.

E3.1.2 accessory

Some accessory items are jigs, fixtures, feeding devices, special guards, dust hoods, grinding attachments, push sticks, and similar items.

3.1.3 anti-kickback device/finger/dog

A type of device that minimizes the possibility of workpiece kickback by maintaining contact between the workpiece and the work-support means, by opposing the tendency of the cutting tool to throw the workpiece from the machine.

3.1.4 arbor

A rotating shaft used for mounting and transmitting torque to a cutting tool(s).

E3.1.4 arbor

A rotating shaft which can also be described as a spindle.

3.1.5 automatic mode

The condition of a machine which, once activated, will complete a function or series of functions on a succession of workpieces without any operator intervention. The function or series of functions will continue until interrupted.

3.1.6 auxiliary fence/filler piece

A stationary spacer device used on the table or fence of a circular saw to help avoid the interference between a hood guard and the fence.

3.2 B**3.2.1 barrier**

A physical obstruction that provides a means of preventing the intrusion of an operator or others into a hazard or hazard area.

3.2.2 bevel cut

A cut made at an angle to the face of a workpiece.

3.3 C**3.3.1 crosscutting**

A sawing operation through the thickness of the workpiece made across the grain in natural wood or across the shorter dimension on a rectangular workpiece of reconstituted wood or plastics.

3.3.2 crush

See "pinch, nip and crush"

3.3.3 cutting

E3.3.3

Severing with a single sharp edge.

See also shearing

3.4 D**3.4.1 dado**

E3.4.1 dado

A straight sided non-through slot, perpendicular to the face of the workpiece, having a width greater than the thickness of a single saw blade.

See illustration 20.

3.4.2 Danger Zone

Any area in or around the machine in which a person is exposed to a risk of contact with machine parts or cutting tools.

3.5 E**3.5.1 ejection:**

E3.5.1

The unexpected movement of the workpiece, parts of it or part of the machine from the machine during processing.

See also, kickback, overfeed, and thrown object

¹⁾ The unassigned listing is for definitions that may be added later.

3.5.2 employee

A person who supplies services to an employer generally for a monetary reward.

3.5.3 employer

A legal entity who engages the services of others recognized as employees for an agreed upon remuneration.

3.5.4 enclosure guard

A barrier designed to prevent entry into the hazard area.

3.5.5 entanglement/entrapment

Captured, caught, snared, pinned, snagged or otherwise held by part of a machine and/or by a workpiece.

3.6 F**3.6.1 featherboard/comb**

A work-guiding and holddown device consisting of stock with a series of spring-like fingers along one edge, set and positioned at an angle to the workpiece.

E3.6.1 featherboard/comb

The purpose of the device is to guide and hold-down a workpiece and in so doing, minimize the possibility of kickback. Putting the fingers at an angle to the workpiece provides the means of having a spring-like and anti-kickback type action.

3.6.2 feeding

The controlled movement of a workpiece or cutting tool to process a workpiece during a woodworking operation.

3.6.3 fence

A device used to locate and guide a workpiece relative to the cutting tool.

3.6.4 fixture/jig

A device to locate, hold, and/or clamp one or more workpieces in a desired position so that the operation can be performed.

E3.6.4 fixture/jig

Devices of this type include a jig, rotating table, and similar work holding devices.

3.6.5 freehand

Freehand operation is the condition where an operator hand-feeds a workpiece or tool to complete an operation without the use of a guide or locating device and where the path of the workpiece or tool is entirely dependent on the skill of the operator.

E3.6.5 freehand

The locating or guiding devices referred to are templates, fence, miter gauges, fixtures and similar devices.

3.7 G**3.7.1 unassigned****3.8 H****3.8.1 unassigned****3.9 I****3.9.1 impact**

Struck by or against an object with sufficient energy to cause injury.

3.9.2 interlocking device

A device used in a control system that is intended to preclude an action from being initiated in an unintended manner or stop an action in a safe fashion, or both, when the device is actuated.

3.10 J**3.10.1 jig**

See figure 3.6.4.

3.11 K**3.11.1 kerf**

The slot made by a saw blade as it saws through a workpiece.

3.11.2 kickback

A particular form of ejection describing the unexpected movement of the workpiece, or parts of the workpiece, opposite to the direction of feed during processing.

E 3.11.2

When the workpiece is being fed against the rotation of the tool or cutter, the tool or cutter can grab the workpiece and throw it in the direction opposite the feed.

3.12 L**3.12.1 unassigned****3.13 M****3.13.1 manual, instruction**

A permanent or semi-permanent booklet of instructions provided by the manufacturer on the construction, installation, care and use of a wood-working machine or accessory.

3.13.2 manual mode

An operating condition where each segment of the operation requires an action on the part of the operator to initiate or maintain it, or both.

3.13.3 modifier

A legal entity modifying a previously manufactured woodworking machine or accessory.

3.13.4 manufacturer

A legal entity responsible for the design, manufacture, quality and sale of a woodworking machine or accessory.

E3.13.4 manufacturer

The word includes any or all of the following operations: – designing, fabricating, casting, machining, inspecting, testing, painting, crating and shipping.

3.13.5 miter gauge

A device used as a workpiece pusher guided by a table groove.

3.14 N**3.14.1 nip**

See “pinch, nip and crush”

3.14.2 numerical control

A control system using numerical data which allows for the preprogramming of all or part of a machine cycle.

E3.14.2 numerical control

The data can be entered into the control system by punched tape, magnetic tape, bubble memory or computer.

3.15 O**3.15.1 Overfeed**

A particular form of ejection describing the unexpected movement of the workpiece, or parts of the workpiece, in the same direction as the feed during processing.

E3.15.1

When the workpiece is being fed in the same direction as the rotation of the tool or cutter, and the cutting action overpowers the feed device, the workpiece can be rapidly accelerated through the machine and ejected.

3.16 P**3.16.1 pinch, nip and crush**

A category of injury, distinguished by magnitude, as a result of a body part being squeezed between two objects.

3.16.2 point-of-operation

The location on the workpiece where a woodworking operation is being performed.

E3.16.2 point-of-operation

This is the area where chips or sawdust are being produced in processing a workpiece. See illustration 21.

3.16.3 point-of-operation area

The point-of-operation area is that danger zone surrounding the point-of-operation where a hazard(s) exists that can cause personal injury.

E3.16.3 point-of-operation area

Examples of hazards in this zone are the rotating cutter or workpiece, rotating, moving or both, and the splinters or sawdust being thrown from the machine, generated at the point-of-operation. See illustration 21.

3.16.4 projectile

An object ejected by the machine and continuing in motion by its own inertia.

3.16.5 push block

A non-metallic device with one or more handles and a flat bottom surface either with a heel or friction material on it, used as a hold down and feed device to provide a safe distance between the hand(s) and the cutting tool.

3.16.6 push stick

A non-metallic stick shaped device designed to provide a safe distance between the hand(s) and the cutting tool. It has, as part of its design, a notched end with a heel and toe to hold down and feed the workpiece past the cutting tool.

E3.16.6 push stick

See illustration 22.

3.17 Q**3.17.1 unassigned****3.18 R****3.18.1 rabbet****E3.18.1 rabbet**

An operation making a two-side notch in the side or face of a workpiece.

See illustration 20.

3.18.2 rebuilder

A legal entity rebuilding a previously manufactured woodworking machine or accessory.

3.18.3 resawing, table saw**E3.18.3 resawing, table saw**

A two-step operation on a table saw in which the first pass is a saw cut made slightly more than halfway through the thickness of a workpiece. On the second pass the same surface as in the first pass is used against the guide and the workpiece becomes two pieces of stock.

There are operations on band saws called resawing but this operation is not intended as part of this definition since, unlike the operation on a table saw, it does not extend the capacity of the machine.

3.18.4 ripping**E3.18.4 ripping**

A sawing operation made through the thickness of the workpiece with the grain of natural wood, along the long dimension of a rectangular workpiece, and usually parallel to that edge on reconstituted wood products or plastics. Two or more pieces are the result of the operation.

Usually a fence or similar guide is used for this operation but some operations are done without a fence such as on a straight line rip saw where the workpiece and off-fall is controlled by the power feeding means.

3.19 S**3.19.1 sawsmith**

A person skilled in the art of repairing, maintaining and/or sharpening saw blades.

3.19.2 scoring

A pre-cut slotting/grooving operation occurring immediately ahead of a ripping or cross-cutting operation to minimize chipping or splintering by a through cutting circular saw blade.

²⁾ This standard is a revision and redesignation of ANSI A12.1-1973.

³⁾ This standard is currently undergoing a revision. Contact the secretariat for more recent information.

⁴⁾ This standard has been officially withdrawn but is available in archive format. Contact ANSI's sales department for more information.

3.19.3 semiautomatic mode

An operating mode in which an operator initiates an intended cycle of events during which operations are performed on a workpiece(s) at the completion of which all machine elements return to their starting position.

3.19.4 shearing

A cutting action caused by relative motion of two or more parts.

E3.19.4

A shear point is generally considered to be where cutting occurs by movement of a mechanical part past a stationary part. A shear hazard is that area of the shear point where injury can occur. See also cutting.

3.19.5 spreader/splitter/riving knife

A flat metal device slightly narrower than the saw kerf designed to prevent the saw blade kerf in the workpiece from closing on the sides of the blade during a sawing operation.

E3.19.5 spreader/splitter/riving knife

The term splitter is synonymous with spreader and a "riving" knife is a spreader that remains in a fixed relationship to the blade regardless of its height above the table. See illustration 23.

3.19.6 stock

Wood, reconstituted wood or plastic material on which woodworking type operations are to be performed.

3.19.7 system designer/builder

A legal entity responsible for the design, construction, and/or installation of a system of machines, transfer devices, etc., for use in a woodworking operation.

E3.19.7 system designer/builder

A turn key contractor is one example of a system designer/builder.

3.20 T**3.20.1 template**

A device having a shape or form used with a pin, cam follower or surface to reproduce the form of a workpiece in a woodworking operation.

3.20.2 thrown workpiece**E3.20.2**

A particular form of ejection resulting from contact with a circular or cylindrical tool where the workpiece can be thrown in any direction perpendicular to the axis of rotation of the tool.

A rotating tool such as found on a router or drill press can throw the workpiece in any direction, radially.

⁵⁾ This standard is a revision and redesignation of ANSI Z53.1-1979.

3.20.3 total connected power

The sum of all loads connected through a single power supply.

3.20.4 trapping space

The diminishing space in any machine set-up where, through powered movement of a component(s) or workpiece(s), it is possible for a body part(s) to be trapped between the tool(s), or its mounting, and the material/workpiece(s) being processed, or the associated jig/fixture/accessory equipment.

3.21 U**3.21.1 unassigned:****3.22 V****3.22.1 unassigned:****3.23 W****3.23.1 warning**

Notice of possible harm to personnel, or bystanders, or both.

3.23.2 woodworking machinery

Means or systems that shape wood and/or wood-like material.

3.23.3 workpiece

Stock having woodworking operations being performed on it to produce a finished form. It is considered a workpiece from the time it is loaded in a woodworking machine until it exits or is removed from the machine.

3.24 X**3.24.1 unassigned:****3.25 Y****3.25.1 unassigned:**

3.26 Z**3.26.1 unassigned****4 General requirements for construction, reconstruction and modification of a wood-working machine****4.1 Responsibility****4.1.1 Manufacturer**

It shall be the responsibility of the machine manufacturer to design and construct the machine in accordance with the applicable parts of this standard.

4.1.1.1 Machine manual - General

It shall be the responsibility of the manufacturer to provide a manual(s) containing information on the construction, installation, care and use of the machine.

E4.1.1.1 Machine manual

This manual would normally contain instructions for the assembly, installation, adjustments, care and use of the machine and its accessories, and a listing of the component parts with electrical, hydraulic, pneumatic and lubrication diagrams, if required, for use by maintenance or service personnel. The information may be contained in one or more manuals which may take the form of paper, electronic media, video, etc.

4.1.1.2 Machine manual - Specific**4.1.1.2.1 Lockout/Tagout**

The manual shall contain instructions for proper shut down of the machine. The manual shall identify the machine's requirements for lockout/tagout as required by Federal or State regulations or statutes.

E4.1.1.2.2

Lockout/tagout requirements should consider all the energy forms utilized by the machine, such as electrical, hydraulic, pneumatic, thermal, chemical, spring and/or gravitational.

4.1.1.2.3 Warnings and/or Labels

The manual shall describe or depict the original placement of all warnings and labels.

4.1.1.2.4 Fasteners

Where a fastener is critical to the safe operation of the machine, its grade and installation torque shall be provided.

4.1.1.2.5 Weight

The weight(s) of major components and/or assemblies shall be provided.

4.1.2 Accessory manufacturer

It shall be the responsibility of any accessory manufacturer to design and manufacture an accessory in conformance with the applicable clauses of this standard.

4.1.2.1 Accessory instructions - General

It shall be the responsibility of the accessory manufacturer to provide appropriate instructions with the accessory on its construction, care, installation, and use.

4.1.2.2 Accessory instructions – Specific**4.1.2.2.1 Lockout/Tagout**

Instructions shall be included for proper shut down of the accessory in preparation for lockout/tagout as required by Federal or State regulations or statutes.

4.1.3 Modifier

A modifier of machines covered by this standard shall be considered to be the manufacturer of those machines insofar as the modification is concerned and shall have the responsibilities of the manufacturer for such modification(s).

4.1.3.1 Revisions to machine manual

It shall be the responsibility of modifiers to supply instructions covering construction, installation, care and use of the area of reconstruction or modification where it differs in a material way from what the original manufacturer supplied.

E4.1.3 Modifier

Integration of a machine into a system is not considered modification of the machine.

E4.1.3.1 Revisions to machine manual

An instruction manual would normally contain information on construction, care and use of the modified area and a listing of component parts with appropriate electrical diagrams etc. The information may be contained in one or more manuals which may take the form of paper, electronic media, video, etc.

4.1.4 Rebuilder

For the purposes of this standard, the rebuilder acts as the manufacturer of the machine. As such, the rebuilder is responsible for meeting the manufacturers' requirements of the standard as it exists at the time of the rebuild. See 4.1.1

4.1.4.1 EXCEPTION: This subclause excludes routine service and maintenance.

4.1.4.2 The rebuilder shall permanently affix markings on the machine that can be used to identify the rebuilder and the date of rebuild.

4.1.4.2.1 Such markings shall not obscure, modify, remove, or otherwise make illegible such identification(s) placed on the machine by the original manufacturer or any subsequent rebuilder(s).

4.1.4.2.2 Such markings shall be located where they are visible and accessible without disassembling or moving the machine.

4.1.4.2.3 Such markings shall be located on a permanent part of the machine or on a part that can not be removed without impairing the operation of the machine.

4.1.4.3 Revisions to machine manual

It shall be the responsibility of rebuilders to supply instructions covering construction, installation, care and use of the area of reconstruction or modification where it differs in a material way from what the original manufacturer supplied.

E4.1.4.3 Revisions to machine manual

An instruction manual would normally contain information on construction, care and use of the modified area and a listing of component parts with appropriate electrical diagrams etc. The information may be contained in one or more manuals which may take the form of paper, electronic media, video, etc.

4.1.5 System designer/builder

It shall be the responsibility of the system designer/builder to design and construct the system in accordance with the applicable clauses of this standard.

Integration of a machine into a system is not considered modification of the machine. However, the system designer does assume responsibility for the safe integration of the machine.

4.1.5.1 System manual**E4.1.5.1 System manual**

It shall be the responsibility of the system designer/builder to supply instructions for the construction, installation, care and use of the system and its components.

4.1.6 Tool/fixture/designer/builder

A designer and/or builder of tools and/or fixtures to be used in or on machines covered by this standard shall be considered to be the manufacturer for those tools and/or fixtures and shall have the responsibilities of the manufacturer for those tools and/or fixtures.

4.1.7 Manufacturer-Employer

It shall be the responsibility of the employer to maintain equipment and provide training to employees so as to comply with the requirements of this standard. Where operations require deviations from the requirements, the employer shall furnish and supervise the use of a means providing equal or greater safety.

4.1.7.1 Training

It shall be the responsibility of the manufacturer to make available initial safety training to maintenance personnel and operators at the time of delivery and furnish training material. The manufacturer / modifier / rebuilder shall provide guidelines to the purchaser in maintaining the equipment in a safe condition and in providing safety training to employees.

4.1.7.2 Maintenance**4.1.8 Employee**

It shall be the responsibility of the employee to use safety equipment and to follow instructions provided by the employer.

4.2 References

4.2.1 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI A14.3-1992, Fixed ladders - Safety requirements

ANSI A64.1-1968, Requirements for fixed industrial stairs

ANSI A1264.1-1995, Floor and wall openings, stairs and non-residential railings - Safety requirements

ANSI Y14.17-1966 (R1987), Fluid power diagrams

ANSI Z87.1-1989, Practice for occupational and educational eye and face protection

ANSI Z88.2-1992, Practices for respiratory protection

ANSI Z535.1-1998, Safety color code for marking physical hazards

ANSI Z535.2-1998, Specification for Safety Signs

ANSI Z535.3-1998, Criteria for Safety Symbols

ANSI Z535.4-1998, Product Safety Signs and Labels

ANSI Z535.5 -1998, Accident Prevention Tags (for Temporary Hazards)

ANSI/ASME B15.1-1996, Mechanical power transmission apparatus - Safety standard

ANSI/NFPA 70-1999, National electric code

ANSI/NFPA 79-1997, Electrical standard for industrial machinery

ANSI S12.15-1992, Measurement of sound emitted by portable, stationary and fixed electric power tools

ANSI/RIA R15.06-1999, Industrial robots and robot systems - Safety standard

ISO 3746 - Acoustics - Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Survey Method Using an Enveloping Measurement Surface Over a Reflecting Plane

ISO 3746 - Two noise measurement standards are referenced in this standard. The ANSI S12.15 does not adequately accommodate large multi-source machines. Therefore, the ISO 3746 standard should be used when more than one noise source is present on a machine.

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4.2.2 Other References

Machine components not addressed by this standard shall comply with any applicable nationally recognized standards.

4.3 Hazard identification and control

4.3.1 Electromagnetic Compatibility Hazards

4.3.1.1 Industrial electrical/electronic equipment, apparatus, or systems shall comply with the applicable electromagnetic interference and compatibility requirements of 47CFR, Parts 2, 15 and 18.

E4.3.1.1

Electrical disturbances caused by or associated with the use of industrial machines should be addressed and if necessary mitigated to comply with the relevant Federal Communications Commission requirements.

Further consideration should be made to:

- Reduce the level of electromagnetic energy to reduce risk of disturbances of other equipment or systems, interference with communication systems, or injury to personnel.*
- Reduce the likelihood of hazardous malfunctions of the equipment or control circuitry caused by being subject to external electromagnetic interference or disturbances.*

4.3.2 Electrical System Hazards

E4.3.2

Electrical hazards associated with the design and use of industrial machines should be addressed as part of an overall risk assessment of the complete system and application. This assessment should take into consideration an acceptable level of risk associated with the personnel and the equipment. Such safety hazards will include, but not limited to, the following:

- Electrical shock or fire hazards resulting from faults or failures within the electrical/electronic equipment.*
- Hazards associated with the malfunctioning of the equipment control circuits.*
- Malfunctions of the equipment due to external power disruptions or disturbances as well as faults or failures in the power circuitry.*

4.3.2.1 Shock, Short Circuits, and Overloading

Electrical/electronic equipment, apparatus, or systems operating from a nominal voltage of 600 volts or less shall meet the requirements of ANSI/NFPA 79, Electrical Standard for Industrial Machinery.

E4.3.2.1

In particular ANSI/NFPA 79 addresses:

- *Prevention of electric shock*
- *Protection against short circuits*
- *Protection against overloading.*

A component of the equipment, apparatus, or system should comply with the applicable requirements for that component and be used in accordance with its established rating for the intended conditions of use.

Electrical systems should be protected against moisture, oils, dust, and other contaminants as warranted by the intended use and location.

4.3.2.2 Hazards resulting from restart after power loss or failure

Where a machine is shipped with a motor(s) starter(s) and there is risk of injury to personnel from a hazard if the motor(s) restarts after power loss or failure, means shall be provided to reduce risk of restart or reduce the risk of injury. (See 6.1.2. for Employers Responsibility).

E4.3.2.2 Hazards resulting from restart after power loss or failure

Some machines are shipped without controls or motors, or both, and the manufacturer cannot know what will be installed on the machine. The maintenance manual should provide the installer of the controls, or motors, or both, the control schematic and motor type that would meet the requirements of the standard and the hazard, if any. (Refer to ANSI/NFPA 79.)

4.3.3 Pressurized Systems Hazards

Components, sub-systems, systems, and installation of pressurized systems shall comply with applicable nationally recognized standards.

4.3.4 Puncture, Cutting, and Shear Hazards

4.3.4.1 All sharp edges, points or shear hazards accessible during normal operation and/or maintenance and not necessary for the function of the machine shall be eliminated.

4.3.4.2 Where practical, sharp edges, points or shear hazards necessary for the function of the machine shall be safeguarded from contact with persons in the vicinity of the machine during normal operation of the machine.

4.3.5 Motion hazards

The manufacturer shall provide protection against the risk of moving part hazards. Where hazards cannot be eliminated, they shall be safeguarded. Where they can not be safeguarded the manufacturer shall warn against the hazards.

4.3.5.1 Components that are stationary during normal operation and are in proximity to moving parts shall be restricted against being dislodged.

4.3.5.2 Components or subsystems which may be subject to movement shall be restricted such that movement will not result in increased risk.

4.3.5.3 Liquid shall be contained such that movement of the container, as a normal function of the operation and/or maintenance of the machine, will not result in:

- a. tipping or unexpected movement of the machine or its components,
- b. spillage of any of the contents.

4.3.5.3.1 If liquid exists within a system which, during normal operation, can produce or be subjected to hydraulic shock, means shall be used to reduce the shock to a level not injurious to personnel or the machine.

E4.3.5 Motion Hazards

Some of the recognized hazards are:

- a) Rotating components such as flywheels, gears, sheaves and shafts;*
- b) In-running pinch points such as meshing gears, belt and sheave combinations, and meshing chains and sprockets;*
- c) Pinch points between moving and stationary components;*
- d) Motion of counterbalancing means during normal operation or in the event of failure.*

Examples of moving part hazards that cannot be eliminated by design are the rotating face plate on a manual wood lathe, the rapidly moving table and saddle of a CNC router, and the rotating table of a swing arm shaper.

4.3.5.4 Springs and shock absorbers shall be designed, installed and maintained such that they do not "bottom-out" or over-extend during normal operation of the machine.

4.3.5.5 Structural members shall be designed to withstand impact and dynamic loads expected during normal operation of the machine.

E4.3.5.5

Components which might be damaged or might cause damage by impact during operation may be provided with bumpers, shock absorbers, springs, or other devices to lessen the effects of such impacts.

4.3.5.6 Surfaces of the machine upon which personnel are expected to stand during normal operation and/or maintenance shall be slip-resistant.

4.3.5.7 Hinged covers or access panels that must be raised to open shall have a means of securing them in their open positions against accidental closures that could cause injury.

4.3.5.8 Slide assemblies shall have limit stops to prevent movement past intended travel where such movement would create a hazard.

4.3.6 Powered cranks, levers, or control hand wheels

Powered cranks, levers, or control hand wheels that create pinch points shall be safeguarded.

4.3.6.1 Cranks or control hand wheels with handles

Cranks or control hand wheels with handles, operating at a peripheral speed of 50 feet per minute or more, shall be safeguarded or self-disengaged during powered operation.

4.3.6.2 Control hand wheels with spokes but without handles

Control hand wheels with spokes but without handles, operating at a peripheral speed of 125 feet per minute or more, shall be safeguarded or self-disengaged during powered operation.

4.3.6.3 Hand wheels without spokes or projections

Control hand wheels without spokes, operating at a peripheral speed of 500 feet per minute or more, shall be safeguarded or self-disengaged during powered operation.

4.3.7 Hazards associated with ladders/stairs, work platforms, and walkways

If ladders/stairs, work platforms or walkways are provided as part of the machine, the manufacturer shall comply with the applicable standard.

4.3.8 Hazards from wood dust

Means shall be provided, where practical, to contain wood dust within the machine envelope and for a connection to a dust collecting means when the dust in the air caused by processing workpieces is a hazard to the operator(s). (See section 7 for the employer's responsibility).

4.3.9 Anti-motion mechanism or counterbalance system

Where the free-fall rate of vertically moving components can result in injury, motion controlling means, such as one of the following, shall be provided.

4.3.9.1 Counterweight

A counterweight shall be designed, located or guarded so that it will not create a risk of injury.

4.3.9.2 Spring counterbalance

Spring counterbalance, when used, shall not create a hazard on spring failure and shall incorporate a safe means for disassembly. A warning shall be given if improper disassembly can create a hazard.

4.3.9.3 Hydraulic or pneumatic counterbalance system

Hydraulic or pneumatic counterbalance shall include a self-energizing locking or retarding mechanism when the falling rates of vertical components constitute a hazard.

E4.3.8 Hazards from wood dust

A warning may be necessary to inform the employer where in normal use, the amount of wood dust generated can exceed the limits set by the enforcing authority.

E4.3.9 Anti-motion mechanism or counterbalance system**E4.3.9.2 Spring counterbalance**

Instructions necessary for safe disassembly and reassembly should be included in the maintenance manual.

E4.3.9.3 Hydraulic or pneumatic counterbalance system

Mechanisms such as orifices, check valves or spring-loaded stops may be used to fulfill this requirement.

4.3.9.4 Brake and locking devices

When a brake or locking device is used for an anti-motion device involving hazard(s), it shall be of the self-energizing or self-locking type.

E4.3.9.4 Brake and locking device

A device such as a spring engaged or permanent magnet brake may be used to fulfill this requirement.

4.3.9.5 Counterweight and support chain or cable

Guarding shall be provided to reduce risk of the hazard of a falling mass or whipping support chain or cable (causing injury to personnel) in the event of a failure of any component in the system.

4.3.10 Noise and Vibration Hazards**4.3.10.1 Noise Warnings**

Where the noise level measured at the operator(s) position on an 8 hour time-weighted average basis at idle or in use exceeds 85 dbA measured consistent with the requirements in ANSI S12.15, a warning shall be given that hearing conservation measures are required to protect the hearing of operators.

4.3.10.2 Availability of Noise Information

The manufacturer shall make available to the purchaser noise measurement information necessary for installation and use of the machine to comply with 29 CFR 1910.95.

4.3.10.3 Fasteners subject to vibration

Fasteners which are subject to loosening due to vibration or other influences shall be secured with appropriate locking methods, such as lock nuts, lock washers, etc.

4.3.10.4 Operator exposure to vibration

Where operators can be exposed to hazardous levels of vibration, means shall be provided to reduce exposure to the vibration below hazardous levels.

4.3.11 Chemical Reactions

4.3.11.1 Materials, liquids or other chemicals may not be used if the material, liquid or other chemical will react with air or moisture in the air in such a way as to cause the release of flammable, explosive or toxic substances.

4.3.11.2 Materials, liquids or other chemicals which cause injury to human skin or eyes upon contact shall be contained so as to reduce risk of such contact during normal use and maintenance of the machine.

4.3.11.2.1 Warnings of the presence of such materials, liquids or other chemicals shall be given on the machine in the proximity of any location where contact is possible.

4.3.11.2.2 Instructions regarding the presence, control and safe handling of such materials, liquids or other chemicals shall be given in the instruction manual accompanying the machine.

4.3.11.3 Where materials, liquids or other chemicals present during normal use or maintenance of the machine could combine with other materials, liquids or other chemicals expected to be present could cause injury, appropriate warnings shall be placed on the machine.

4.3.11.4 Where materials, liquids or other chemicals present during normal use or maintenance of the machine could cause allergic reactions, appropriate instructions shall be given in the user manual accompanying the machine.

4.3.11.5 Where liquids are in use during normal operation and/or maintenance of the machine, information shall be provided in the operator manual that, in the event of ingestion of the liquid, a practical antidote is identified or that there is no antidote indicated.

4.3.11.6 Where material(s) are used whose molecules will break down in the presence of heat or ultraviolet radiation to produce dangerous products, appropriate warnings shall be given on the machine and in the operator manual.

4.3.11.7 Liquids or gases used in the normal operation or maintenance of the machine shall be held in containers which will not react with the liquids or gases.

4.3.12 Requirements for safeguarding

If a hazard exists, safeguarding shall be used following these requirements, where practical.

E4.3.12

Hazards should be eliminated by design, where practical. If the hazard can not be eliminated, the safeguarding and/or warning means of this standard should be applied.

For the purposes of this standard, physical barriers are the first safeguarding means to be applied. Other safeguarding means are then described for use, followed by warnings and instructions.

Proper safeguarding is a function of many things, including nature of the hazard, location of the hazard, and machine application. Guidelines for design of guards can be found in other American National Standards such as B15.1, and the B11 series.

4.3.12.1 Requirements for a fixed guard

A fixed guard used to satisfy the requirement shall:

- a) Reduce risk of injury to body parts by limiting entry into the hazard area(s) which it safeguards;
- b) Create no pinch point(s) between it and other stationary or moving part(s) of the machine, fixture or tooling;
- c) Be securely attached to the machine structure, component(s) or fixture and, where possible, utilize fasteners removable by a tool(s);
- d) Allow inspection, offer maximum visibility consistent with requirements (a) through (c), and allow the use of auxiliary equipment as is necessary.

4.3.12.2 Requirements for movable guards

A movable guard used to satisfy the requirements shall:

- a) Come into position upon actuation of the machine cycle or be interlocked so that the machine will not operate until the guard is in position;
- b) Reduce risk of injury to body parts by limiting entry into the hazard area that it is safeguarding;
- c) Create no pinch point(s) between it and other stationary or moving parts of the machine, fixture, or tooling;
- d) Allow inspection, offer maximum visibility consistent with the requirements (a) through (c), and allow the use of auxiliary equipment as is necessary.

4.3.12.3 Requirements for a safeguarding device

A safeguarding device used to satisfy the requirements shall:

- a) Require the application of both of the operator's hands on the operating controls of the machine, until the tool contacts the work or the hazard being safeguarded is no longer present; or,
- b) Establish an operating position such that no part of the operator's body is in close proximity to the rotating cutter or trapping zone; or,
- c) Stop the cutter rotation or stop and reverse the feed by use of a presence-sensing device if any part of the operator's body enters the area that the device is designed to protect; or,
- d) Reduce risk of the operator inadvertently reaching into the hazard area by restraining or withdrawing the operator's hands.

E4.3.12.3 Requirements for a guarding device

"Close proximity" has been accepted to be within 12 inches of the hazard.

4.3.12.3.1 Requirements for a presence-sensing guarding device

A presence-sensing guarding device, when used, shall be interlocked into the control circuit to prevent or stop machine activation if an operator's hand or other part of the body is detected in the sensing field of the device. The device shall do the following:

- a) Stop machine motion before any parts of the body can enter a hazard area;
- b) Not, of itself, create any hazard to the operator;
- c) Not be used as a cycle start mechanism;
- d) Be designed to be fail-safe.

Failure of the light source or power supply, excessive ambient light, temperature variations, or other environmental factors shall not adversely affect the safeguarding of the operator.

4.3.12.3.2 Requirements for a pullback device

A pullback device, when used, shall include attachments for each of the operator's hands. Such attachments shall be adjusted to prevent the operator from reaching into the hazard area or to withdraw the operator's hands from the hazard area before injury can occur. A separate pullback device shall be provided for each operator, if more than one operator is required on a machine.

4.3.12.3.3 Requirements for holdout or restraint device

A holdout or restraint device, when used, shall include attachments for each of the operator's hands. Such attachments shall be securely anchored and adjusted in such a way that the operator is restrained from reaching into the hazard area. A separate set of restraints shall be provided for each operator, if more than one operator is required on a machine.

4.3.12.3.4 Requirements for a two-hand control device

A two-hand control device shall meet the following requirements:

- a) The control actuators shall be protected from unintended actuation and arranged by design, construction or separation so that the concurrent use of both hands of each operator is required to initiate the machine cycle;
- b) The control system shall be designed to require the release of all actuators used to initiate the cycle before an interrupted or completed cycle can be resumed or re-initiated;
- c) It shall use a control arrangement requiring concurrent operation of the individual operator's hand controls.

4.3.12.4 Requirements for a shield

A shield used to satisfy the requirements of this standard shall:

- a) Be an effective barrier for chips and sawdust;
- b) Not, in itself, create a hazard(s) such as a pinch point or sharp edge;
- c) Be effectively mounted through mechanical, magnetic or other means.

E4.3.12.3.4 Requirements for a two-hand control device

- a) *The word concurrent, as used in this standard, means acting in conjunction with, and is used to describe a situation where two or more control actuators are in an operating condition at the same time.*
- b) *The use of the word concurrent is intended to exclude any implication that a simultaneous moment of actuation must exist between the operation of the individual two-hand operating devices.*
- c) *The word concurrent, as used in this standard, means acting in conjunction with, and is used to describe a situation wherein two or more controls exist in an operating condition at the same time. The use of the word concurrent is intended to exclude any implication that a simultaneous moment of actuation must exist between the operations of the individual two-hand controls.*

E4.3.12.4 Requirements for a shield

Shields are intended to provide protection for persons who must work in an assigned area(s) and are not intended to contain all chips or wood dust within the machine. A shield may be constructed of any rigid material that does not create a fire hazard.

4.3.12.5 Requirements for an awareness barrier

An awareness barrier used to satisfy the requirements of this standard shall, by contact with the operator, make the operator aware of a hazard or reduce risk of ready entry/access to a hazard area by use of a guardrail or gate/door and enclosure.

E4.3.12.5 Requirements for an awareness barrier

The awareness barrier concept is that of a barrier that moves to provide additional clearance and cannot be lifted or moved without the operator knowing it. Such a barrier also provides visual boundaries to the hazard area. On larger machines and multiple machine installations it may not be possible to safeguard the hazard area and the use of barriers or gate/enclosures may be the only practical method of safeguarding. An example of this is when industrial robots are used for material handling.

4.3.12.6 Requirements for an awareness device

An awareness device used to satisfy the requirements of this standard shall be such that it will:

E4.3.12.6 Requirements for an awareness device

Such devices may be desirable where a hazard could exist part of the time; for instance, during startup of transfer machines.

- a) Issue a warning sound to alert an operator or other personnel of an approaching hazard or alert personnel during the period when a hazard exists. This sound shall be distinctive to distinguish it from other existing sounds;
- b) Give out a visible warning light to alert an operator or other personnel of an approaching hazard or alert personnel during the period when a hazard exists.

4.3.13 Machine Stability Hazards**4.3.13.1 Machines designed for a fixed location**

Machines designed for a fixed location shall be securely anchored to prevent walking, tilting, or moving. All other machines must meet the requirements of 4.3.13.3, below.

4.3.13.1.1 All machines shall be provided with bolt holes or other means for securing to the floor or supporting structure.

4.3.13.2 Casters or wheels

Casters or wheels that support a machine shall be retractable or of a locking design.

4.3.13.3 Stability Tests

Machines not anchored or secured to the floor, wall or ceiling shall meet the following stability tests.

4.3.13.3.1 When lifted from any side such that the machine is tilted 7 degrees from its at rest position, the machine will return to its at rest position when the lifting force is removed.

4.3.13.3.2 A machine installed in accordance with the manufacturer's instructions shall not overturn when any doors, empty drawers, movable tables, or other appurtenances are placed in any position to which they are capable of being moved without the use of a hand tool. The machine need not be capable of normal operation when components are positioned for this test.

E4.3.13.3.2

Manufacturers should also consider the possibility of loaded drawers being opened.

4.3.14 Pinch, Nip, and Crush Hazards

Where practical, pinch, nip and/or crush hazards shall be eliminated or safeguarded if they are accessible during normal operation and/or maintenance.

E4.3.14 Pinch, Nip, and Crush Hazards

Pinch points exist where two or more objects, any of which is in motion, meet or come near one another. This can occur as a result of rotation or linear motion. Nip is another term for Pinch.

Crushing is similar to pinching, except at a greater magnitude. Crushing generally involves damage to bone or other structure whereas pinch may not.

Other terms of art are nip point, pinch point, etc.

4.3.14.1 Positive barriers

Barriers and machine structure which physically restrict or prevent access to the hazard zone are considered guards for the purposes of this requirement.

E4.3.14.2

4.3.14.2 Awareness barriers

Awareness barriers are acceptable only where other means of safeguarding listed above are not practical.

Awareness barriers are not considered positive barriers. That is, they do not necessarily prevent or restrict access. Rather, they serve to make the operator aware of the hazard zone without restricting access to the zone.

4.3.14.3 Warning labels

Warning labels are acceptable as a substitute for awareness barriers only when no other practical alternative is available.

4.3.15 Hazards from Workpiece Ejection

E4.3.15

The manufacturer, where practical, shall provide means to reduce the risk of workpieces being forcefully ejected from machines. These means shall address the possibility of wrong way feed and may include other means.

Positive means for preventing wrong way feed should be used where practical. Some machines such as manual fed spindle shapers do not lend themselves to such devices, in which case warnings and instructions should be used.

4.3.15.1 Kickback

E4.3.15.1

Resistance of a rotating abrasive or cutting tool contacting the workpiece applies force tangential to the direction of rotation of the tool. When this force is in the direction opposite the feed direction of the workpiece and it is unchecked or uncontrolled, a potential of kickback exists. The potential for kickback occurs when a cutting tool binds in the workpiece and can be caused by a variety or combination of factors, including, but not limited to, poorly maintained cutters or blades, improperly aligned guide fences, irregularities in workpieces, excessive feed rates, wrong way feed, and/or operator inattention.

The hazard created may be either the thrown workpiece or the exposed work processing means such as a saw, cutter, or abrasive head or belt.

4.3.15.2 Overfeed

E4.3.15.2

Resistance of a rotating abrasive or cutting tool contacting the workpiece applies force tangential to the direction of rotation of the tool. When this force is in the same direction as the feed direction of the workpiece and it is unchecked or uncontrolled, a potential of overfeed exists. The potential for overfeed occurs when a cutting tool binds in the workpiece and can be caused by a variety or combination of factors, including, but not limited to, poorly maintained cutters or blades, improperly aligned guide fences, irregularities in workpieces, excessive feed rates, wrong way feed, and/or operator inattention.

The hazard created may be either the thrown workpiece or the exposed work processing means such as a saw, cutter, or abrasive head or belt.

4.3.15.3 Thrown workpiece**E4.3.15.3**

A rotating tool such as found on a router or drill press can throw the workpiece in any direction, radially. Thrown workpiece is associated with moving rotating abrasive or cutting tools contacting fixed workpieces in such a way as to lift and/or throw the workpiece. The potential for thrown workpiece occurs when a cutting tool binds in the workpiece and can be caused by a variety or combination of factors, including, but not limited to, poorly maintained cutters or blades, improper workpiece supports, irregularities in workpieces, excessive feed rates, and/or operator inattention.

The hazard created may be either the thrown workpiece or the exposed work processing means such as a saw, cutter, or abrasive head or belt.

4.3.16 Projectiles**E4.3.16**

The manufacturer, where practical, shall provide means to reduce the risk of projectiles being forcefully ejected from machines.

Projectiles generally involve the ejection of parts, either machinery and or processed materials/workpieces. Rapidly moving or rotating parts, and everything in their vicinity, are capable of becoming projectiles. For example, clamps or guards in the vicinity of a rotating cutter can become projectiles if they contact the cutter.

4.3.16.1 Where ejected materials can not be contained, personnel in the vicinity of the machine shall be protected by suitable means, such as guarding or face and eye protection.

4.3.16.2 Where practical, components having motion sufficient to throw projectiles capable of injury shall be safeguarded to reduce the risk of such projectiles inflicting injury.

4.3.16.3 Personal protective devices, such as face or eye protection should be used where ejected materials cannot be contained.

4.3.17 Impact Hazards**E4.3.17**

Where practical, safeguarding means shall be used to isolate machine, workpiece, or other movements from employees where such movement can result in impact injuries.

Examples of machines or conditions which can result in impact are Robotic arms, CNC machine centers, projectiles, KB, material movement or conveyance.

4.3.18 Entanglement and Entrapment Hazards

E4.3.18

Where practical, entanglement or entrapment hazards shall be safeguarded.

Loose clothing, jewelry, long hair, gloves, fingers, hands, etc. can become entangled or entrapped in rotating or moving parts. Refer to work practices section of this standard.

Entanglement/entrapment hazards may exist when loading, unloading, adjusting, measuring, cleaning, or similar operations.

Examples of entrapment/entanglement hazards include robotic arms, router spindles, drill presses, rotating or moving parts, lathes.

4.3.19 Abrasion Hazards

Where practical, moving machine surfaces shall be designed or safeguarded to reduce the risk of abrasion injury.

4.3.20 Miscellaneous Hazards

4.3.20.1 Provisions, attachments, systems and/or accessories provided for the purpose of lifting materials

E4.3.20.1

There are numerous ANSI/ASME standards for hoists, for example

Provisions, attachments, systems and/or accessories provided for the purpose of lifting materials shall comply with the appropriate currently published and nationally recognized standards.

4.3.21 Radiation Hazards**4.3.21.1 Ionizing radiation**

E4.3.21.1 Ionizing radiation

All woodworking and accessory equipment using ionizing radiation shall comply with the applicable provisions of Title 10 CFR Part 20 "Standards for Protection Against Ionizing Radiation."

Ionizing radiation injury can be caused by x-rays, gamma rays, alpha particles, beta particles, neutrons, and other nuclear particles.

4.3.21.2 Non-ionizing Radiation

E4.3.21.2 Non-ionizing Radiation

All woodworking and accessory equipment shall comply with the applicable provisions of the current edition of the American Conference of Governmental Industrial Hygienists "Threshold Limit Values for Chemical Substances and Physical Agents."

Non-ionizing radiations include ultraviolet lamps, electric arc welding, plasma torches, high-intensity lights in photocopying machines, sources of "black light", lasers, heating elements, high temperature furnaces, molten metal, fires and explosions, and microwave ovens.

4.4 Controls

4.4.1 Operator controls

4.4.1.1 Access Controls shall be located such that they are within the normal reach of a machine operator from the operating position(s) and not require that the operator(s) reach over, under or past unguarded moving parts, workpieces or cutters that can cause injury.

4.4.1.2 Unintended actuation

Controls shall be designed to minimize the possibility of unintended actuation by the normal movement of the machine operator or work. EXCEPTION: This requirement does not apply to emergency stop controls.

E4.4.1.2 Unintended actuation

Ease of access and multiple operating capability means are of primary importance on emergency stop controls. (See ANSI/NFPA 79.)

4.4.1.3 Identification

Controls shall be clearly identified when their function is not self-evident.

E4.4.1.3 Identification

See ANSI/NFPA 79.

4.4.1.4 Jog/inch controls

The jog/inch controls, when supplied and actuated, shall not initiate a continuous run or an automatic move.

4.4.1.5 Mechanical controls:

4.4.1.5.1 Hand wheels, direction of rotation

A handwheel turned in a clockwise rotation shall produce, for the controlled component, a linear movement to the right, away or upward. If rotary motion is produced by the handwheel, clockwise rotation shall cause clockwise movement of the controlled component. Counterclockwise rotation of the handwheel shall produce motion opposite that of clockwise rotation.

4.4.1.5.2 Levers, direction of motion

A control lever shall move in the same direction as the controlled component when both motions are parallel.

4.4.1.6 Multiple control stations:**4.4.1.6.1 Setup control station**

When a separate setup control station(s) is provided in addition to the normal operator's control station, selection of the setup station(s) shall render the operator's station inoperative, except for emergency stop. Switching from one control station to another shall not create a hazard.

E4.4.1.6.1 Setup control station

A setup control station(s) is normally not capable of cycling the machine. It is basically a jog/ inch control station used to set up a part of a multi-station machine. Keyed on-off controls are generally used to lock out all other stations when a particular station is being used.

4.4.1.6.2 Multiple operators

When more than one operator is required to operate the machine from different control stations, each station shall be provided with a cycle start button and all cycle start buttons must be depressed concurrently in order to initiate the cycle.

4.4.1.6.3 Multiple operating stations, one operator

When one operator can operate the machine from more than one station, all cycle start buttons other than the one being used shall be made inoperative.

4.4.1.6.4 Multiple part loading

Where parts are manually loaded and where the operator is exposed to a hazard due to cutter or machine component movement, the transfer of a part(s) from one position to another shall only occur when initiated by the operator.

4.4.2 Emergency stop control**4.4.2.1 Application**

All machines shall incorporate one or more emergency stopping means, which upon momentary operation, shall safely stop all machine motions. These emergency stopping means shall be located at all operator control stations and, if inherent hazards are present at other operating positions, an emergency stopping means shall be provided at each position. EXCEPTION: On a manual machine with a single motor and motor controller, the motor stopping means is considered the emergency stop.

E4.4.2.1 Application

Emergency stopping means include pull cables, mushroom buttons, pressure mats, presence sensing devices and similar devices. Set up positions are not considered operator control positions.

E4.4.2.3 Accessibility

Stopping means should be within normal reach of the operator and the operator should not be exposed to an unguarded hazard to activate it.

E4.4.3 Power-operated clamping

This may be accomplished by the use of toggles, wedges, cam lock arrangements, accumulator tanks with check valves, or by other means.

E4.4.4 Control function

When an unanticipated motion occurs it can cause an operator reaction which results in an injury.

E4.6.1.1 Loss of control media

Parts coming loose from fixtures, tools flying out, or heads dropping due to loss of clamping pressure are typical hazards caused by loss of control media.

4.4.2.2 Color

The emergency stop(s) actuator shall be red in color. (See ANSI Z535.1.)

4.4.2.3 Accessibility

Emergency stop actuating means shall be readily accessible and not in a location that requires anyone activating it to reach over, under or around a hazard.

4.4.2.4 Function

The emergency stopping means shall override all other controls and, when actuated, shall not create a hazard.

4.4.2.5 Restart

All machine motions stopped by an emergency stop control(s) shall be restartable only by an intentional operator action.

4.4.3 Power-operated clamping

When power operated clamping is used, it shall be so designed so as not to release due to a failure or actuation of the emergency stopping means. Release shall be accomplished by either the completion of the cycle or an intentional action by the operator.

4.4.4 Control function

A control device shall not be used to initiate any motion unrelated to its designation.

4.5 REMOVED

4.6 Hydraulics and pneumatics

4.6.1 Circuitry

4.6.1.1 Loss of control media

Circuits shall be designed and components selected, applied and adjusted so that loss of control media shall not cause a hazard.

E4.6.1.3 Pressure variations

A high pressure transient, as a result of valve closure, may cause failure of other components, creating a hazard from flying parts, hydraulic fluid discharge or uncontrolled motion. Components and circuit design should take this possibility into consideration.

E4.6.1.4 Range of adjustment

Examples of adjustable components are relief valves, flow control valves, flow dividers and similar devices. The maximum safe pressure range of the circuit should be stated in the maintenance manual.

E4.6.2.1 Isolation or venting

Unexpected motion may occur from a charged accumulator, creating a hazard for maintenance personnel.

E4.6.2.2 Nonvented accumulator

A properly identified nonvented accumulator will remind the maintenance personnel to discharge fluid before servicing. The warning given can state "Danger: Unvented Pressure Vessel. Avoid Serious Personal Injury. Discharge Fluid Before Servicing" or similar wording.

4.6.1.2 Rating

Circuits shall be designed so that the components shall be operated within the component manufacturer's recommended specifications.

4.6.1.3 Pressure variations

Circuits shall be designed and components applied so that anticipated pressure variations do not cause a hazard.

E4.6.3 Flexible hose

Hose carriers, cable restraints, hose bundles, etc., offer this protection.

4.6.1.4 Range of adjustment

No adjustable components shall be used that can be adjusted beyond the safe working range of the circuit unless means are furnished to prevent that adjustment.

E4.6.4 Circuits with maintained pressure

A warning stating "Danger: Pressurized System. Avoid Serious Injury. Discharge Pressure Before Servicing" or similar wording may be appropriate. Additional precautions may also be necessary.

4.6.1.5 Loss of pressure

Where the loss of working pressure can cause a hazard, a means shall be provided to reduce risk of unsafe operation under this condition.

4.6.2 Accumulators

4.6.2.1 Isolation or venting

Circuits employing accumulators shall automatically vent the accumulator pressure or isolate the accumulator when the machine is shut off.

4.6.2.2 Nonvented accumulator

A nonvented accumulator shall be identified with a warning against its hazards. Charging and discharging information for proper servicing of a nonvented accumulator shall be given on or near the accumulator in a visible location, and in the maintenance manual.

4.6.2.3 Accumulator charged over 200 psig (.1406Kg/m²)

Gas-charged accumulators operating above 200 psig (.1406Kg/m²) charging pressure shall be charged with inert gas.

4.6.3 Flexible hose

A flexible hose(s) shall be arranged in a manner so as not to create a draping or tripping hazard to the operator in the work area. Where failure of a flexible hose(s) can constitute a whipping hazard, the hose shall be constrained to minimize that possibility.

4.6.4 Circuits with maintained pressure

When pressure is maintained with power off, such as in a counterbalance or accumulator circuit, a warning of this condition shall be provided.

4.7 Cutting tool retention**4.7.1 Cutting tool retention during rotation**

Means shall be provided to retain the cutting tool or blade. If held in place by a retention means the mechanism shall not release as a result of loss of power, stopping or braking action.

4.7.2 Cutting tool retention during tool changing

The cutting tool or cutting tool adapter shall remain in place in the storage magazines or in the transfer mechanisms during all phases of the tool change cycle and shall not be released as a result of power loss.

E4.8.1 Robot

A programmed robot may create a hazard by moving suddenly and unexpectedly or failing to take the programmed path. Limiting access is one way of providing a safeguarding means. Access to the area can be interlocked or may require a special key. Reference ANSI/RIA 15.06.

E4.8.2 Material transfer device

Limited access is the usual way of providing safeguarding. Access to the area can be interlocked or may require a special key.

E4.9.1 Foot operated control device

Unintended actuation may occur from falling stock or accidental stepping on the device. Two methods of safeguarding are:

- a) to guard the top of the device so that the foot must be placed under the guard to actuate the device; or,*
- b) to lock out or remove the device when not in use.*

E4.10 Work support/loading height

On manual machines the following work support/loading heights have been found to be commonly used:

Machine	Heights	
	(in)	(cm)
Circular Saw		
(Manual Feed)	(34-42)	(86-107)
(Power Feed)	(30-38)	(76-96)
Band Saw	(36-48)	(91-122)
Shaper	(34-40)	(86-102)
Jointer	(34-40)	(86-102)
Lathes	(38-42)	(96-107)
Sander-Manual Feed	(34-42)	(86-107)
Radial Arm Saw	(34-40)	(86-102)

4.8 Material transfer components:**4.8.1 Robot**

When a robot is used to load and unload machines, safeguarding means shall be used to minimize the possibility of injury to personnel by any part of the robot.

4.8.2 Material transfer

A material transfer device which is an integral part of the machine that can create a risk of injury shall be safeguarded.

4.9 Foot operated device**4.9.1 Foot operated control device**

A foot operated control device shall be provided with a means to minimize the possibility of unintended operation when such actuation can result in a hazard to personnel.

E4.12.3 Direction of the arbor/spindle thread

This requirement is designed to ensure that the nut will not back off during a powered cut. However, on some machines equipped to reverse spindle rotation or equipped with a braking means, or both, a keyed washer or some means of adjusting the braking time may be necessary to prevent spin-off of the arbor nut.

4.10 Work support/loading height

Work support/loading height shall be designed to be convenient to an operator. See clause 7 for employer's responsibility where the operator's stature can cause a risk of injury.

4.11 Notice on manuals

In addition to the safety instructions required in clause 5, the manufacturer shall permanently affix to the machine a conspicuous notice that a manual(s) has been furnished that specifies information to be understood and followed to avoid injury.

4.12 Arbor/spindle design**4.12.1 Arbor/spindle**

The arbor/spindle and tool shall be designed to fit without appreciable play.

4.12.2 Size of arbor/spindle

The size and shape of the arbor/spindle for mounting cutting tools shall be designed to fit the applicable tools without appreciable play.

4.12.3 Direction of the arbor/spindle thread

When circular cutting tools are secured by means of a central arbor and nut, the hand (left or right) of the thread shall be so that the arbor nut tends to tighten as the spindle revolves under power. When direction of rotation is reversible or if an arbor/spindle brake is furnished, means shall be used to minimize the possibility of the nut spinning off.

4.12.4 Length of arbor/spindle thread

When circular saw blades are mounted by means of a central arbor/spindle, retaining nut and flanges, the following two conditions shall be maintained:

- a) Arbor/spindle thread shall be of sufficient length to allow full thread engagement of the retaining nut;
- b) The saw blade shall be supported concentrically on the arbor/spindle.

E4.13 Operating speed

Because of the design and material, some saw blades and cutters may not be suitable for all possible spindle speeds of a machine. It is, therefore, important that an operator or setup operator know the speed at which the spindle will rotate in order to safely setup or use the machine. Common practice is to put the information on a plate on the machine or in the machine manual.

E4.13.2 Opposing flanges

Normally this requirement is satisfied by having equal diameter and equal bearing surfaces by the use of relieved flanges.

E4.15 Tool/workpiece coasting hazard

Means to satisfying this requirement include guards, braking devices and short coasting time.

4.13 Operating speed

The operating speed(s) or range of speeds for which the machine was designed shall be provided with the machine.

4.13.1 Design and material of saw blade flanges

Flanges shall be piloted and of such diameter as to satisfactorily transmit the driving torque from the spindle to the circular saw blade or cutting tool. Where the bearing surface of the flanges is not sufficient to transmit the driving torque, drive pins or other means shall be used. Flanges may be made of steel, cast iron, or other material of equal or greater strength and rigidity.

4.13.2 Opposing flanges

Opposing flanges, between which a circular saw blade or cutting tool is mounted, shall be designed so that the opposing bearing surfaces on the flanges do not cause a bending problem that results in a hazardous condition.

4.14 Drive pins

Drive pins, when supplied, shall be of such a diameter, strength, and number to transmit without failure, from the spindle to the saw blade or cutting tool, the stall torque at the spindle of the largest motor intended to be used on the machine.

4.15 Tool/workpiece coasting hazard

Where normal use can result in injury to personnel from accidental contact with a rotating or moving tool, or workpiece that coasts to a stop after its driving means is de-energized, means shall be provided to minimize the possibility of that injury. The means used shall not create an additional hazard(s).

E4.17 Access door/cover

A door/cover used for setup or maintenance should only be used by experienced personnel and may require that the machine be operational with the door/cover open. Where the machine does not have to be operational, the machine shall be disconnected and locked out from its power source.

E4.19.1

This standard provides specific color values, tolerances, and use guidelines for red, orange, yellow, and other colors commonly used in hazard identification.

E.4.19.2

Safety signs are normally used to identify hazards within an environment. They are not generally used for specific, on-product hazards.

4.16 Excessive speed of cutter rotation

Rotating tools shall not be operated at speeds higher than their rated speed (RPM).

4.17 Access door/cover

A door cover which closes access to a hazard area not used in the processing of workpieces or in machine setup shall be attached in a manner which requires a tool(s) to open. Where access to a hazard area into which an operator must place body parts in the processing of workpieces or in the setup of a machine, the door cover shall be provided with a safeguarding means or a warning shall be given to minimize the possibility of an injury.

4.18 Limiting speed for a rotating cutting tool

A rotating cutting tool designed to be used on a woodworking machine shall be marked, where possible, by its manufacturer with its maximum safe rotational speed. When the cutting tool or saw is too small to mark legibly, the maximum safe speed shall be marked on its packaging.

4.19 Warnings, Safety Signs and Labels**4.19.1 Colors**

Colors used in warnings, safety signs and labels shall comply with ANSI Z535.1, "Safety Color Code."

4.19.2 Safety Signs

The design of safety signs shall comply with ANSI Z535.2, "Specification for Safety Signs."

4.19.3 Safety Symbols

The design of safety symbols shall comply with ANSI Z535.3, "Criteria for Safety Symbols."

E4.19.5

Temporary hazards are those which only exist for a limited period of time. For example, certain hazards may exist only during installation of a machine, after which the hazard no longer exists and the warning is no longer appropriate.

E5

Machine Specific Requirements are included in this standard for the sake of continuity with prior versions of ANSI O1.1. It is the intent of this Committee that future machine specific standards, adopted under the O1 series, will supercede their respective sections of this standard.

4.19.4 On-Product Warnings

The design of on-product warnings and instruction labels shall comply with Z535.4, "Product Safety Signs and Labels."

4.19.5 Temporary Hazards

The design of temporary hazard tags shall comply with ANSI Z535.5, "Accident Prevention Tags (for Temporary Hazards)."

5 Requirements for specific machines**5.1 Band and jig saws****5.1.1 Vertical band saw****5.1.1.1 Blade guide(s)**

An upper and lower blade guide shall be furnished that provides adequate support for the blade.

5.1.1.2 Upper blade guide adjustment

An upper blade guide shall be vertically adjustable for the full range of the workpiece thickness capacity. The employer shall be responsible for insuring that an employee operating a band saw adjusts the upper blade guide to be as close to the maximum height of the workpiece or fixture as practical.

5.1.1.3 Guarding of the saw blade

All portions of the saw blade, where possible, shall be enclosed or safeguarded except the working portion between the bottom of the upper guide and the top of the table. The guard providing protection in the guide post area above the upper guide shall guard the cutting edge of the saw blade on the front and open side of the machine.

5.1.1.4 Guarding of the band wheels

Means shall be provided to enclose the band saw wheels during operation. Access doors or covers used shall be secured in a manner so that they will remain closed during normal operation and in the event of a band breaking. The enclosure shall meet the requirements of ANSI/ASME B15.1, for enclosures except for the band exit area, the guidepost and the telescoping guard.. These openings shall be kept to a practical minimum.

5.1.1.5 Wheel coasting hazard

An effective means of stopping the blade motion shall be provided to minimize the coasting hazard.

5.1.1.6 Saw blade tension

A means shall be provided to adjust and indicate the proper tension for the range of band saw blades designed to be used.

5.1.1.7 Saw blade width

A built-in means shall be provided to limit the maximum blade width that can be installed on the machine where greater blade width will create a hazard.

5.1.1.8 Instructions on minimum radius operations

Instructions shall be provided regarding the minimum radius that can be sawed for each recommended saw blade width.

5.1.1.9 A small or difficult-to-hold workpiece

Where a hazard exists to the operator on manually fed machines in processing a small or difficult-to-hold workpiece, means shall be furnished by the employer to feed or clamp, or both, the workpiece to complete the operation safely.

5.1.1.10 Feed rolls

Powered feed rolls on a band saw shall be guarded, where practical, to minimize access to in-running nip points.

5.1.1.11 Rip fence locking

A rip fence, when supplied, shall have adequate means for locking it in position for all locations within its capacity.

5.1.2 Scroll/jig saw**5.1.2.1 Blade guarding**

A scroll or jig saw blade shall be safe-guarded above the workpiece to minimize the possibility of accidental contact with the cutting edge of the blade.

5.1.2.2 Workpiece hold down

A jig or scroll saw shall be furnished with an adjustable hold down designed to oppose the lifting tendency of the reciprocating blade.

5.1.2.3 Pinch points

When a pinch point(s) exists in the reciprocating mechanism which can cause injury, it shall be guarded.

5.2 Circular saw**5.2.1 Table saw**

The employer shall ensure that the saw is operated only when the blade-guarding device of the type furnished with the saw or other appropriate safe-guarding means is used.

5.2.1.1 Guarding of saw blade beneath and behind the table

Guarding beneath the table shall be provided to minimize possibility of contact with moving parts during normal operation of the saw. If an open-bottom enclosure is used to guard the blade or other moving parts from contact, the depth of the enclosure shall be such that the plane of the bottom is 1 in or more below the lowest point of the largest saw blade intended to be used with the saw and any portion of the drive mechanism in its lowest position.

5.2.1.2 Blade guard

Each saw shall be provided with a self-adjusting or fixed/manually adjusted hood-type guard that covers the blade above the workpiece. If fixed or manually adjusted, its clearance over the workpiece shall not exceed .25 in. (6.4mm) in use. A self-adjusting guard shall not offer excessive resistance to manually feeding a workpiece. For operations where a blade guard increases the risk of injury or is impractical to use, the employer shall furnish and supervise the use of a safeguarding means that provides equal protection.

5.2.1.2.1 Design

A positive means shall be provided that shall limit the maximum diameter blade that can be mounted on the arbor by the manufacturer.

5.2.1.2.2 Mounting

The blade guard hood shall be so mounted to ensure that its operation will be positive, reliable and in alignment with the saw blade. The mounting shall be adequate to resist reasonable forces encountered in normal operations which may tend to throw it out of alignment.

5.2.1.3 Narrow ripping cut

A push stick or fixture shall be provided by the employer and used by the operator when making a narrow ripping cut.

5.2.1.3.1 Push stick

A push stick when used, shall be of sufficient length to minimize the possibility of the operator's hand contacting the saw blade. A push stick shall be so constructed to be suitable for this use.

5.2.1.3.2 Special fixture

A special fixture or feeding device, or both, to prevent interference between the rip fence and the hood guard shall be provided by the employer and used by the operator for ripping a narrow width close to the fence.

5.2.1.4 Spreader

Each saw shall be furnished with a spreader.

5.2.1.4.1 Design

The spreader thickness shall be less than the saw blade kerf of the narrowest width of the maximum diameter standard blade(s) designed to be used on the table saw and of sufficient length and width to resist reasonable side forces encountered in normal operation that tend to throw the spreader out of line with the saw blade and minimize the possibility of kickback as a result of heeling or pinching of the blade. The manufacturer shall state the spreader thickness in the operating instructions.

5.2.1.4.2 Mounting

The mounting means shall be designed to allow the spreader to be properly aligned with the saw blade for all operating positions of the saw blade or table.

5.2.1.4.3 Location

The spreader shall be located so that the edge closest to the blade shall not be more than .5 in. (12.7mm) from the blade when:

- a) a blade of maximum recommended diameter is installed;
- b) and, the blade is in its maximum up position. When a blade is used, smaller than the maximum possible, the employer shall provide and supervise the use of a means that performs similar functions to the spreader.

5.2.1.4.4 Use

The employer shall ensure that a spreader is used for all operations where it can be used. For operations where a spreader cannot be used, the employer shall provide and supervise the use of a means providing similar safety functions.

5.2.1.5 Anti-kickback device

An anti-kickback device(s) shall be provided which minimizes the possibility of the unexpected backward movement of the workpiece causing injury to an operator or bystander. It shall be operable for all stock thicknesses up to the full through-cutting capacity of the saw. On an operation where an anti-kickback device(s) cannot be used, the employer shall provide other equally effective means to reduce the possibility of the unexpected backward movement of the workpiece.

5.2.1.6 Rip fence

An adjustable position rip fence shall be provided for use in a ripping or beveling type operation(s). The fence shall be designed to permit proper alignment with the saw blade and be capable of being clamped in location so that it remains in position and parallel to the saw blade.

5.2.1.7 Miter gauge

An adjustable head miter gauge and its guiding table slot(s) shall be provided on a saw not equipped with a moving table. The gauge shall be designed so that it can be used without contacting the saw blade or blade guard during use. The gauge shall provide a means to mount facing boards or fixtures to the adjustable head face. The employer shall ensure that the facing board or fixture used is safe for the intended operation.

5.2.2 Power feed rip saw**5.2.2.1 Hood and guard**

The blade(s) shall be guarded except for the areas necessary to feed the stock and retrieve a workpiece. An upper hood shall be provided that will protect the hand(s) of the operator from flying splinters and broken saw teeth and will deflect sawdust away from the operator. Feed rolls and chains shall be provided with a means to prevent the hand(s) of the operator or off bearer from coming in contact with an in running nip point(s).

5.2.2.2 Adjustment of power feed

The employer shall ensure power feed devices are properly adjusted for each piece of stock in order to reduce the possibility of kickback.

5.2.2.3 Chain feed bed

The links in a chain feed bed shall be designed, where possible, so as not to present a pinch point hazard. Where this is not possible the nip points shall be safeguarded.

5.2.2.4 Side guarding

Side guarding shall be provided to prevent narrow trim edges from being thrown out of the side of the machine.

EXCEPTION: Side guards shall not be required for straight line rip saws.

5.2.2.5 Anti-kickback device

An anti-kickback device(s) shall be provided which minimizes the possibility of the unexpected backward movement of the workpiece causing injury to an operator or bystander. It shall be operable for all stock thicknesses up to the full through-cutting capacity of the saw. On an operation where an anti-kickback device(s) cannot be used, the employer shall provide other equally effective means to reduce the possibility of the unexpected backward movement of the workpiece.

5.2.3 Cut-off saw**5.1.2.3.1 General requirements****5.2.3.1.1 Blade guard**

Each saw shall be provided with guarding designed to minimize the risk of injury from flying splinters and broken saw teeth, and to minimize the risk of the operator's hand inadvertently contacting the saw blade.

5.2.3.1.2 Saw carriage return

On a manually operated saw a means shall be provided to prevent the saw carriage from moving out of its at rest position as a result of gravity or vibration.

5.2.3.1.3 Operating controls

A saw equipped with power feed shall be designed to return the saw blade carriage to its at rest position if the cutting stroke is stopped by interruption of an operating control and no hazard results.

5.2.3.1.4 Travel limit

The saw shall have a positive travel limiting means designed to prevent any unguarded part of the saw blade from extending beyond the front edge of the work support table.

5.2.3.2 Under table cut-off saw**5.2.3.2.1 Saw blade guarding**

The saw blade shall be guarded in its at rest position and that part of the blade above the work shall be guarded by a hood type guard that complies with 5.2.3.1 during operation.

5.2.3.2.2 Work holding means

A clamping means shall be provided to prevent stock movement during a cutoff cycle. When there is a risk of injury from the pinching hazard created by the work securing means, which cannot be eliminated by design, a warning shall be given.

5.2.5

See Illustration 5

5.2.3.3 Over table cut-off saw**5.2.3.3.1 Saw blade guarding**

An upper guard shall be provided to enclose the unused part of the saw blade to minimize the possibility of injury from flying splinters, broken saw teeth and other debris. A lower guard shall be provided which shall cover the lower part of the blade sides to the full depth of the tooth gullet to the extent possible, when the saw is in its at rest position.

EXCEPTION: Where the possibility of contact with the saw blade is remote because of its location, no lower blade guard is required.

5.2.3.3.2 Direction of rotation

The manufacturer shall indicate on the machine the direction of rotation for the saw blade that tends to force the stock down on the work support surface and against the fence for cross cutting operations.

5.2.4 Panel saw**5.2.4.1 Saw blade guarding**

A blade guard(s), stationary or moving type, shall be provided to minimize the possibility of contact with the rotating cutting tool(s).

5.2.4.2 Stock holding means

Stock securing means shall be provided to prevent stock movement during the cutting cycle. When there is a risk of injury from the pinching hazard, created by the work securing means which cannot be eliminated by design, a warning shall be given.

5.2.5 Radial arm saw

5.2.5.1 Saw blade hood

Each saw shall be provided with a hood that completely encloses the upper portion of the blade down to a point that includes the centerline of the saw arbor to prevent arbor mounted devices from coming off. The hood shall be designed to help to protect the operator from flying debris and broken teeth and to deflect sawdust away from the operator.

5.2.5.2 Lower blade guard

A lower blade guard shall be provided by the manufacturer that covers the sides of the maximum diameter blade that the machine is designed to use from the tip of the teeth at least to the base of the maximum gullet depth. The lower guard shall be designed to automatically adjust to the thickness of the workpiece and remain in contact with it during the cut.

5.2.5.2.1 Lower blade guard instructions

The manufacturer shall furnish instructions for the proper use of a lower blade guard and the hazards, if any, caused by its use.

5.2.5.2.2 Lower saw blade guard use

The lower guard shall be used only for sawing operations where it functions properly. Care shall be taken by the employer to see that additional hazards resulting from the use of lower guards are not created.

5.2.5.3 Direction of rotation

The manufacturer shall indicate on the machine the direction of rotation for the saw blade that tends to force the stock down on the work support surface and against the fence for cross cutting operations.

5.2.5.4 Fence

A saw table supplied by the manufacturer shall be equipped with a fence which is an adequate back stop when cross cutting and a stock guide when ripping. It is the responsibility of the employer to supervise the use of the fence during those operations for which it was designed.

5.2.5.5 Adjustable stop

An adjustable means shall be furnished with the saw to limit the forward travel of the blade beyond the position necessary to complete the operation. The employer shall ensure that the limit is properly adjusted for each set-up.

5.2.5.6 Travel limit

See general requirement 5.2.3.1.4.

5.2.5.7 Anti-roll out

The employer shall provide a means to prevent the saw carriage of a manually operated saw from moving forward on the arm as a result of gravity or vibration.

5.2.5.8 Saw carriage return

On a manually operated saw the employer shall train the operator to return the saw carriage to its at rest position after completion of the cut.

5.2.5.9 Ripping operation**5.2.5.9.1 Hold down device**

A hold down device shall be furnished to minimize the possibility of the stock lifting off the table at the start of a ripping operation.

5.2.5.9.2 Anti-kickback device

An anti-kickback device designed to contact the workpiece on both sides of the kerf on the outfeed side of the blade shall be provided. The device shall be operable for all thicknesses of material within the capacity of the saw.

5.2.5.9.3 Spreader

A spreader, when provided, shall be capable of being aligned with the saw blade, positioned in the workpiece kerf, and designed to minimize the risk of kickback and the workpiece kerf from closing on the saw blade.

5.2.5.9.4 Push stick

A push stick, when used, shall be of sufficient length to minimize the possibility of the operator's hand contacting the saw blade. A push stick shall be so constructed to be suitable for this use.

5.2.5.9.5 Special fixture

A special fixture and/or feeding device to provide clearance, between the blade guard fence and the lower blade guard, shall be provided by the employer and used by the operator for ripping a narrow width close to the fence.

5.2.5.9.6 Direction of feed

The employer shall instruct and supervise the operator to feed the workpiece only against the direction in which the saw blade turns. The manufacturer shall indicate the correct feed direction.

5.3 Cylindrical cutter machines**5.3.1 Jointer****5.3.1.1 Cutterhead design**

A manual feed jointer shall be equipped with a cylindrical cutterhead.

5.3.1.2 Knife projection

The projection of knives beyond the body to the cylindrical cutterhead shall not exceed one-eighth inch. (0.125", 3.2mm).

5.3.1.3. Blade retention

See 5.9.7.

5.3.1.4 Front of fence cutterhead guarding

A guard shall be supplied which remains in contact with the stock being cut and automatically covers the unused portion of the cutterhead on the front side of the fence. The employer shall ensure that the guard is used for all operations where it can be used, and that it is immediately reinstalled following completion of those operations requiring its removal.

5.3.1.5 Cutterhead guarding behind the fence

Any exposed portion of the cutterhead behind the fence that creates a risk of injury shall be guarded.

5.3.1.6 Throat area

The gap between the infeed and outfeed tables at the stock support surface shall be as narrow as possible and not exceed 2.5 in. (63.5mm) with the tables set for zero depth of cut tangent to the knife cutting circle. The gap between the top edge of the outfeed table and the knife cutting circle shall not exceed .125 in. (3.2mm) when the outfeed table is tangent to the knife cutting circle.

5.3.1.7 Table position locking

Where there is a hazard created by the unintended movement of the infeed or outfeed support table, means shall be provided to prevent such movement.

5.3.1.8 Fence position

When a fence is supplied, an adequate means for locking it in position shall be provided for location and angle to the tables.

5.3.1.9 Safety instructions

Instructions shall be provided on the hazards caused by a kickback. These shall include information on how to minimize the possibility of a kickback and injury. The employer shall inform each operator of the hazards and shall supervise the implementation of the instructions given by the manufacturer.

5.3.1.10 Push block

A push block or blocks, when used, shall be of an appropriate design for the operation to be performed. The employer shall provide and ensure the use of a push block(s) where required for a safe operation.

5.3.1.11 Special operations

Special fixtures and other safety devices shall be provided by the employer for all special operations requiring them. The employer shall be responsible for their maintenance and use and shall allow only properly trained operators to use them.

5.3.2 Molder/multiple head planer**5.3.2.1 Guarding the cutterhead**

The cutterhead(s) and cutting tool(s) shall be guarded to minimize the possibility of unintended contact.

5.3.2.2 Feeding mechanisms

The nip or pinch point of feed rolls and similar self-feeding devices shall be guarded during operation to minimize the possibility of injury to operators or others.

5.3.2.3 Safety instructions

Where there is a risk of injury to personnel because of the high rate at which the workpiece is fed through the machine, safety instructions on how to avoid the hazard shall be provided.

5.3.3 Planer, single or two surface**5.3.3.1 Guarding of the cutterhead**

The cutterhead shall be covered by a guard to minimize the possibility of accidental contact. Where an exhaust system is provided it may form all or part of the guarding means. On a single or two surface planer, not equipped with a dust collector hood, an opening in the guarding to discharge chips and wood dust is permitted.

5.3.3.2 Cutterhead design

See 5.3.7.

5.3.3.3 Feeding means

Nip or pinch points on feed rolls and similar self-feeding devices shall be guarded during operation to minimize the possibility of injury to the operator(s) or helper(s).

5.3.3.4 Multiple board surfacing

Machines designed to be used for simultaneous multiple board surfacing shall be provided with sectional infeed rolls having sufficient yield in the sections to provide feed contact pressure on the stock over the range of stock thickness variation specified for the planer.

5.3.3.5 Safety instructions

Instructions shall be provided on how to minimize the possibility of injury from the following conditions as applicable:

- a) Kickback when multiple surfacing;
- b) Pinching hazard to fingers when hand loading short workpieces;
- c) An open discharge area for chips and wood dust that allows access to the cutterhead where accidental contact with the cutterhead can occur.

5.3.3.6 Depth of cut limitation

The design of the machine shall include a means to limit the maximum depth of cut per pass and a means to limit the minimum thickness of stock that can be processed.

5.3.3.7 Special fixtures

It shall be the responsibility of the employer to provide and maintain fixtures used for special cuts on planers and to authorize their use only by qualified operators.

5.3.4 Router**5.3.4.1 Manual/automatic spindle router****5.3.4.1.1 Cutter safeguarding**

Means to minimize the possibility of inadvertent contact with the cutter shall be provided.

5.3.4.1.2 Tool locking means

No set screw or other tool locking means shall be designed to protrude beyond the outer diameter of the section in which it is located in a chuck or other tool holding means.

5.3.4.1.3 Dust and chip collection

A means shall be provided to allow the collection of dust and chips generated at each spindle.

5.3.4.2 Automatic spindle router**5.3.4.2.1 Exposed moving machine parts**

Where a hazard exists of an operator or a bystander being struck by moving machine parts, means shall be provided by the employer to limit access to these areas.

5.3.5 Shaper**5.3.5.1 Single spindle manual feed shaper****5.3.5.1.1 Spindle/arbor**

Each spindle/arbor shall have a provision for use of keyed washer(s) or an equally effective means of preventing intended loosening of the spindle/arbor locknut.

5.3.5.1.2 Braking

Means for preventing prolonged rotation of the cutting tool after it has been de-energized shall be provided where required to minimize a coasting hazard.

5.3.5.1.3 Vibration

The employer shall ensure that the cutting head shall be stable and does not vibrate excessively when operated at maximum recommended speed.

5.3.5.1.4 Table opening

The table opening in an under the table spindle shaper shall provide for support of the workpiece to within .25 in (6.4mm) of the largest diameter shaper cutter recommended for use on the machine. Suitable inserts shall be provided for smaller diameter shaper cutters for support of the workpiece.

5.3.5.1.5 Straight line shaping

Shapers intended for straight line manual feed shaping shall be furnished with the following items.

5.3.5.1.5.1 Adjustable fence

A fence shall be provided with adjustment means to limit the depth of cut. The infeed face of the fence shall have adequate adjustment for the capacity of the machine. Means shall be provided to adjust the outfeed face of the fence to align it with the outside extremity of the cutter. The adjustment and locking of the individual faces shall be such that the settings will be maintained during normal operation of the tool. Means shall be provided for firmly securing the fence to the table.

5.3.5.1.5.2 Guarding the cutting tool

The employer shall ensure that all sections of the cutting tool are safeguarded except an opening to allow access of the workpiece to the cutting tool. The guarding means above the cutting tool shall extend beyond the largest diameter cutting tool recommended and shall be vertically adjustable down to the uppermost surface of the workpiece.

5.3.5.1.5.3 Workpiece holding/guiding device

A suitable means of holding and guiding the workpiece past the cutting head shall be provided by the employer, to make it unnecessary for hands to be in close proximity to the cutting tool on short, narrow, or unstable workpieces.

5.3.5.1.5.4 Stop blocks

Where an interrupted cut is to be made in the edge of a workpiece, the employer shall furnish and ensure the use of a securely fastened stop block(s) to minimize the possibility of a kickback.

5.3.5.1.6 Contour shaping

Shapers intended for manual feed contour shaping shall be furnished with the following items.

5.3.5.1.6.1 Starting pin/block

A starting pin or starting blocks shall be provided to provide the operator with a fulcrum to guide and steady the workpiece during the start of the cut.

5.3.5.1.6.2 Collars

Arbors for contour shaping shall be provided with a ring or collar to control the depth of cut.

5.3.5.1.6.3 Guarding the cutting tool

Any portion of the cutting tool(s) that is exposed above the upper surface of the workpiece shall be safeguarded, where possible, with a barrier that extends beyond the maximum diameter of the cutting tool(s). The employer shall ensure the use of the safeguarding device for all operations where it can be used and shall provide and ensure the use of other means required to provide equal safety.

5.3.5.1.7 Special instructions

Instructions on the special hazards associated with the use of shapers shall be provided by the manufacturer. The employer shall not allow the use of the machine by an operator who has not been instructed on the special hazards associated with its use and shall ensure that the instructions provided are followed.

5.3.5.2 Multiple spindle manual feed shaper

All provisions of 5.3.5.1 shall apply to each spindle of a multiple spindle shaper.

5.3.5.2.1 Stop-start controls

A means shall be provided to stop and start each spindle individually and independently.

5.3.5.3 Automatic straight line shaper**5.3.5.3.1 Guarding of cutter(s)**

The non-working side of all cutting tools and the exposed end of all arbors shall be guarded.

5.3.5.3.2 Workpiece clamping

Workpiece clamping, shall be designed to have sufficient capacity to hold a workpiece in position during a maximum capacity cut. The clamp actuating means furnished shall be designed such that in the event of loss of pressure or power the clamping force will be retained until released by the operator.

5.3.5.3.3 Power feed

All elements of the power feeding means shall be guarded in accordance with the requirements of ANSI/ASME B15.1.

5.3.5.4 Rotary table shaper**5.3.5.4.1 Guarding of cutter(s)**

Where possible, the non-working side of all cutting tools and the exposed end of all arbors shall be guarded.

5.3.5.4.2 Work holding means

Adequate means for fastening work holding devices and templates to the worktable shall be provided.

5.3.5.4.3 Limited access

(See clause 7 for employer's responsibility.)

5.3.6 Tenoner/trim saw**5.3.6.1 Guarding the cutting tools**

A guard(s) shall be provided to minimize the possibility of contact with that area of the saw blade(s) or other cutting tool(s) not designed to contact a workpiece.

5.3.6.2 Guarding of power feed means

Feed chain(s), belt(s) and sprockets that are a hazard to personnel shall be completely enclosed except for that portion used to transport the stock.

5.3.6.3 Emergency shutdown device

An emergency shutdown device(s) shall be provided which is accessible to operator(s) and helper(s) at all positions designed to be used for loading and unloading stock.

5.3.6.4 Braking means

Where a risk or injury exists from a coasting blade or cutter, means shall be provided to minimize the possibility of injury. (See 5.3.5.1.2)

5.3.7 Miscellaneous cylindrical cutter machines

Other machines using cylindrical cutters such as profilers, dovetailers, engravers and carvers still have the cutting tool(s) safeguarded from unintended contact. The manufacturer shall provide a guard, where possible, to the size or type of cutter recommended for use on the machine. If multiple types or sizes of cutters are used on the machine that makes full barrier guarding not possible, the employer shall limit access to the machine or provide other appropriate safeguarding.

5.4 Drilling/boring/mortising machine**5.4.1 Point-of-operation area safeguarding on a manual machine**

Safeguarding of the point-of-operation, rotating cutting tool or trapping zone, shall not be required on manual machines.

5.4.2 Point-of-operation area safeguarding on a semiautomatic or automatic machine

On machines operating in the semiautomatic or automatic mode the employer shall be responsible for safeguarding the point-of-operation area when any part of the operator's body must come within 12 inches (309.8mm) of the rotating tool(s) or spindle(s), or in the trapping zone to load, unload, adjust, measure, cleanup or perform similar duties. An awareness barrier is acceptable when a guard or guarding device cannot be used, or if used, would of itself create a hazard.

5.4.3 Workpiece(s) clamping

The employer shall provide a workpiece clamping means, where necessary, to minimize the possibility of injury from unintended rotation or movement of the workpiece or fixture.

5.5 Wood lathe**5.5.1 Guarding a rotating cutter**

Guarding shall be provided that will minimize the possibility of contact with the cutter on the non-working side.

5.5.2 Guarding a rotating workpiece

On a semiautomatic or automatic lathe where the workpiece is rotated by the headstock at high speed and workpiece/workpiece parts can be thrown from the lathe, a guard shall be provided to minimize the possibility of injury to personnel. On a manual machine the employer shall determine when an over the workpiece guard is required to minimize the possibility of injury from a thrown workpiece/workpiece parts.

5.5.3 Guarding a trapping zone

On automatic and semiautomatic wood lathes a safeguarding means shall be used to minimize the possibility of the operator reaching in and being caught between the tool and workpiece.

5.5.4 Tool Rest

A tool rest shall be supplied on a manual lathe and shall be designed to be adjustable for changes in workpiece diameter and cutting techniques.

5.5.5 Work support(s)

An adjustable work support(s) shall be used for small diameter workpieces when breakage, due to high tool loads, can occur on automatic and semi-automatic lathes. The work support(s) shall not in itself create a hazard.

5.6 Sander**5.6.1 Workpiece support**

Where the hazard exists of body parts getting caught by the in-running pinch point or by loss of control of the workpiece because of the gap between the workpiece support means and the abrasive, an adjustment means shall be provided to minimize that gap and possibility of injury.

5.6.2 Nip point(s)

A belt sander shall have in-running nip points of the belt safeguarded, where possible, to minimize the possibility of an injury caused by the hazard.

5.6.3 Never used run of sanding belt

Where it is probable that an operator will be injured by the hazard of the never-used run of sanding belt, it shall be safeguarded to minimize the possibility of that injury.

5.6.4 Feed rolls

Feed rolls on self-fed sanders shall be safeguarded to minimize the possibility of body parts coming in contact with the in-running nip point(s).

5.6.5 Pressure points

Pressure rolls on self-fed machines shall be safeguarded to minimize the possibility of body parts coming in contact with the in-running nip points.

5.6.6 Transport means

Safeguarding shall be provided to minimize the possibility of body parts being caught by the pinch points of the transport means.

5.6.7 Unexpected ejection

Means shall be provided to minimize the possibility of injury to personnel by unexpected ejection from the machine of abrasive, machine parts, or a workpiece.

5.6.8 Anti-kickback device(s)

On machines intended for use in sanding multiple boards simultaneously an effective means shall be provided to minimize the possibility of the kickback of the workpieces.

5.7 Miscellaneous and combination machines**5.7.1 Miscellaneous machines**

Miscellaneous machines within the scope of this standard not mentioned elsewhere in this standard shall be safeguarded where a hazard exists.

5.7.2 Combination or multiple function machine

Each separate point of an operation area, where a hazard exists, shall be safeguarded by suitable means. Refer to the applicable clauses for specific requirements on a similar type of operation area being used to process the stock.

5.8 Safeguarding

5.8.1 This section reserved for future use

E5.8.2 Point-of-operation area

The point-of-operation where dust or chips are produced in the processing of a workpiece is normally inaccessible. Hazards in the point-of-operation area such as the rotating/moving workpiece or cutter, trapping zone and flying debris may require safeguarding.

E5.8.2.1 Guarding of a rotating/moving workpiece or cutter

See clause 5 for the safeguarding requirements for specific machines.

E5.8.2.2 Trapping zone

"Close proximity" has been accepted to be within 12 inches of the hazard.

E5.8.2.3 Flying debris

The employer should refer to the enforcing authority for wood or particulate levels.

5.8.2 Point-of-operation

5.8.2.1 Guarding of a rotating/moving work-piece or cutter

A guard, guarding device, or awareness barrier is required when a rotating/moving cutter(s) is exposed on a machine in the automatic or semiautomatic mode and it is necessary for any part of the operator's body to be in close proximity to the cutter for the purposes of loading, unloading, adjusting, measuring, cleaning up or similar operations. An awareness barrier is only acceptable where a guard or guarding device is not practical or would of itself present a hazard that would not exist by using an awareness barrier.

5.8.2.2 Trapping zone

On machines operating in the automatic or semi-automatic mode, a guard, guarding device, or awareness barrier is required when it is necessary for any part of the operator's body to be in close proximity of the trapping zone for the purpose of loading, unloading, adjusting, measuring, cleaning up or similar operations. Awareness barriers are only acceptable where there is no other appropriate alternative.

5.8.2.3 Flying debris

Flying scrap, chips, slivers and sawdust that create a hazard shall be controlled, where possible, by use of shields, dust exhaust systems or other suitable means.

E5.9 Special device(s) provided by the employer

Devices required for safe operation under this category may be used for:

- a) Work holding, supporting or guiding;*
- b) Work loading or unloading;*
- c) Work feeding;*
- d) Anti-kickback.*

E5.9.2 Anti-kickback device

An example of an anti-kickback device furnished by an employer, is a featherboard or a workpiece holding fixture.

E5.9.3 Manual work feeding device

An example of a work feeding device is a push stick or block, a miter gauge, or a keyed work holding fixture.

5.8.2.4 Instructions

It shall be the responsibility of employers to instruct their employees on the hazards associated with the point-of-operation area and to ensure their use of safeguarding means, proper work habits and personal protection devices.

5.9 Special device(s) provided by the employer

5.9.1 Responsibility

It shall be the responsibility of the employer to determine when a special device(s) is required and, to provide it, maintain it, and ensure its use.

5.9.2 Anti-kickback device

An anti-kickback device, as designed and constructed, shall minimize the possibility of a kickback. The employer shall ensure that it is maintained and adjusted to operate effectively.

5.9.3 Manual work feeding device

A manual work feeding device, where provided, shall be designed and constructed to provide the operator with a sufficient margin of safety to minimize the possibility of injury when completing an intended operation.

5.9.4 Work holding and/or guiding device

5.9.4.1 Attachment means

The attachment means of a work-holding and guiding device shall be of sufficient capacity to resist all normal cutting forces and shall not in itself create a hazard.

E5.9.4.3 Power clamping

If the clamp opening is more than .25 in. (6.4mm) and the clamp location is within the reach of an operator this condition may create a hazard.

E5.9.4.4 Weight specification and handling

The installing, removing and transporting means considered are eye bolts, hooks, and handling holes.

5.9.4.2 Workpiece retention

Fixtures shall be designed to prevent unintended movement of the workpiece being processed. The restraining or clamping means shall not in itself create a hazard.

5.9.4.3 Power clamping

When the power clamping means for a workpiece causes a pinch point hazard to personnel, that hazard shall be safeguarded.

5.9.4.4 Weight specification and handling

Any work holding or guiding device that weighs more than 50 lbs (22.7kg) shall be clearly and permanently marked to identify its weight. The marking shall be visible when the device is in or on the machine. A means of safely installing, removing and transporting the device shall be identified and, where practical, provided. EXCEPTION: Devices that are an integral part of a machine are exempt from this requirement.

5.9.4.5 Workpiece loading device

An automatic and semiautomatic loading device that has a pinch point(s) or trapping space that can cause injury to an operator shall have the hazard(s) safeguarded.

5.9.5 Work guiding means

5.9.5.1 Template

A template, when used as work guiding means, shall be constructed to be securely attached to the machine or fixture.

5.9.5.2 Fixture as a work guide

A fixture, when used as a work guiding means, shall be securely attached to or guided in the machine and shall be designed to support the cutting forces it must control during the operation.

E6.1.1 Instructions

While much literature of a general nature exists providing guidelines for the installation and care of a woodworking machine or accessory, each manufactured product has unique characteristics requiring separate and unique care that should be furnished to the employer.

5.9.6 Special tooling

Special tooling, when used, shall be designed to be safe for the operation requiring its use. It shall be the employer's responsibility for maintaining the tooling in safe condition or discarding it when it becomes unsafe.

5.9.7 Blade retention

A cutterhead with a removable blade(s) shall be furnished with a means to securely retain the blade(s) under all normal operating conditions. The employer shall not permit resharpening procedures that compromise or eliminate the means used to retain the blade(s).

5.9.8 Safety instructions

The employer shall instruct employees on the hazards associated with the use of a device such as a template, cutting tool, or fixture. The instructions provided shall include, but not be limited to, identifying all hazards stated by the manufacturer of the device in the instructions with, or on, the device.

6 Care

6.1 Responsibility

6.1.1 Instructions

See 4.1.1.1, 4.1.2.1, and 4.1.3.1 for the manufacturer's, modifier's and accessory manufacturer's responsibility to provide instructions.

E6.1.2 Installation

E6.1.2.1

Since proper installation can reduce the possibility of injury to an employee(s) and damage to a machine, typical areas where recommendations or requirements may be provided are:

- *The securing of a machine to the floor, foundation, table or alternate mounting means;*
- *The placement of a machine where a kick-back can throw a workpiece out of the machine into a work traffic area. (See 4.3.8. and clause 5.);*
- *The installation of electrical components on, or the connection of, electrical power to the machine to meet the recommendation of the manufacturer (see 4.5) and the requirements of the enforcing authority;*
- *The conformance with the dust (4.3.9) and noise (4.3.11) requirements of the enforcing authority;*
- *Electrical grounding, local exhaust ventilation, ionizing and non-ionizing radiation shielding, fuel gas connections (if applicable).*

E6.1.2.2 Machine-area

Sufficient clearance must be provided for access door openings, personnel, ladder or man-lift positioning, and for other necessary maintenance equipment. The manufacturer should provide information on any special/unusual access requirements (that would affect the ability to perform parts or components change-outs safely) in the pre-sales process.

E6.1.3 Training of maintenance personnel

The manufacturer shall provide general safe practice information for the training of maintenance personnel to include lockout/tagout.

6.1.2 Installation

6.1.2.1 It shall be the responsibility of the person(s) installing a woodworking machine, to use and follow the recommendations of the manufacturer on proper safety procedures that will provide for a safe installation, and that will minimize the possibility of injury to employees and damage to the machine and its components.

6.1.2.2 Machine-area

It shall be the responsibility of the employer to provide and maintain an adequate area around woodworking machines to allow for safe maintenance practices according to manufacturer specifications.

6.1.3 Training of maintenance personnel

It shall be the responsibility of the employer to ensure the initial and continuing competence of personnel inspecting and maintaining a woodworking machine and to ensure that what is done is in accordance with the instructions from the manufacturer, accessory manufacturer, modifier, or the employer's own written instructions based on those furnished with the machine or accessory, or both.

E6.1.4 Inspection and maintenance

Periodic and regular inspection using an appropriate checklist can help ensure the maintenance of safe operating conditions by determining potential problems before they cause an accident.

E6.1.5 Pre-inspection shutdown procedure

For safety inspections not requiring air hydraulic or electric power to be used, the following procedures are typical:

Bring the machine to zero energy state:

- Shut down and disconnect electrical power;
- Shut down, disconnect, and bleed-off other power sources including air, hydraulic, line shaft, gas, steam, capacitors, etc.;
- Verify absence of coasting motion or potential stored energy.
- Take positive action to prevent reactivation of power such as locking out all energy sources.
- Attempt to activate machine by depressing the start or cycle control to verify that power is off. This should verify absence of power. Be sure the start or cycle control is off before continuing.
- Secure all loose or freely moveable machine members.

E6.2.1.1 Defective blade

Defective blades can stick, jam, kickback or throw teeth and should be inspected and repaired only by a qualified sawsmith. If a skilled sawsmith is not available, saw blades should be returned to the manufacturer or distributor for welding, slotting, or tensioning as required for safe operating speed and service. Excessive gum accumulation can accentuate kickback and should be cleaned off before the thickness of the gum is approximately two-thirds the tooth set. It is strongly recommended that users obtain and follow instructions for proper maintenance of all saw blades.

6.1.4 Inspection and maintenance

It shall be the responsibility of the employer to establish and follow a program of maintenance and inspection of a woodworking machine to ensure that all of the parts, auxiliary equipment, and safeguards are in safe operating condition.

6.1.5 Pre-inspection shutdown procedure

It shall be the responsibility of the employer to establish a safe shutdown procedure based on manufacturer specifications prior to performing inspection or maintenance on a woodworking machine and to ensure that the procedure is followed. On completion of the inspection or maintenance, the employer shall be responsible for the machine being restored to a safe operating condition before allowing it to be put back in use.

E6.2.1.3 Vibration

On blades of 12 in. (304.8mm) diameter or less, the method of manufacture and size of the blade ordinarily ensures that the blade will be stable when new and only require balancing when re-ground.

6.2 Blades, bands, and knives

6.2.1 Circular saw blades

6.2.1.1 Defective blade

The employer shall be responsible for ensuring that a cracked, vibrating, dull, badly set or improperly filed or tensioned saw blade(s) is immediately removed from service, that it not be used until it has been properly inspected and repaired or that it is discarded. The employer also shall be responsible for insuring that a saw blade(s) on which gum or tar has accumulated on the sides is removed from service until cleaned of the excess.

6.2.1.2 Tooth clearance

The employer shall not allow the use of a saw blade(s) that does not have sufficient set or side relief to prevent burning.

6.2.1.3 Vibration

The employer shall not allow the use of a saw blade that has not been balanced or tensioned, or both, to minimize vibration and cracking and to remain stable throughout its design speed range. EXCEPTION: Blades 12 in. (304.8mm) diameter or less do not require tensioning.

6.2.2 Band saw blades and wheels**E7 Use****6.2.2.1 Cleanliness**

The employer shall see that band saw blades and wheels shall be kept clean and free from accumulation of sap, gum, resins or any foreign substance.

The use of a machine includes the selection, installation and use of tooling, fixtures, safety devices, personal protective devices, set-ups and work handling. The tasks involved may be the responsibility of one or more supervisors but each function must be done properly to ensure a safe operation.

6.2.2.2 Joints

To avoid blade breakage and grabbing in the stock, the employer shall not allow the use of a saw blade with a brazed or welded joint thickness that is wider than the thickness of the band stock.

E7.1.1 Authorization**6.2.2.3 Defective blade**

To minimize the possibility of blade breakage, the employer shall ensure the removal from service of any cracked, dull, badly set or improperly brazed or welded saw blade.

In some plants, there is a posting by the machine of those employees authorized to use it. This is one method of complying with this clause.

6.2.3 Knives and cutter heads**6.2.3.1 Maintenance**

The employer shall see that all knives and cutting heads of woodworking machines shall be kept sharp, balanced, properly adjusted, and firmly secured.

6.2.3.2 Vibration

The employer shall ensure the removal from service of a cutting tool(s) or arbor(s), or both, with excessive vibration or excessive lateral or radial play.

6.3 Accessories and attachments

The employer shall not allow the use of accessories and attachments which are not specifically recommended by the machine manufacturer or which will adversely affect the safe usage of the machine.

7 Requirements for the Use of Woodworking Machinery

The employer shall be responsible for ensuring the safe use of a woodworking machine.

7.1 Personnel**7.1.1 Authorization**

The employer shall not allow anyone to operate a woodworking machine who is not experienced enough or adequately trained to operate the machine safely.

7.1.2 Selection of operating personnel

It shall be the responsibility of the employer to select an operator(s) and helper(s), as required, who, in the judgment of the employer based on personnel records, past work history, observation and similar information, are able to safely operate a woodworking machine.

E7.1.3 Training of the operator

The instructions given should include, but not be limited, to:

- 1 A description of the assigned task(s);*
- 2 The function of controls to be encountered in performing the assigned task(s);*
- 3 The hazards associated with the assigned task(s);*
- 4 The designated method of feeding;*
- 5 The designated method of safeguarding;*
- 6 The methods of function-testing or otherwise assuring the proper function of safeguarding means;*
- 7 Responding to and reporting inconsistent or unpredictable performance.*

E7.1.5 Safe practices

Information on safe shop rules is available from many authoritative sources. To have a safe shop, the employer should establish safe practices that apply to the skill of employees, equipment, products, and type of business involved. Color coding of machine hazard areas should comply with ANSI 535.1-1998 and OSHA requirements and be provided by the manufacturer..

E7.2.1 Compliance with standards

It is recommended that the manufacturer incorporate the ANSI standards into their manuals and make available a copy of this ANSI O1.1 standard to the purchaser.

7.1.3 Training of the operator

The employer shall be responsible for instructing the operator(s) and helper(s) as required on the hazard(s) of the machine(s) he or she is to operate or assist in operating and the safe method(s) to be used.

E7.2.2.1 Employee work dress code

Hazards exist in the work place, such as rotating tools, workpieces, and machine parts which can entangle long or loose sleeves, long hair, jewelry, gloves, etc.; and heavy components, stock, workpieces, etc., which can fall and strike an employee; and kicked-back or thrown parts which can strike an employee. The employer is in the best position to judge the risk of injury from those hazards, to determine or mandate a dress code to minimize the risk, and the authority to ensure its use.

7.1.4 Availability of Instruction Manual

The operating instructions manual required in 4.1.1.1, 4.1.2.1, and 4.1.3.1 of this standard should be made available to those responsible for training the operator.

7.1.5 Safe practices

It shall be the responsibility of the employer to establish, monitor and enforce appropriate rules for the safe operation of a woodworking machine(s) consistent with the manufacturer's training and instructional requirements of this standard.

E7.2.2.3 Hearing protection

The employer is in the best position to determine the noise exposure of an employee and to ensure that appropriate steps such as engineering methods, administrative controls or personal audiometric protective devices such as ear plugs or muffs are used.

7.2 Equipment

7.2.1 Compliance with standards

The manufacturer and employer shall not allow the use of a woodworking machine that is not in compliance nor shall sell, distribute or salvage the machine that has been red tagged by an enforcing authority as being out of compliance with safety regulations.

7.2.2 Personal protective equipment**7.2.2.1 Employee work dress code**

The manufacturer will include in their safety manual guards that will prevent the entanglement with these hazards. It shall be the responsibility of the employer to ensure that the operator of, and helper for, a woodworking machine, are dressed and groomed appropriately to minimize the possibility of entanglement with the workpiece, tool or exposed moving machine parts, and are wearing the appropriate or mandated personal protective clothing for the work being done.

7.2.2.2 Eye and face protection

It shall be the responsibility of the employer to ensure that eye protection is worn by an operator(s) or helper(s) when operating a woodworking machine and that the appliance used conforms to ANSI Z87.1, or its latest issue, or the requirements of the enforcing authority.

7.2.2.3 Hearing protection

The employer shall be responsible for ensuring that appropriate means are used to protect an employee's hearing when the noise intensity or duration, or both, exceed the limits set by the enforcing authority.

7.2.2.4 Respiratory protection

The employer shall be responsible for determining when a hazard exists which can cause respiratory damage to an employee and ensuring that appropriate measures are taken to minimize the possibility of that damage to an employee(s). The measures taken shall conform to ANSI Z88.2 or the latest revision thereof, or those regulations of the enforcing authority.

E7.2.3 Safety device use

An operator needs to know how and when to use a safety device such as a push stick, push block, auxiliary fence, featherboards, fixtures, a power feeder and similar items to minimize the possibility of injury. The employer is in the best position to judge what and how much training is needed on each device and to ensure its use.

E7.3 Environment of use

This includes items such as lighting, adjacent noise, protection from the elements, janitorial services, location of stock, egress means, kickback path location, kickback curtains, etc., are ones under the control of the employer and the employer is in the best position to determine or have determined what needs to be done to minimize the possibility of injuries.

7.2.3 Safety device use

It shall be the responsibility of the employer to train an operator(s) in the proper use of any safety device such as a fixture(s), tool(s), or accessory(s) required to do each operation safely and to supervise its use to minimize the possibility of an injury.

7.3 Environment of use

The employer shall be responsible for insuring that the environment of use of the machine minimizes the possibility of injury to operators, helpers and bystanders.

7.4 Safeguarding the point-of-operation area

Machine manufacturers or their representative shall provide a means of safeguarding the point of operation specified in this standard. Where a specific means of safeguarding the hazard(s) in the point-of-operations area has not been defined in this standard, the employer shall furnish and ensure the use of an adequate means to help avoid injury.

7.5 Set-up

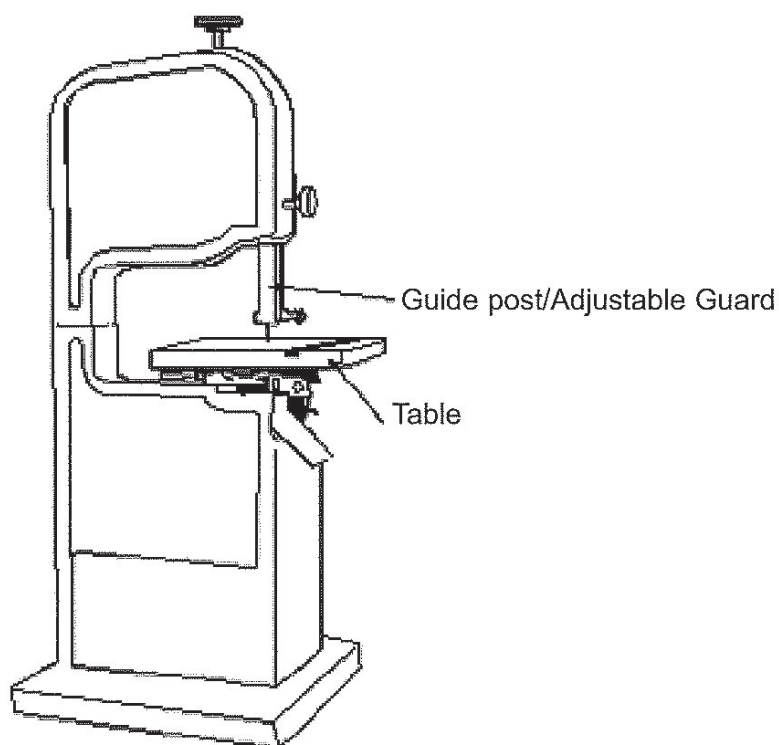
It shall be the responsibility of the employer to ensure that the set-up on a woodworking machine is safe before permitting an operator to use the machine.

7.6 Employee responsibility

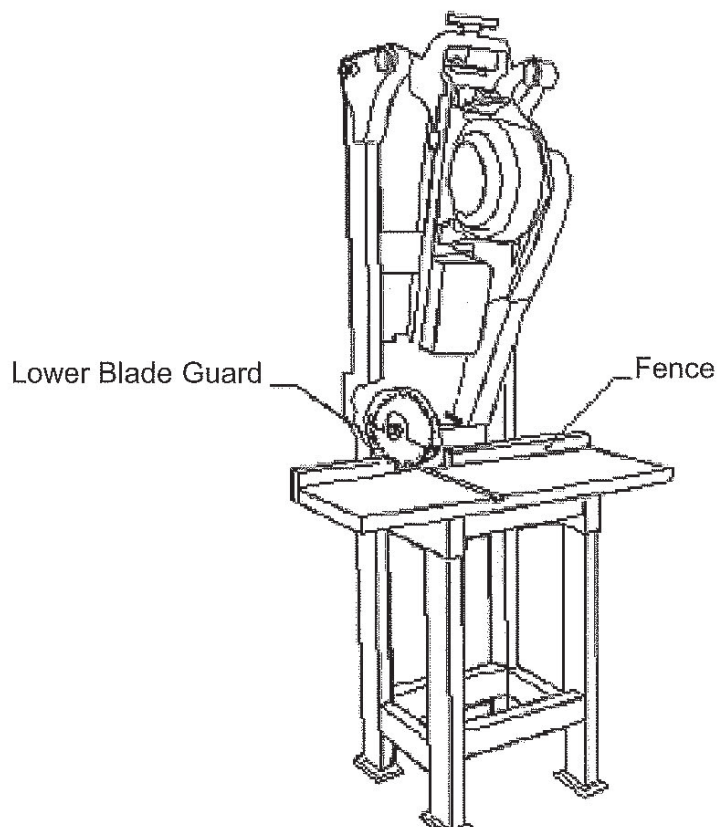
It shall be the responsibility of the employee(s) to:

- a) Follow all safety instructions, practices and procedures of their employer;
- b) Use all appropriate safety devices provided to them by the employer;
- c) Notify supervisor immediately when an unsafe condition or practice is encountered, or where the safety devices no longer provide safety due to deterioration, lack of maintenance, failure of or missing parts, and similar problems;
- d) Follow the instructions of the employer on appropriate dress and protective equipment to be used;
- e) Before leaving the assigned machine, turn off power to the machine and wait until it stops;
- f) Maintain an orderly work area.

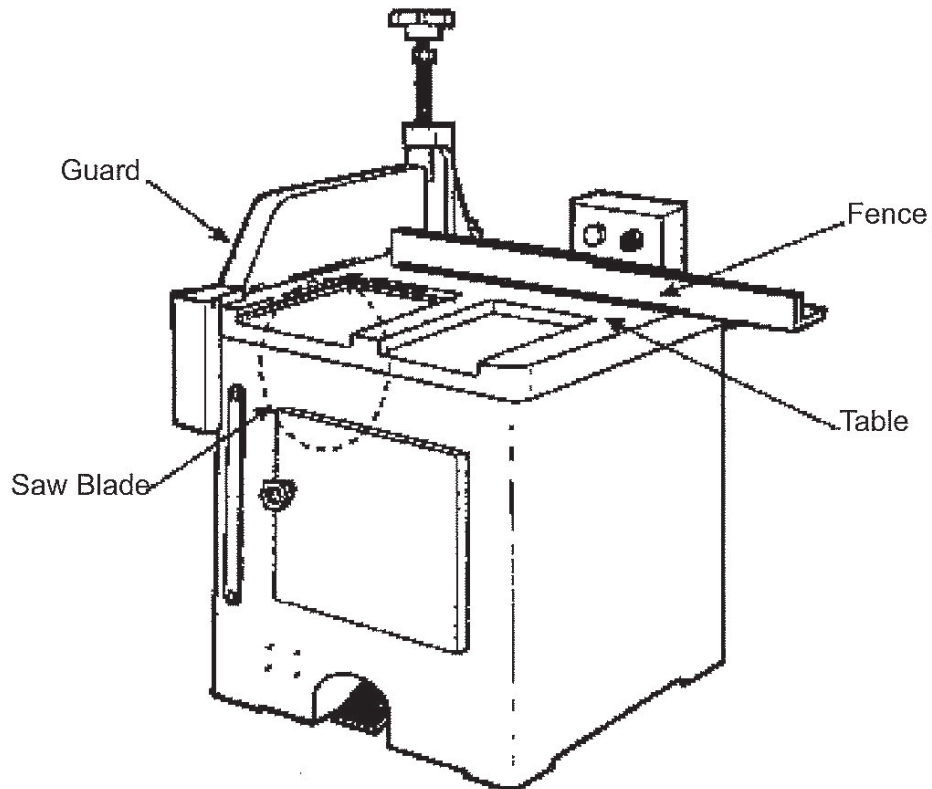
ILLUS. 1 Band Saw (2.1.1)



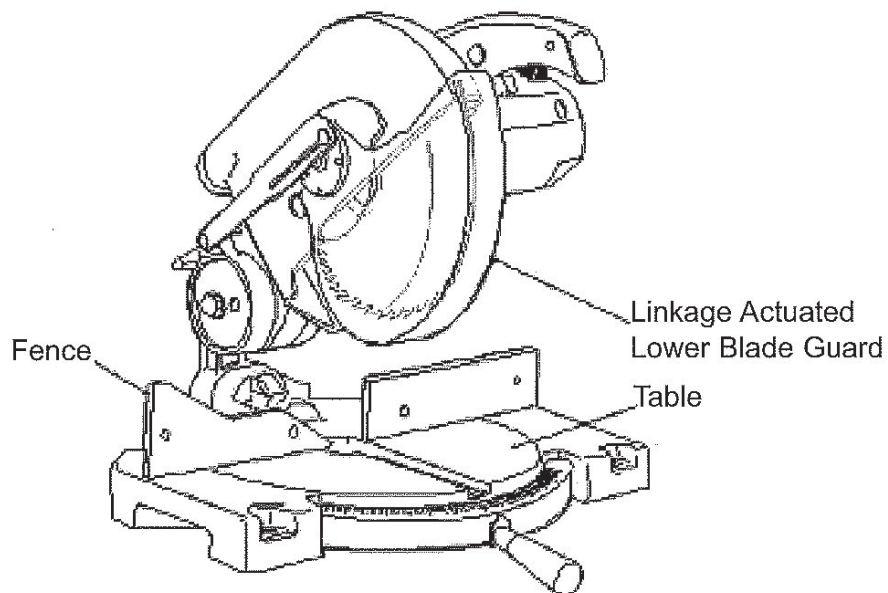
ILLUS. 2A Overhead - Swing Cut-Off Saw (2.2.1.1)



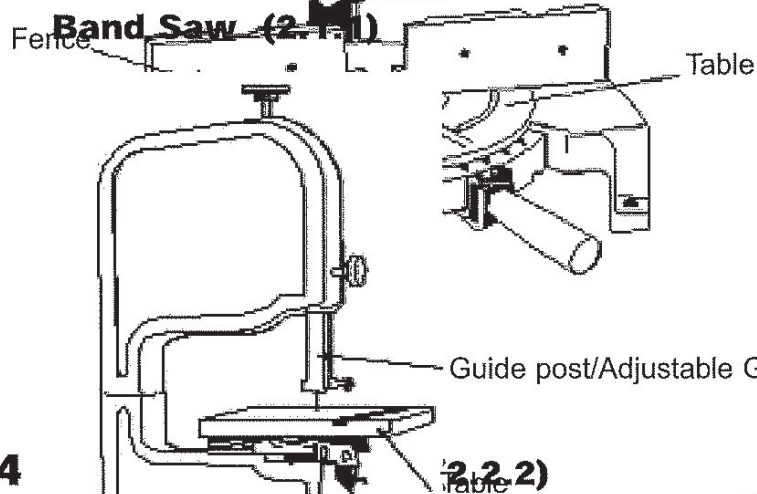
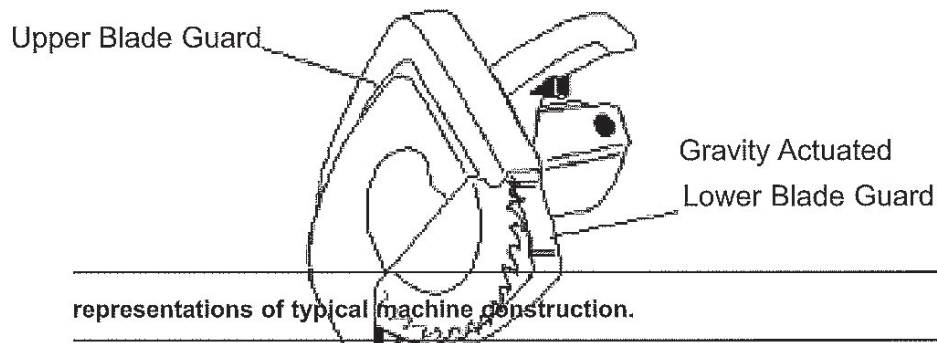
ILLUS. 2B Inverted Swing Cut-Off Saw (2.2.1.3)



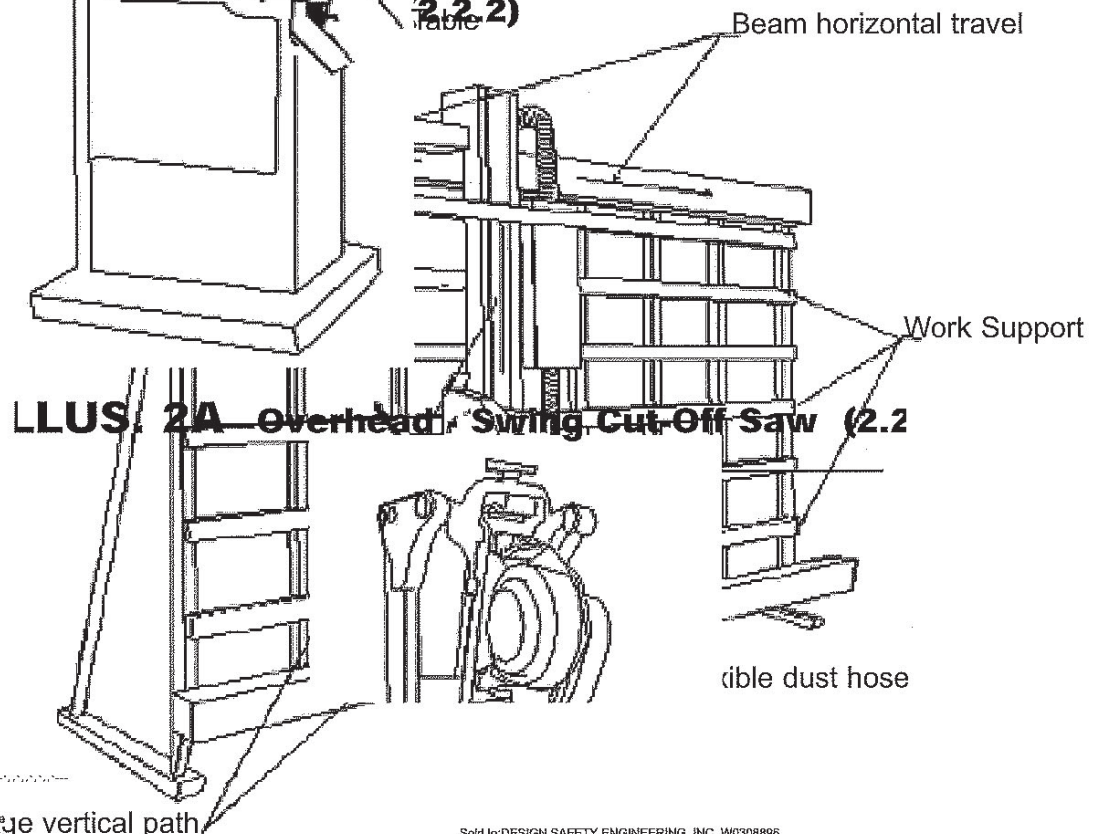
ILLUS. 3A Compound Miter Saw (2.2.1.5)



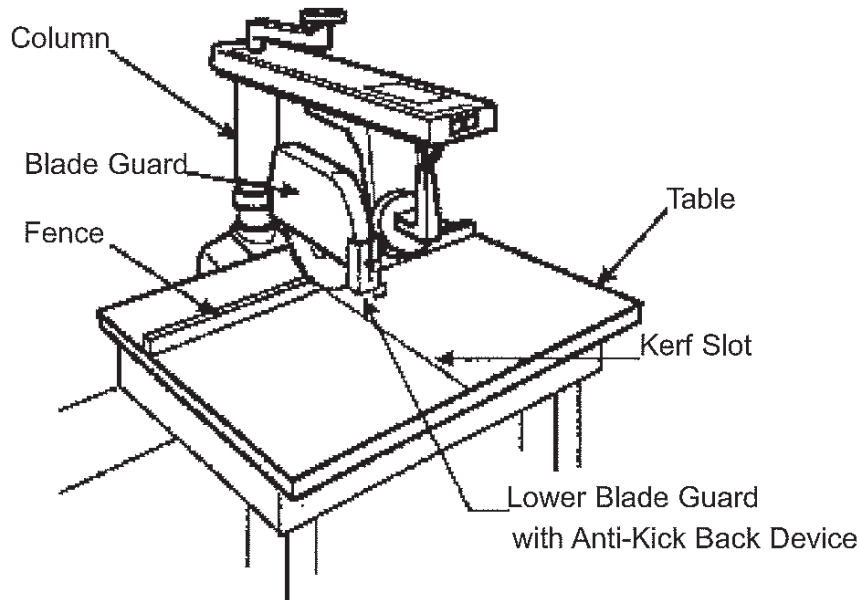
ILLUS. 3B Miter Saw (2.2.1.5)



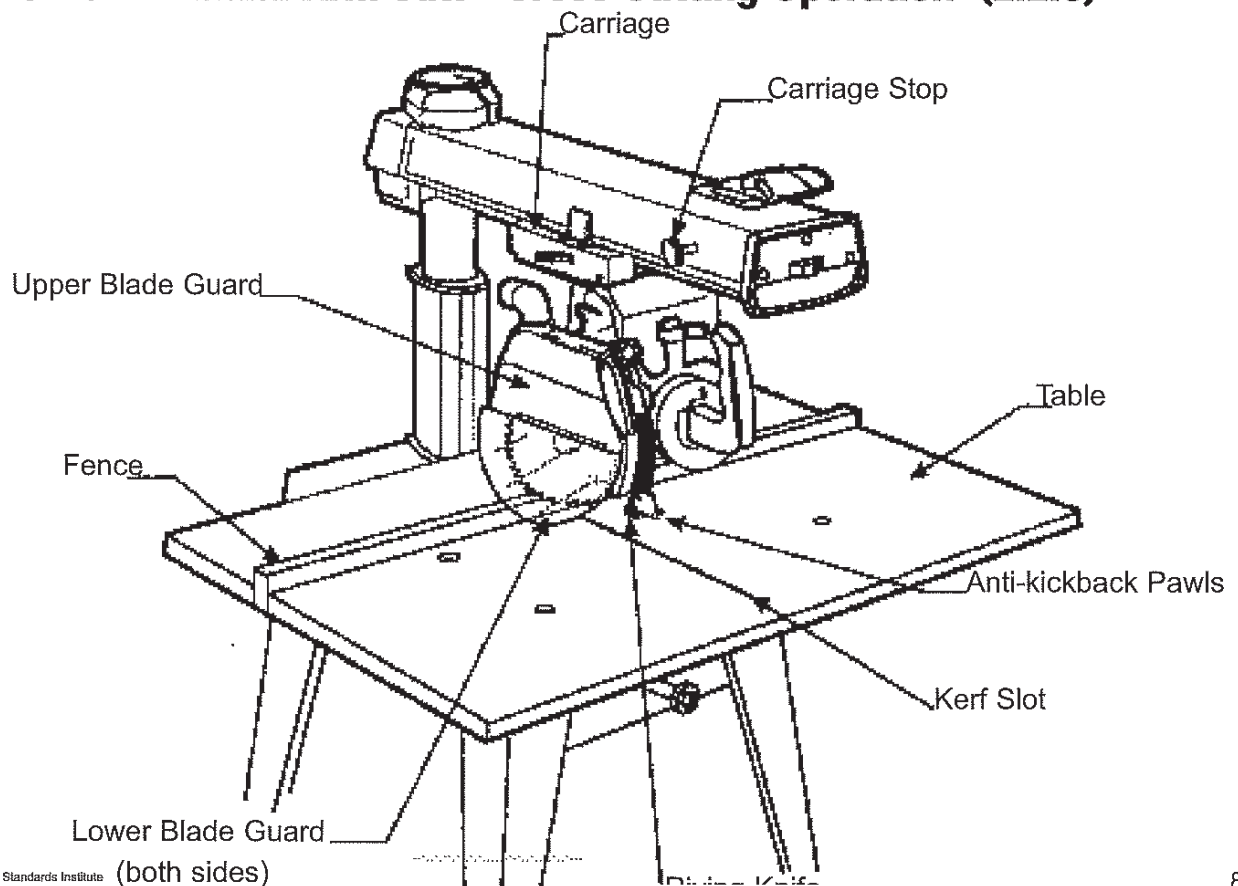
ILLUS. 4



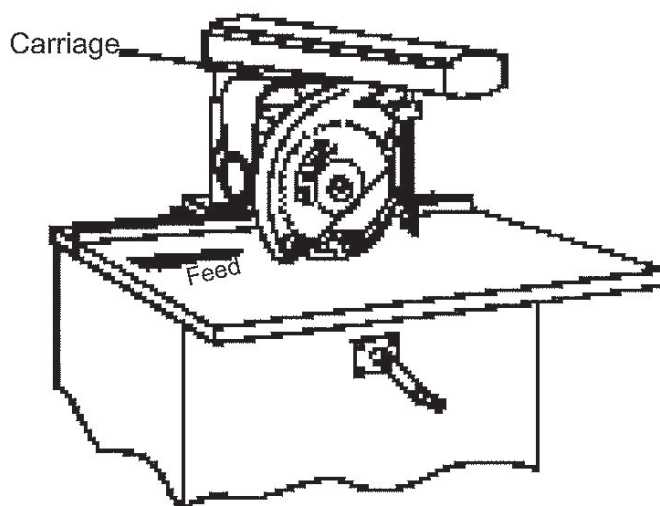
ILLUS. 5A Radial Arm Saw (2.2.3)



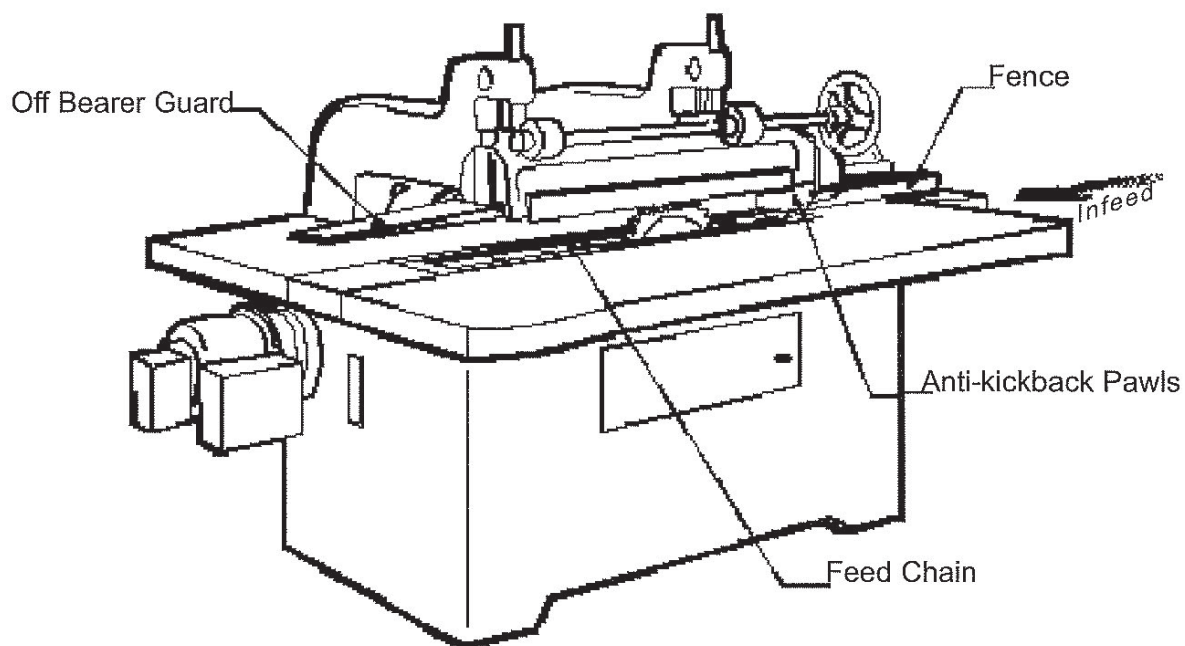
ILLUS. 5B Radial Arm Saw - Cross Cutting Operation (2.2.3)



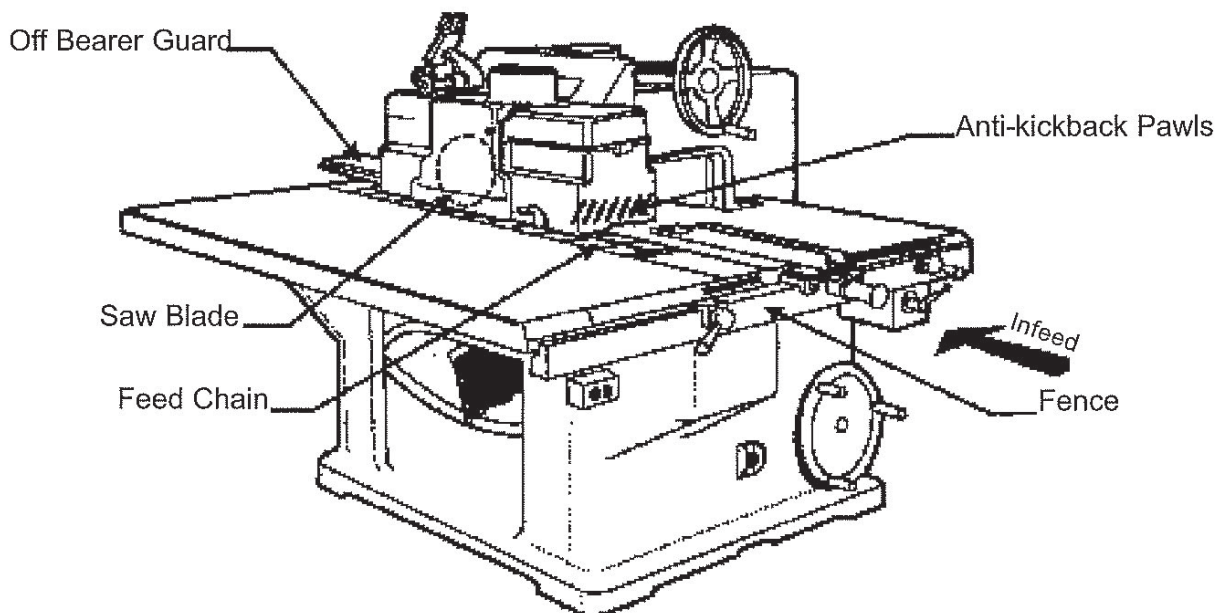
ILLUS. 5C Radial Arm Saw - Ripping Operation (2.2.3)



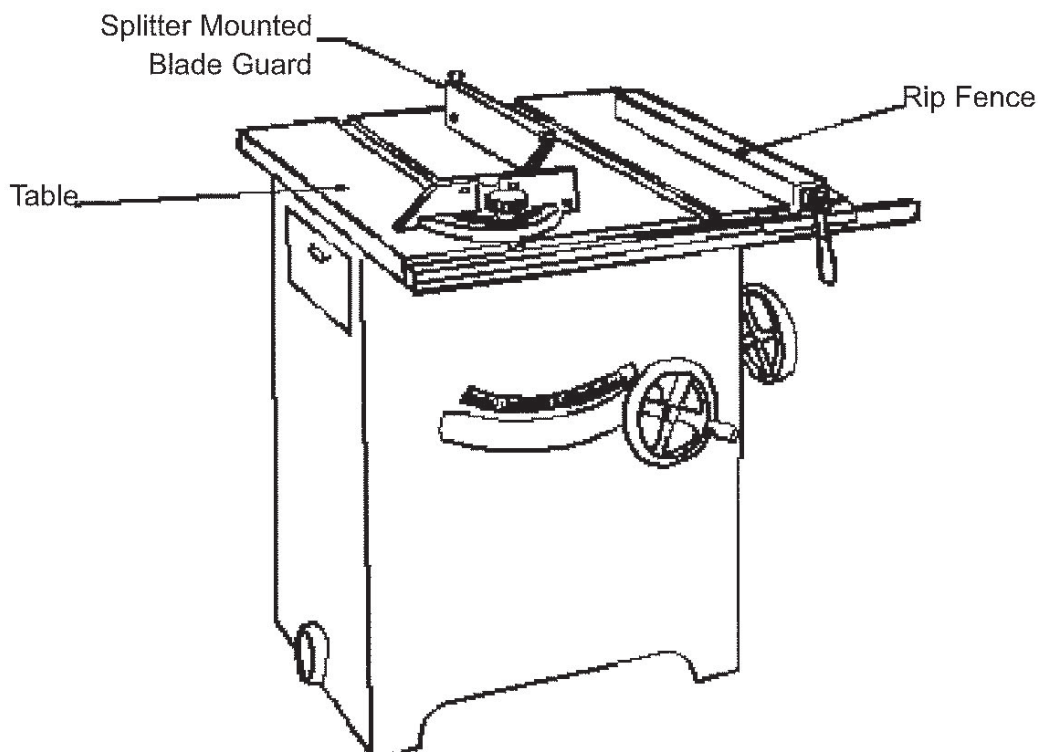
ILLUS. 6A Straight Line Rip Saw - Under Cutting (2.2.4)



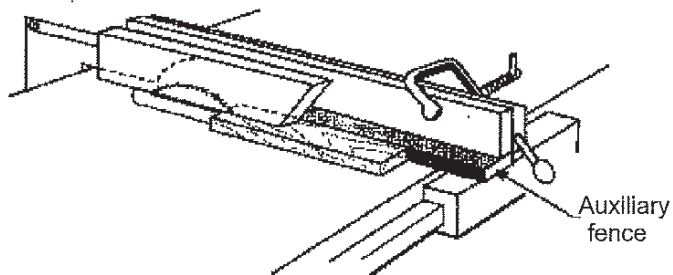
ILLUS. 6B Straight Line Rip Saw - Over Cutting (2.2.4)



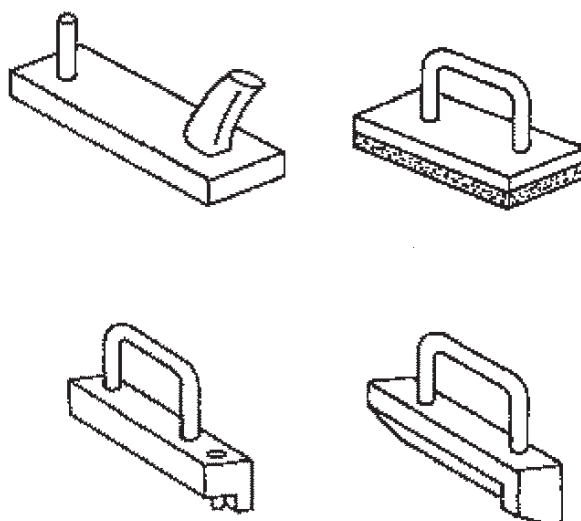
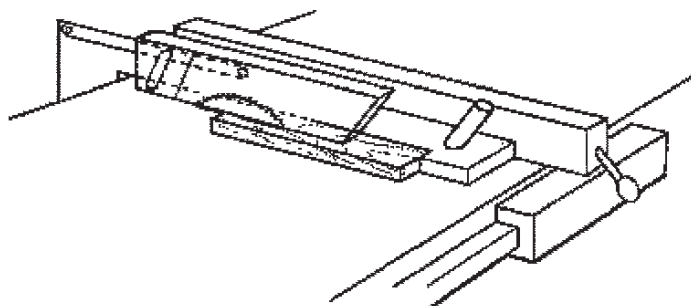
ILLUS. 7A Industrial Table Saw (2.2.5)



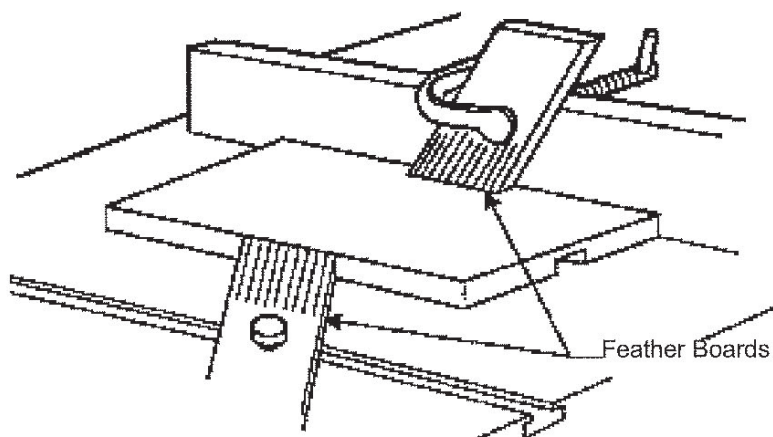
ILLUS. 7B Auxiliary Fence (3.1.5)



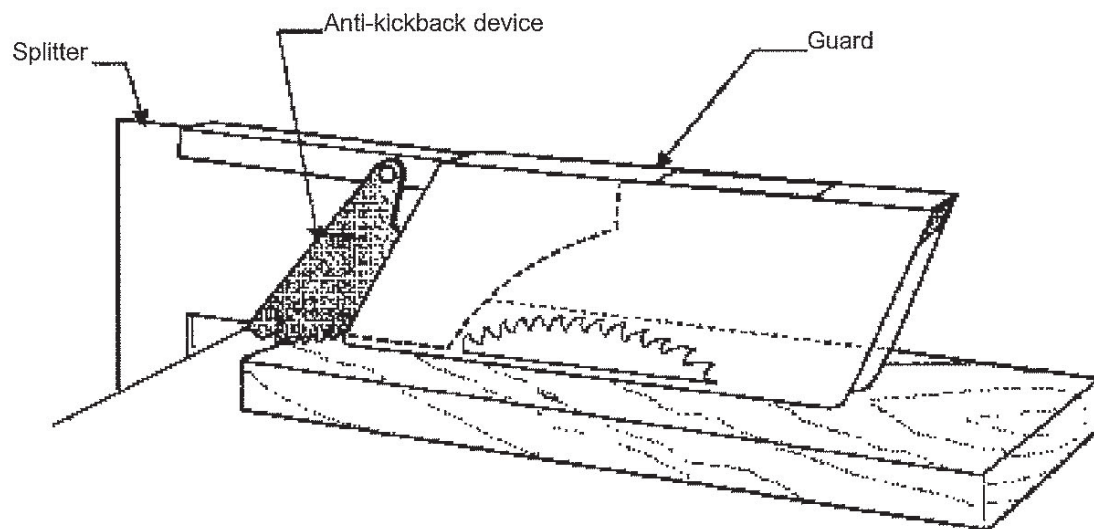
ILLUS. 7C Push Blocks (3.16.3)



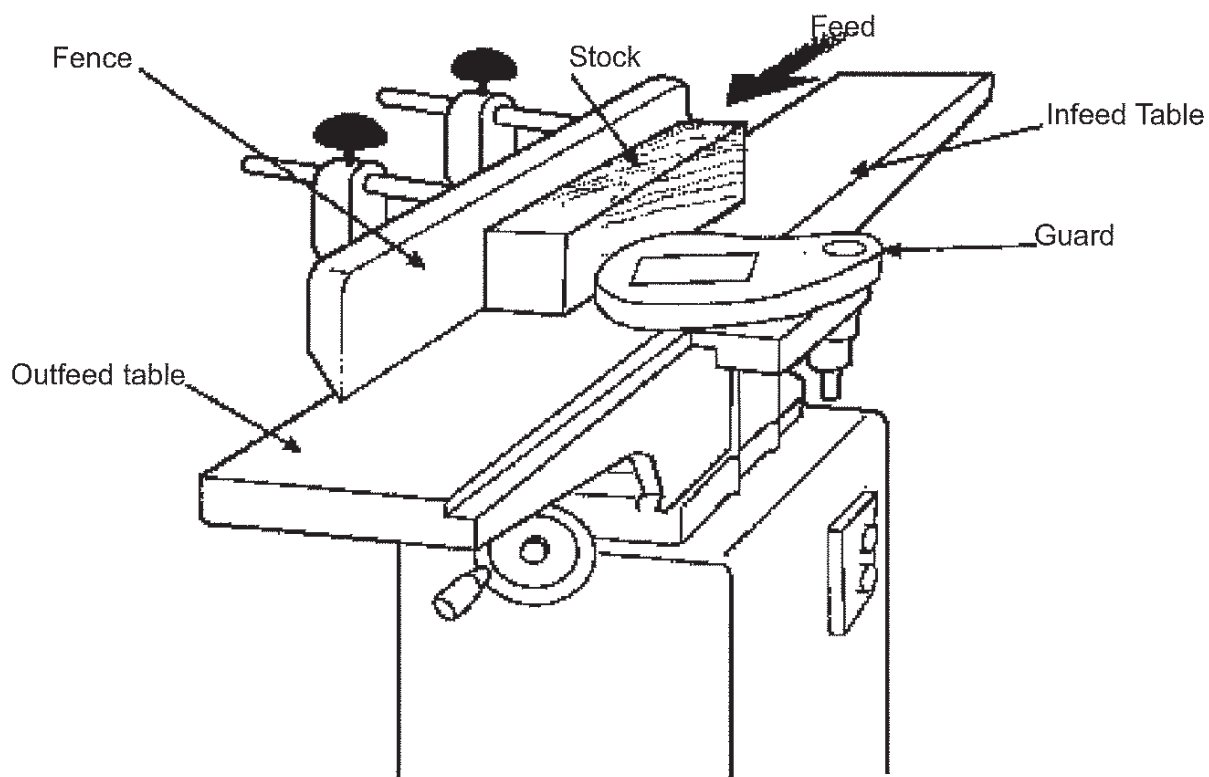
ILLUS. 7D Feather Boards (3.6.1)



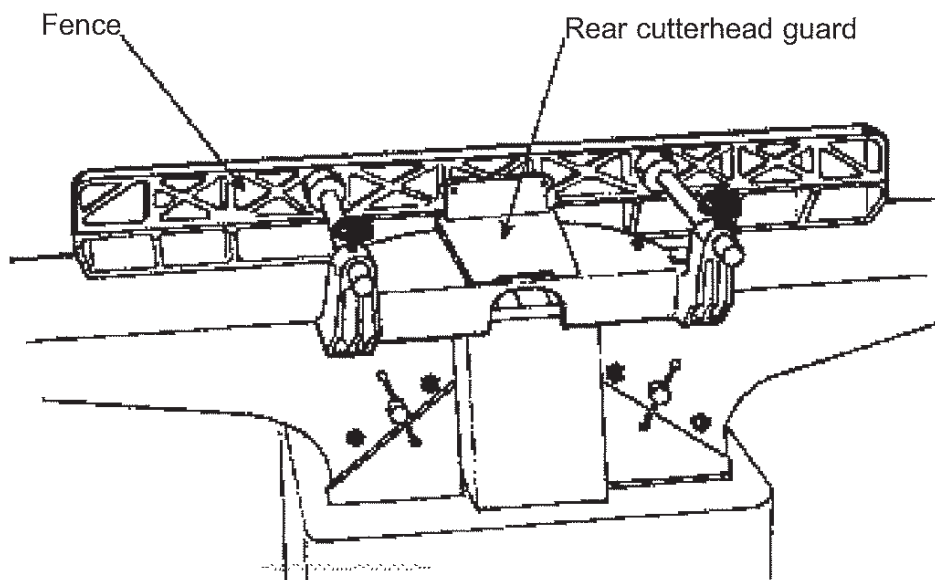
ILLUS. 7E Anti Kickback Devices (3.1.2)



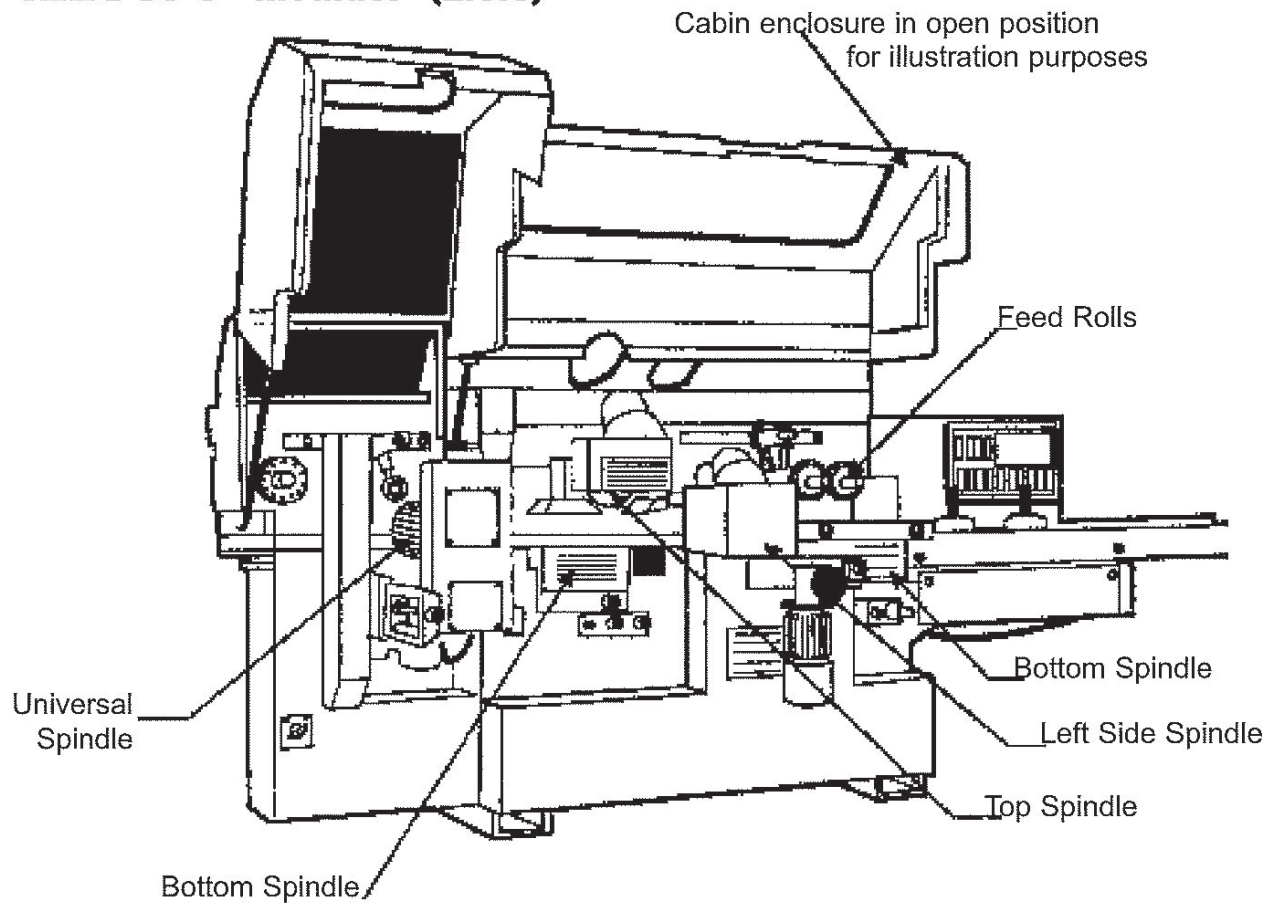
ILLUS. 8A Jointer (2.3.2)



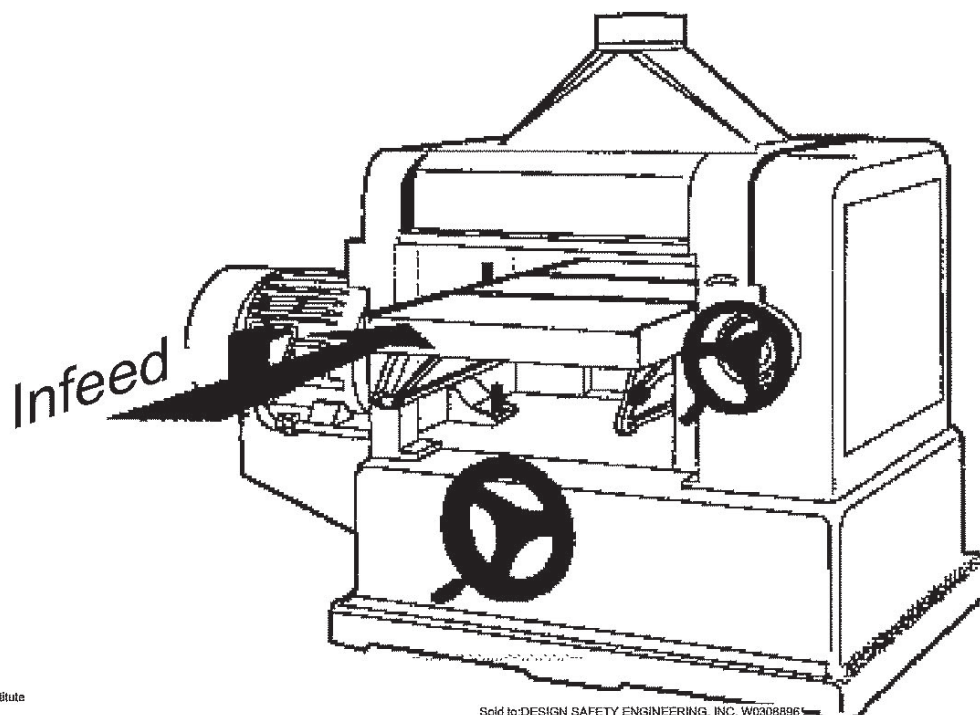
ILLUS. 8B Jointer Rear Cutterhead Guard (2.3.2)



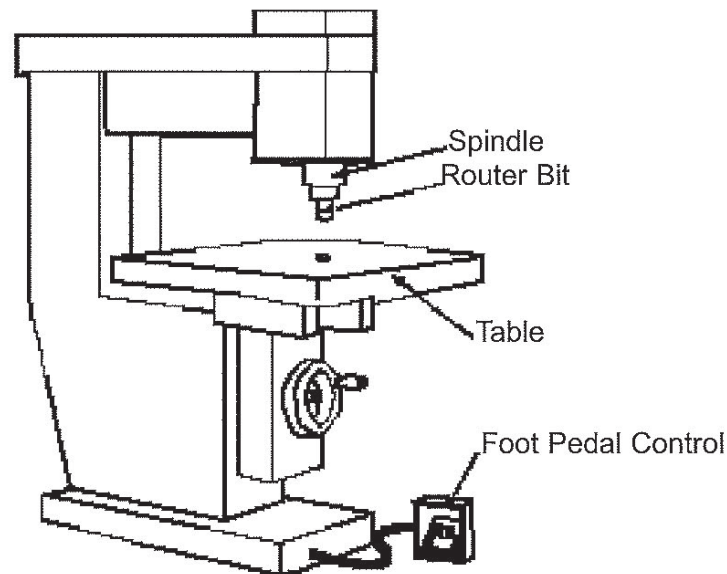
ILLUS. 9 Moulder (2.3.3)



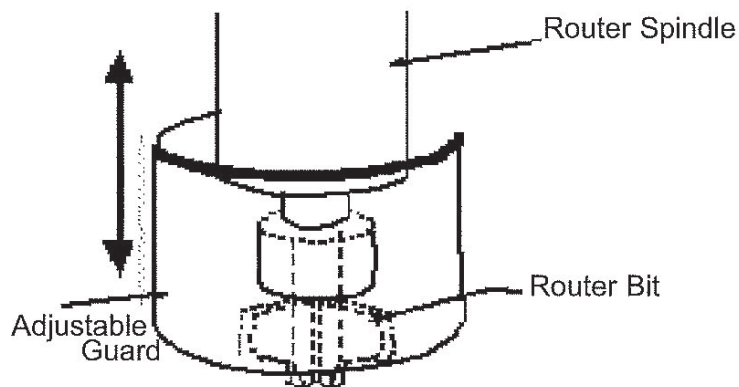
ILLUS. 10 Planer / Surfacer (2.3.5)



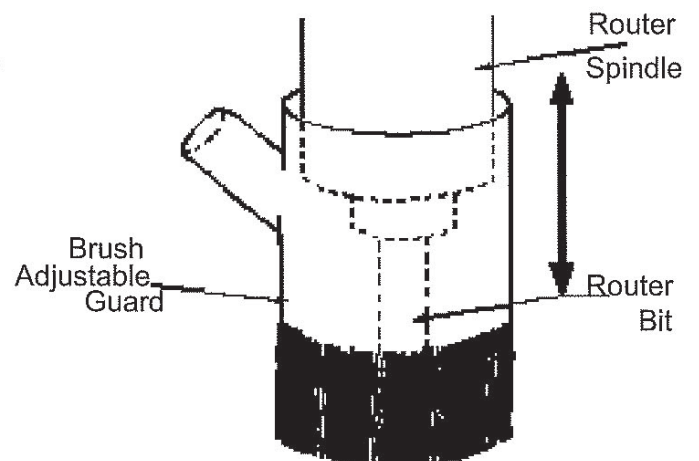
ILLUS. 11A Overarm Router - Shown Without Guard (2.3.6)



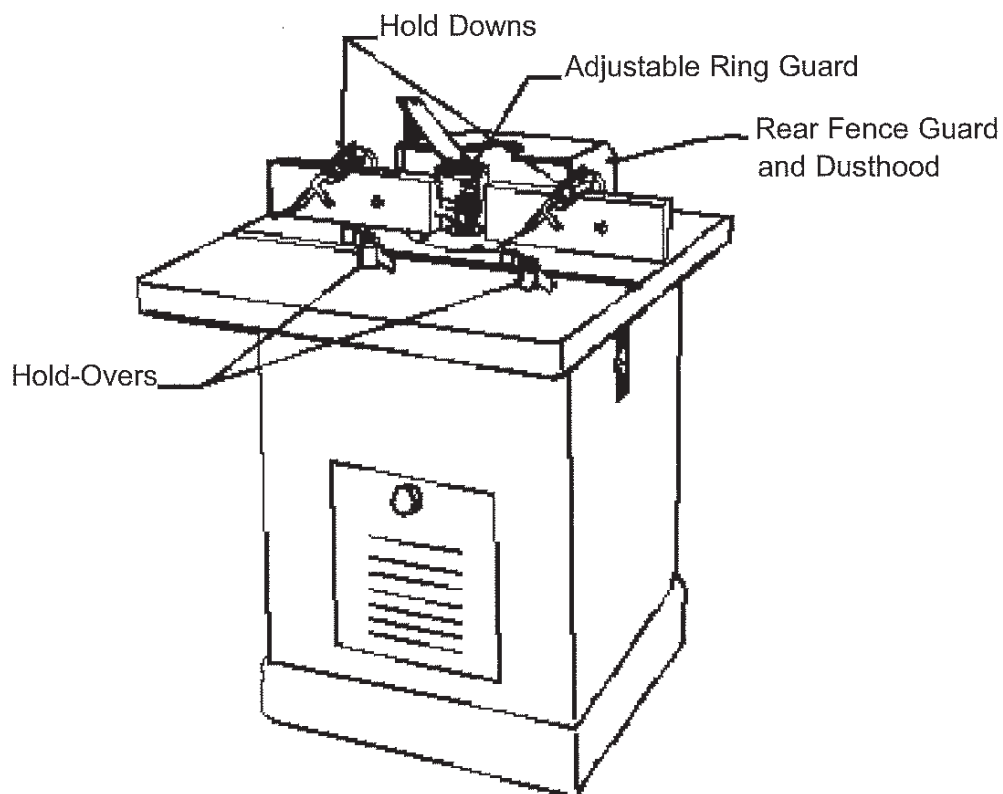
ILLUS. 11B Adjustable Guard for Overarm Router (2.3.6)



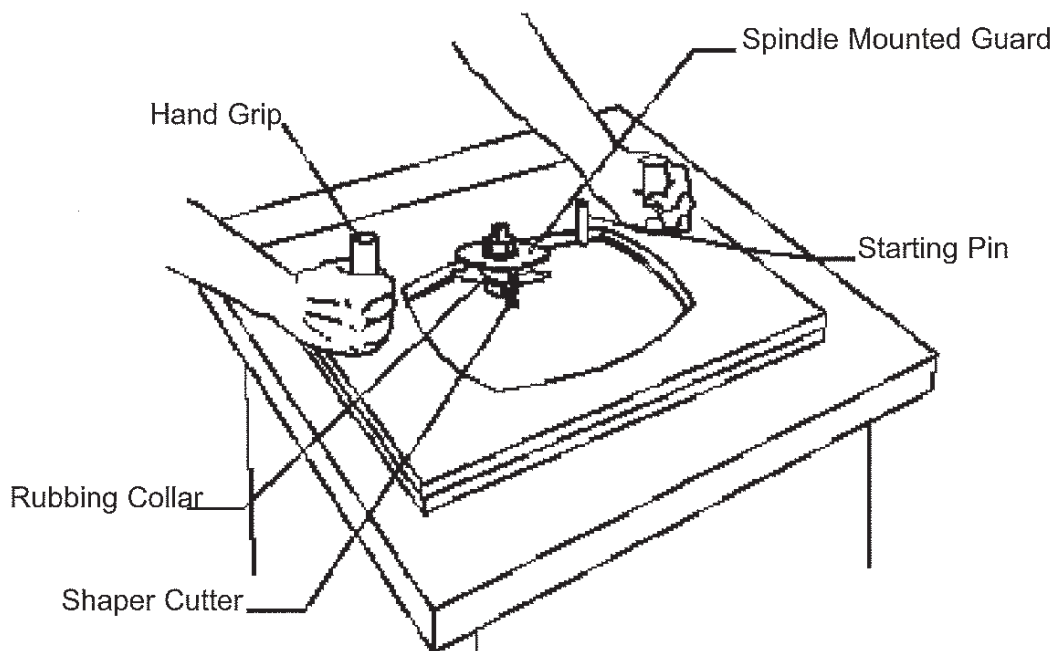
ILLUS. 11C Brush Guard for Overarm Router (2.3.6)



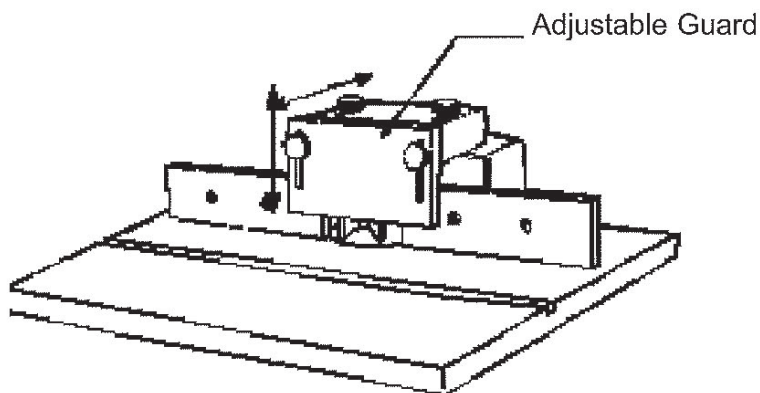
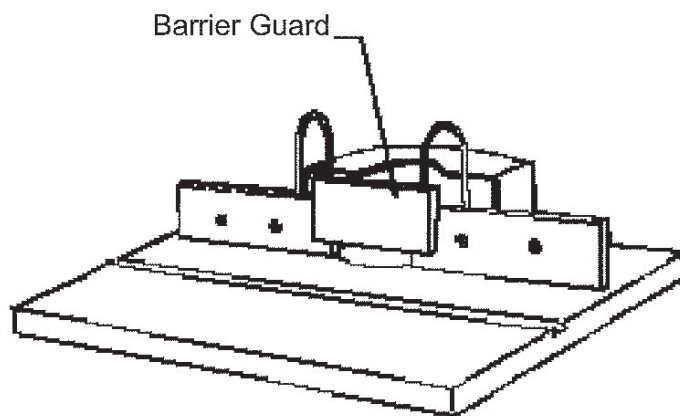
ILLUS. 12A Shaper W/Guard Fence (see also 12C) (2.3.7)



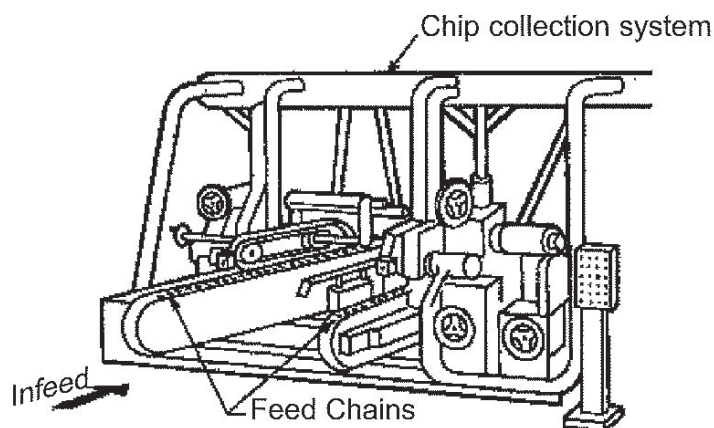
ILLUS. 12B Shaper for Contour Cuts (2.3.7 and 5.4.3.5.1.6.3)



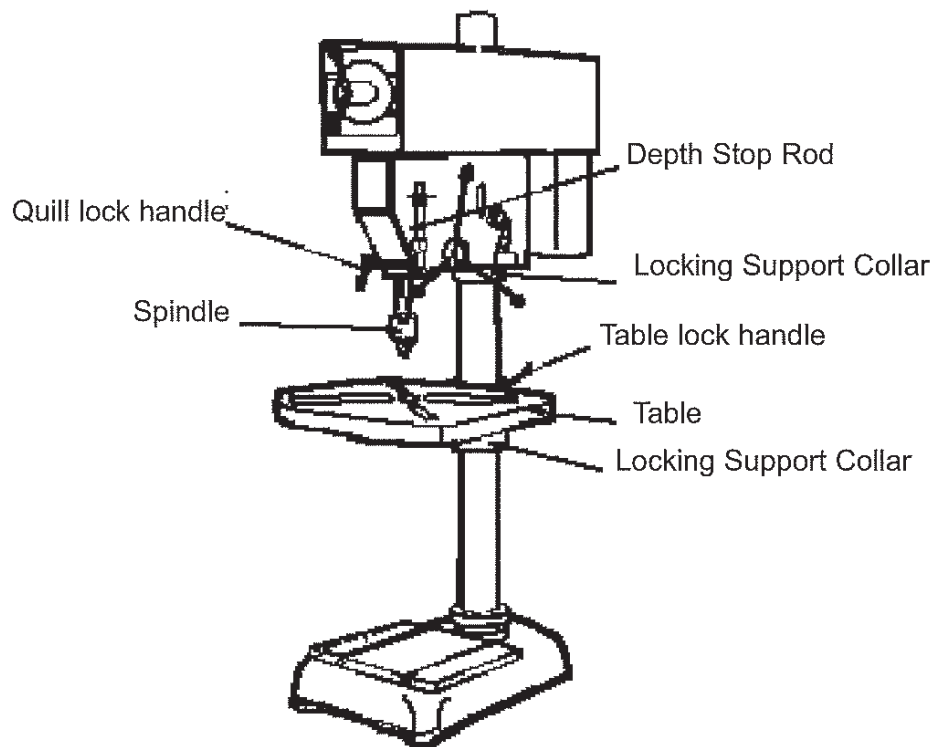
ILLUS. 12C Shaper with Alternate Guards (2.3.7)



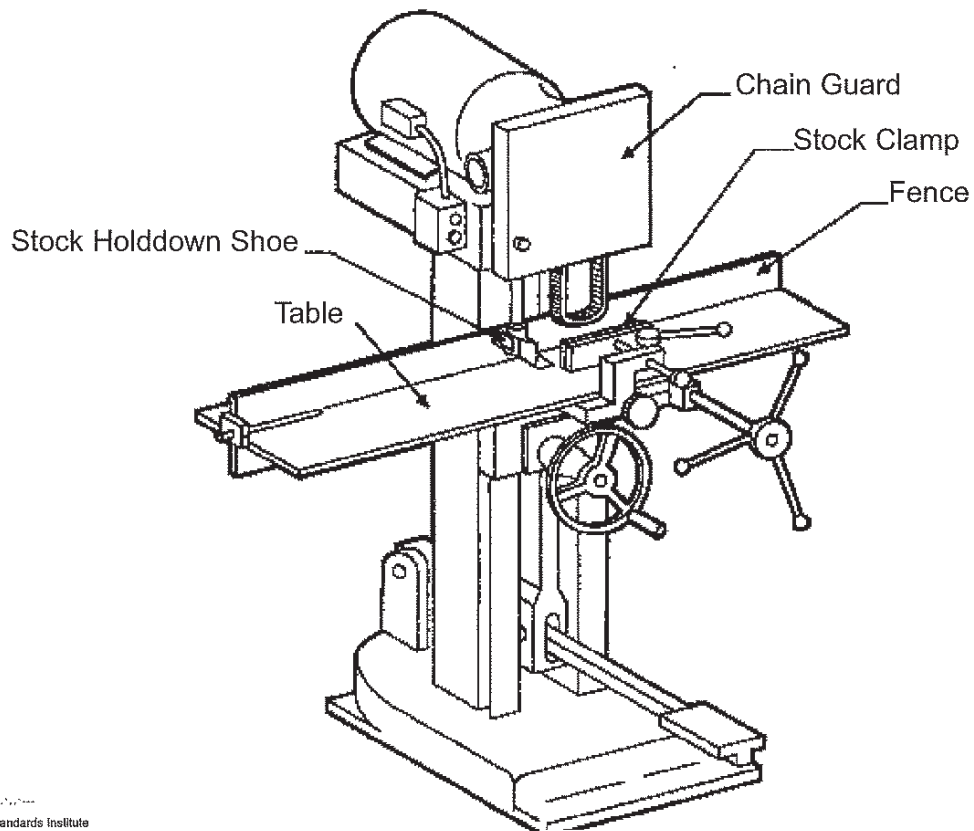
ILLUS. 13 Double End Tenoner (2.3.8)



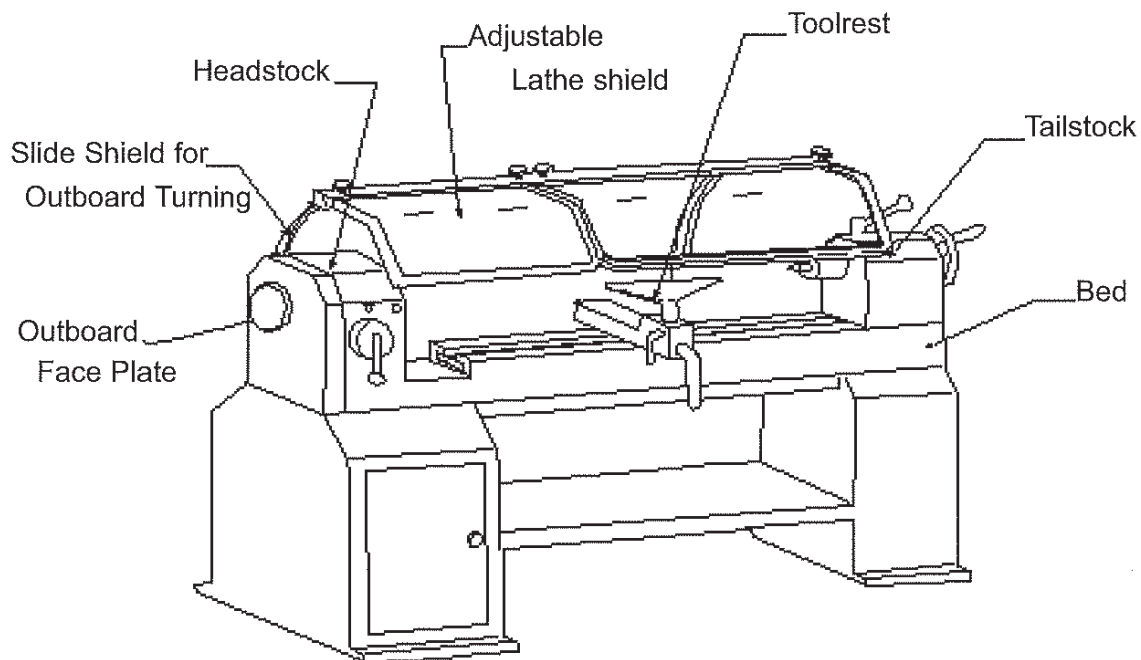
ILLUS. 14 Drill Press (2.4.1)



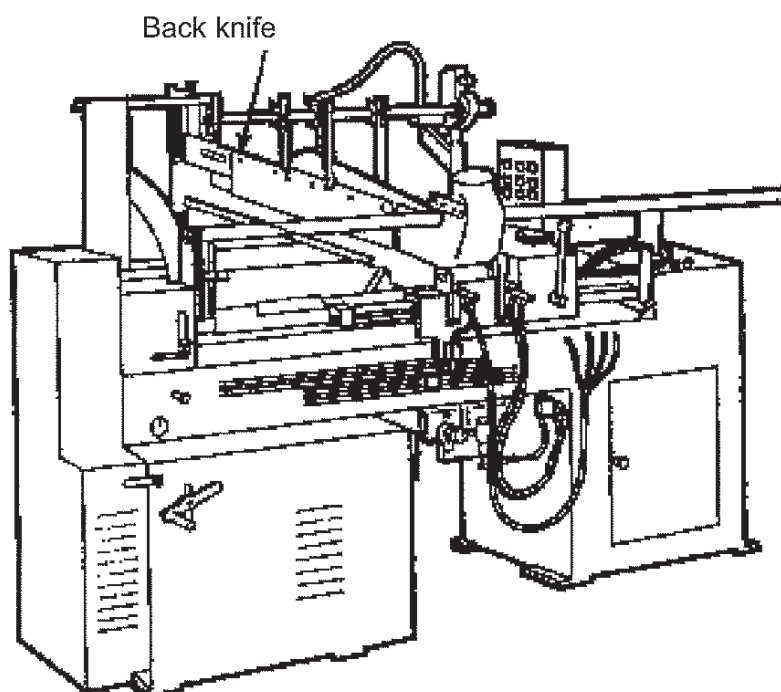
ILLUS. 15 Chain Mortiser (2.4.2)



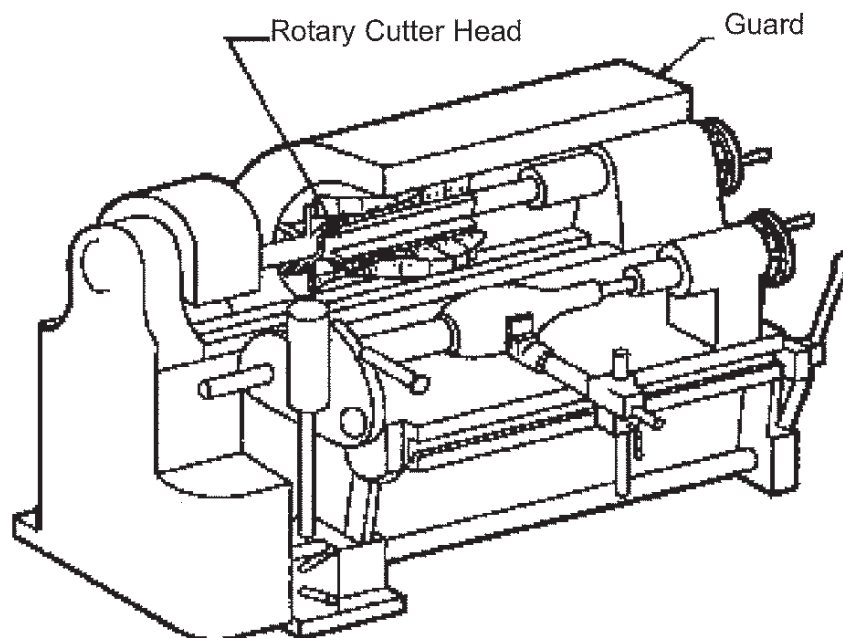
ILLUS. 16 Manual Lathe (2.5.1)



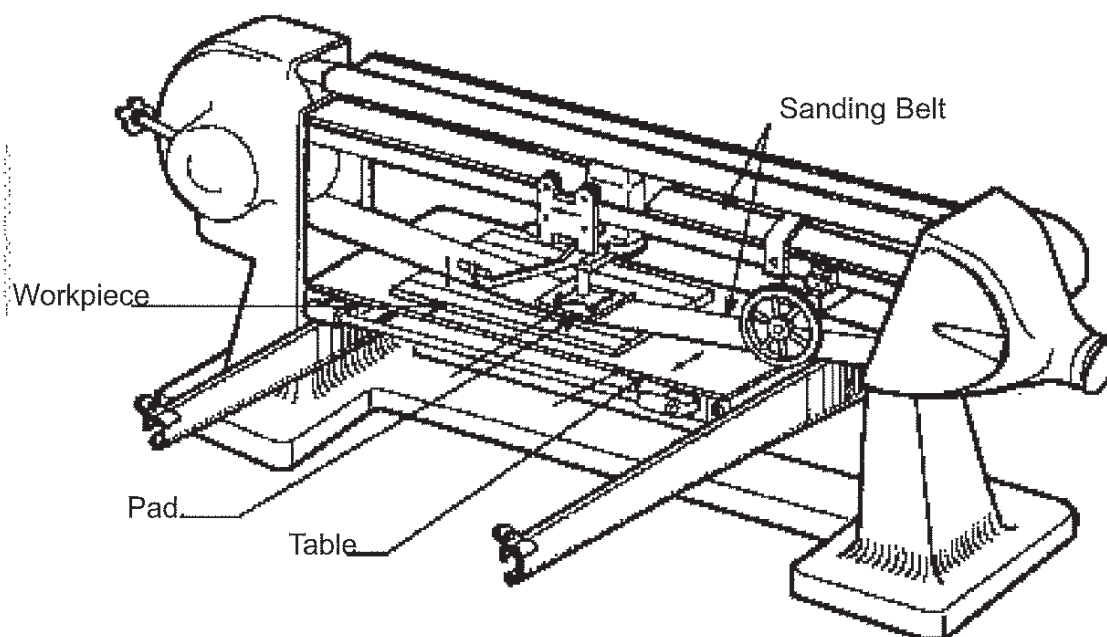
ILLUS. 17 Back Knife Lathe (2.5.3)



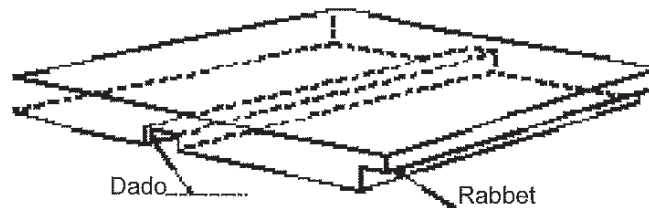
ILLUS. 18 Swing-head Lathe (2.5.4)



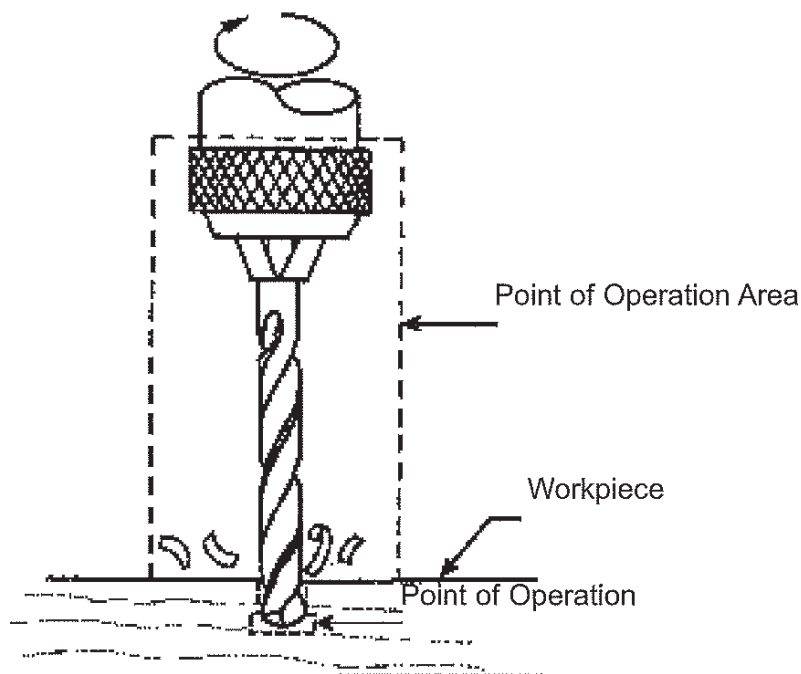
ILLUS. 19 Manual Belt Sander (2.6.1.1)



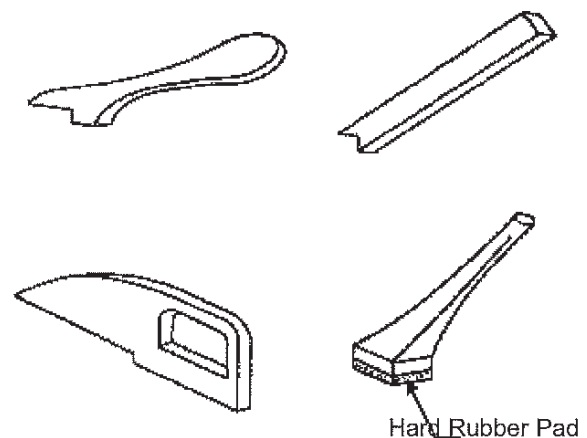
ILLUS. 20 Dado (3.4.1 and 3.18.1)



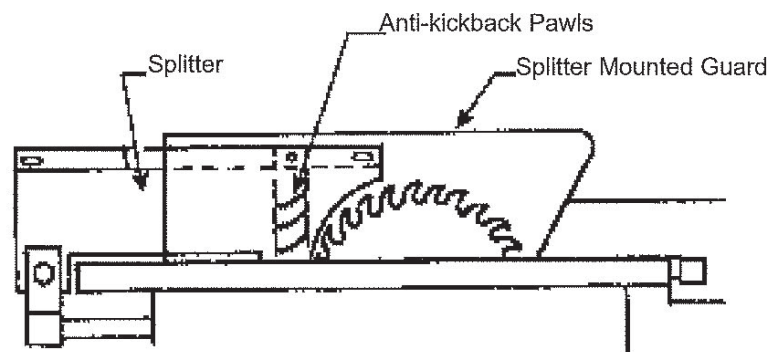
ILLUS. 21 Point of Operation (3.16.1 and 3.16.2)



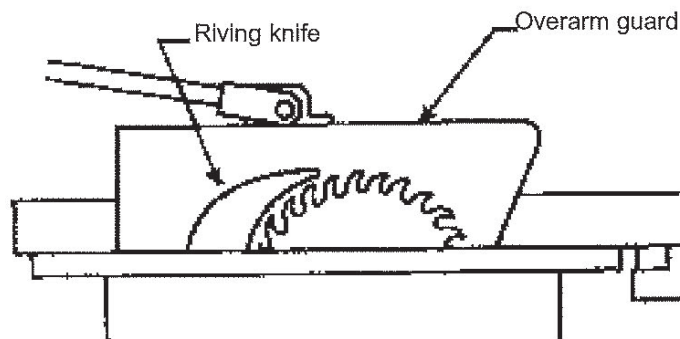
ILLUS. 22 Push Sticks (3.16.4)



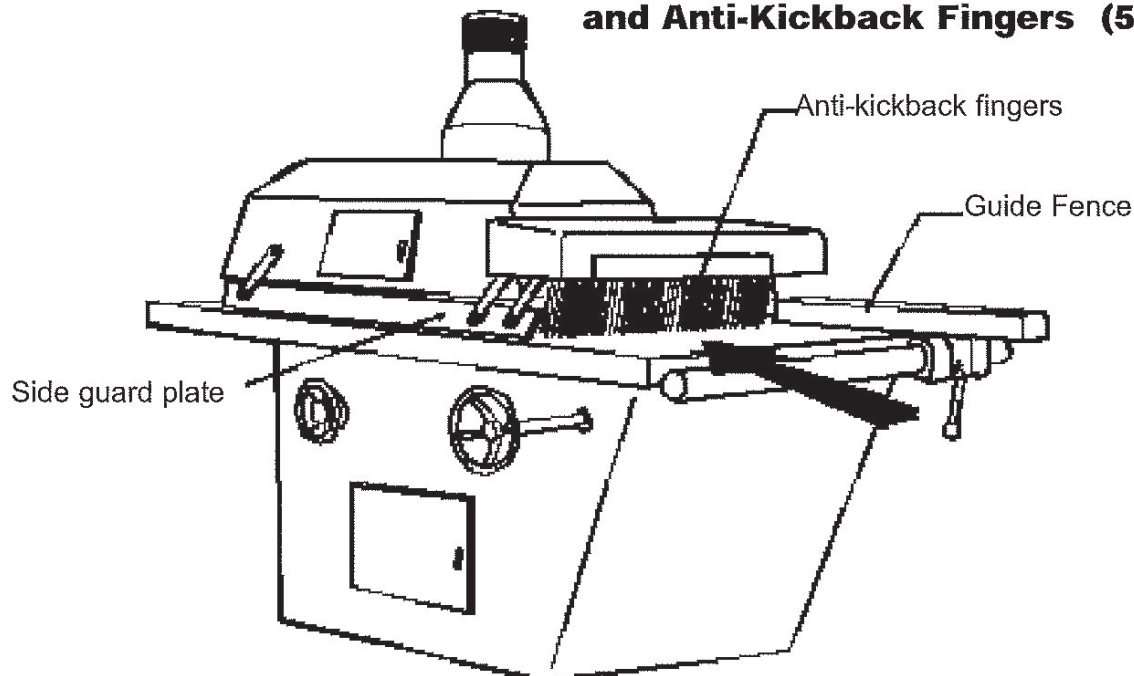
ILLUS. 23A Splitter & Splitter Mounted Guard (3.19.3)



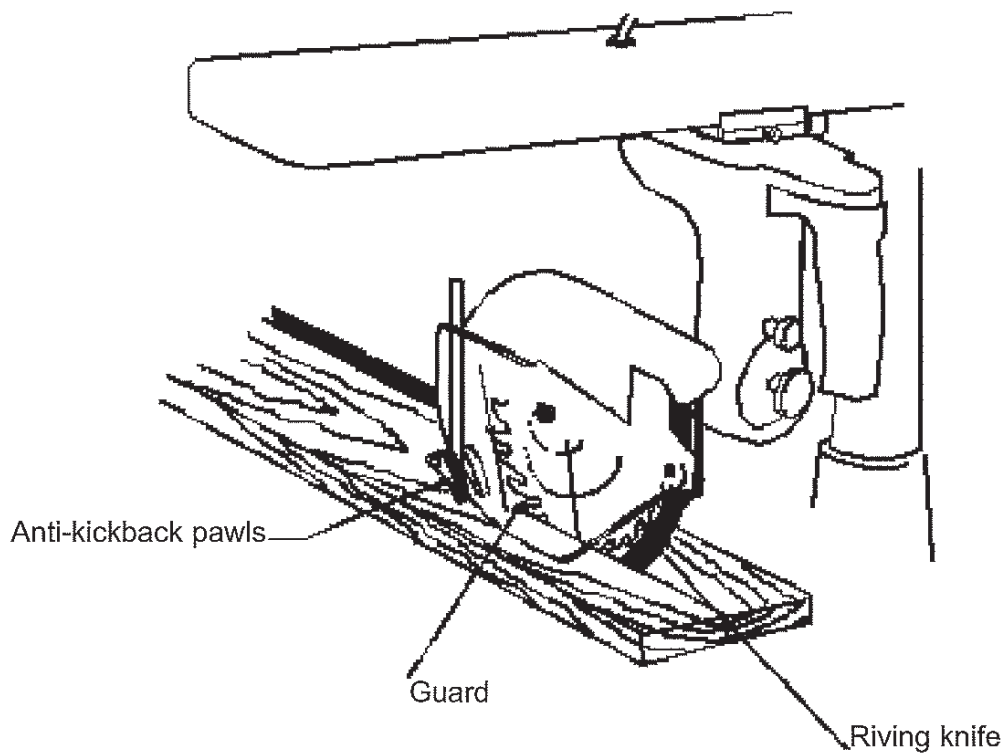
ILLUS. 23B Riving Knife & Overarm Guard (Anti-kickback Device Not Shown) (3.19.3)



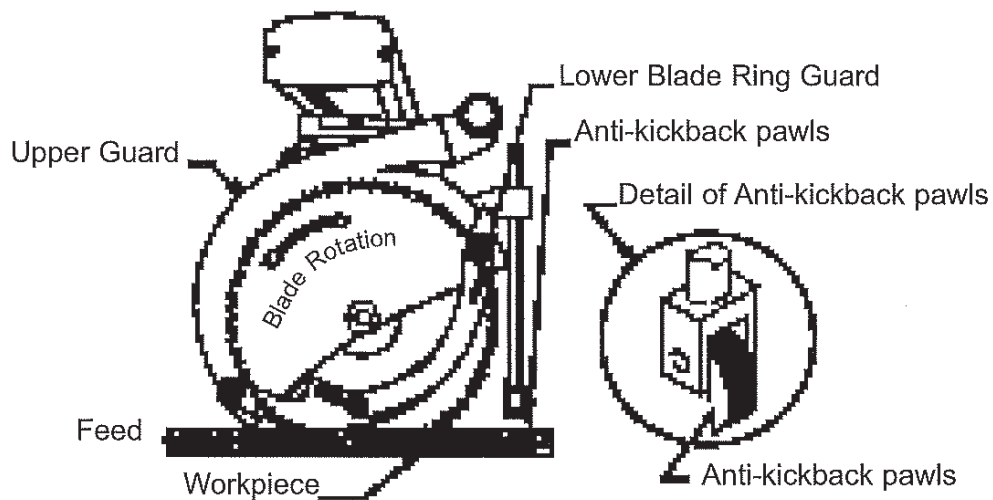
ILLUS. 24 Gang Rip Saw with Side Guard and Anti-Kickback Fingers (5.4.2.2.4)



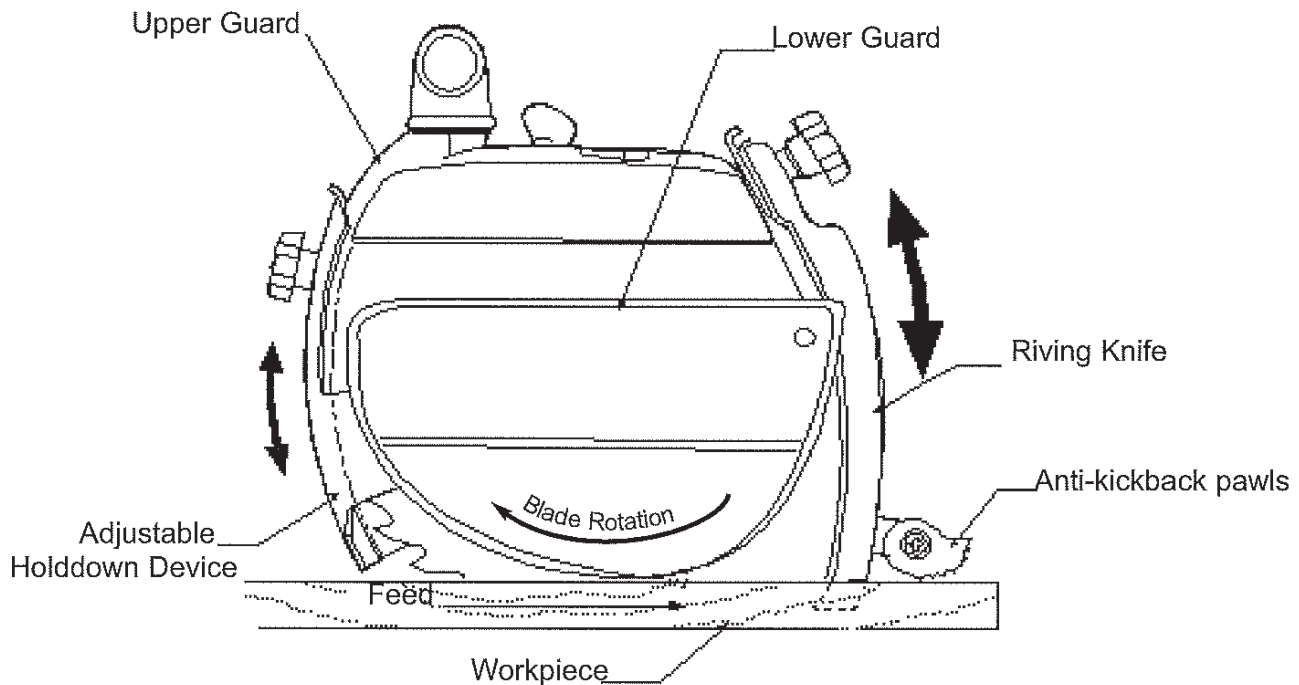
ILLUS. 25A



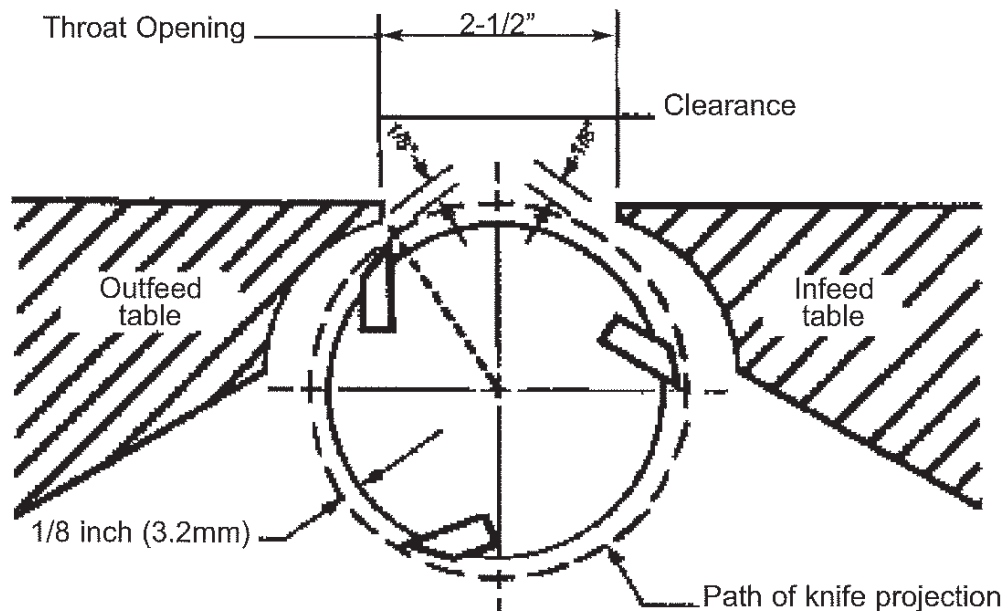
ILLUS. 25B Moveable Upper Guard Rotated To Act As Hold Down Device (5.4.2.5.8.1)



ILLUS. 25C Fixed Upper Guard with Adjustable Hold Down Device (5.4.2.5.8.1)

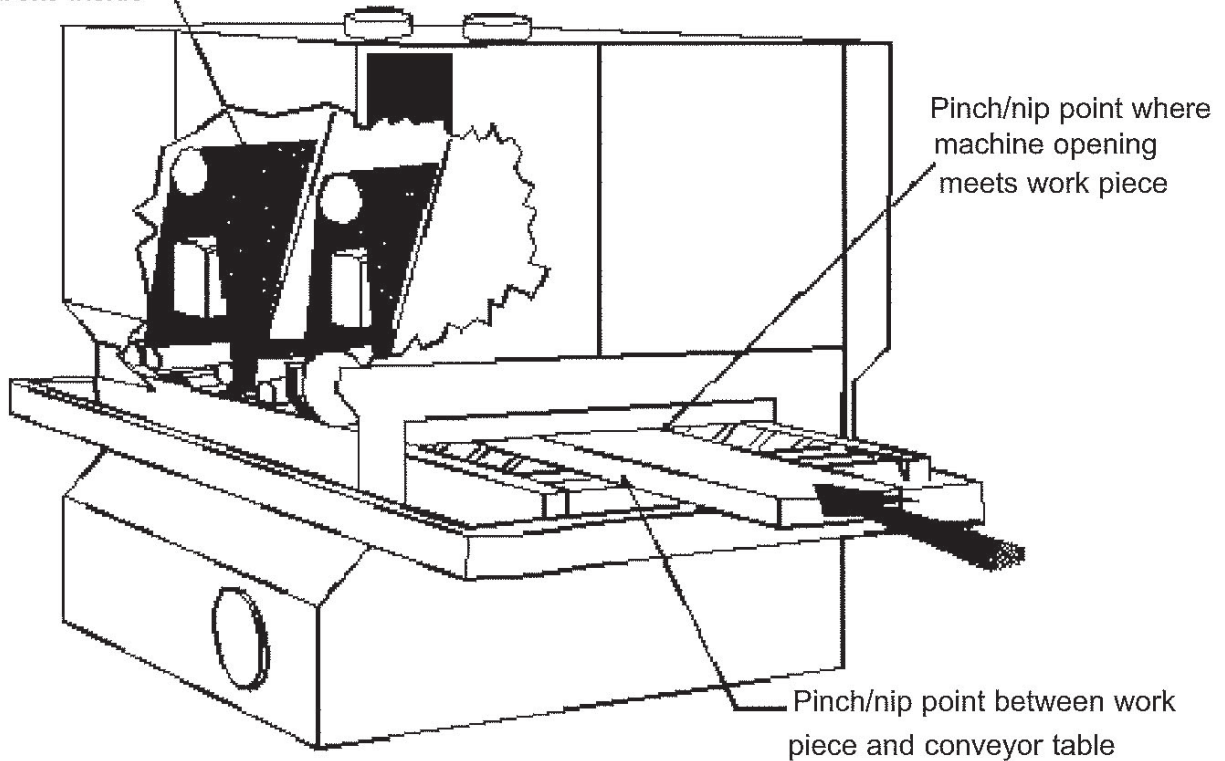


ILLUS. 26 Throat Area On Jointer (5.4.3.1.6)



ILLUS. 27 Door Cut Away View of a Widebelt Sander(5.4.6.1)

High speed rolls and
abrasive belts inside
machine



ILLUS. 28 of Nip Point (Guard not Shown) (5.4.6.2)

