JOHNS-MANVILLE INDUSTRIAL BOARD PRODUCTS

EQUIPMENT AND TECHNIQUES FOR FABRICATING

TRANSITE • ASBESTOCITE • EBONY

OHMSTONE • CHEMSTONE • COLORLITH

MARINITE-23 • MARINITE-36 • MARINITE-65

Johns-Manville trademarks above are registered in various countries of the world.

JOHNS-MANVILLE CORPORATION
INDUSTRIAL INSULATIONS DIVISION

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/1

Table of Contents

	Page
Introduction	Foreword
Dust Control	Foreword
Cutting, Straight Line	1
Dry	
Portable Saw	1
Stationary	
Bullard Cut-Off Saw	2
Bench Saw	3
Planer Saw	5
Carriage Saw	7
Wet	9
Coping Saw	9
Wheel Types-Abrasive, Diamond, Carbide	13
Cutting Wheel Safety	14
Shearing	15
Drilling and Counter Boring	17
Preparation for Drilling	17
Drilling Operation	17
Possible Causes of Poor Quality Work	19
Drill Speeds	19
Grinding Twist Drills	20
Counter Boring	20
Grinding Counter Bore Tools	20
Counter Bore Speeds	20
Machining	21
Lathe	21
Jig Saw and Band Saw	21
Milling	22
Beveling	23
Wet	23
Dry	24
Hand Tools	25
Special Jobs, Colorlith, Chemstone	26
Sink Cut-Outs	26
Recesses and Rebates	26
Dry Grooves	27
Finishing Edges	27
Machining and Assembling Splines	28
Suggested Cutting Shop Equipment	31-35
Appendix	

JOHNS-MANVILLE INDUSTRIAL BOARD MATERIALS

FOREWORD

The purpose of this publication is to provide those engaged in fabricating Johns-Manville Industrial Boards with information on equipment and techniques for cutting, drilling and machining.

While the information represents many years of experience in our own plants, we recommend that before any equipment is decided on individual requirements be discussed with equipment manufacturers. We also suggest you consider the purchase of used equipment. Often times a considerable saving can be realized if such equipment is available.

We wish to caution those fabricating Johns-Manville Boards that during dry cutting, machining, drilling and sanding operations adequate precautions must be taken to remove dust in order to eliminate air contamination. Proper exhaust systems should be so designed to remove dust at the point of origin. Johns-Manville recommends that you consult with firms familiar with equipment for this purpose to assure adequate protection.

For the benefit of those requiring additional information on particular fabricating problems not covered in this manual local Johns-Manville representatives are available for consultation.

J-M INDUSTRIAL INSULATIONS DIVISION

C U T T I N G

Some J-M Products may be cut either dry or wet. The problems encountered in one method are dissimilar to those in the other. Generally speaking, wet machine cutting is somewhat slower than dry cutting but provides a smoother cut surface. The selection of equipment is therefore a matter of choice. In dry cutting proper equipment for dust removal must be available; in wet cutting provisions for sludge disposal are necessary to prevent clogging the sewer system.

D R Y C U T T I N G

Dry cutting may be used for all straight cutting where a very smooth cut is not essential. Both Transite, Ebony, Ohmstone, Chemstone, Asbestocite and Marinite Products are cut on similar equipment, but due to nature of the material the cutting characteristics are not essentially the same.

Ebony and Ohmstone are impregnated with organic compounds which tend to cause heating and glazing of cutting wheels if cut dry. Transite, Asbestocite and Marinite Products have no impregnation and may be satisfactorily cut dry.

EQUIPMENT USED BY JOHNS-MANVILLE:

A. Portable Saw	
Machine Specifications	Description
	This is primarily used for field cutting by a dry method. It is only satisfactory for limited cutting operations where more substantial cutting equipment is not available.
Machine:	Skil Corporation 5033 Elston Avenue Chicago, Illinois Model 107 (10" saw)

Arbor Speed:	2675 rpm. (No load) 2100 rpm. (Under load)
Feed Speed:	A hard push and heavy loads reducing rpm's give best results.
Cutting Wheels:	Skil NO. 11645 (Silicon Carbide): 8 7/8" diam. X 1/2" thick.

B. Bullard Cut-Off Saw

Characteristics

Machine	Description
	Bench type design, cutting action on vertical movement of hydraulic mechanism, cutting speeds controlled by adjustment of hydraulic valve feed, manufactured by Bullard Co., Westboro, Mass.
Material	Transite or Ebony, Asbestocite, Ohmstone, Chemstone.
Capacity	Widths up to 5 3/4"; any length with proper support; thicknesses thru 2".
Recommended thicknesses cut on machine.	Multiple thicknesses up to total of 2".
Tolerance	± 1/32" or equivalent.
Maintenance	Easily maintained and adjusted.
Power	5 HP; 550 AC; Arbor Speed 3750 rpm; V-belt drive.
Cutting Wheels (Abrasive)	Manufactured by Bullard Co., Westboro, Mass., 13 7/8" x 1/8" thick x 1" arbor. Wheel NO. C20-16-B

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/5

Cutting Speed	Variable by thickness of stock.
Stock Holding Equipment	Built-in hydraulic impelled clamp holds stock while cutting.
Safety	Cutting wheel enclosed in sheet steel cabinet. Very safe machine to operate.
Crew	One man.

C. Bench Saws

Characteristics	Description
Machine	Saw designed similar to wood cutting bench saws. Machine equipped with cutting guide parallel to saw blade for accurate cutting. Gauge moveable for various dimensions. Machine has large working surface. See Sketch, Appendix A Method for setting gauge.
Material	Transite, Ebony, Ohmstone; Chemstone; Colorlith; Marinite 23, Marinite 36, 65.
Capacity	Any length or width that is practical to handle by hand. Thicknesses up to 4".
Recommended thicknesses cut on machine.	Ebony thru 3/8" in sheet form, thru 2" in small pieces. Transite thru 3/4" in sheet form, thru 4" in small pieces. Marinite any thickness. Fairly smooth cut edges.
Tolerance	Machine hand fed, high degree of accuracy not expected Tolerances of ± 1/32" can be maintained with careful operation of saw.

Maintenance	Easily maintained and adjusted.
Power	10 HP; 550 AC; Arbor speed approx:

Product	RPM Arbor Speed
Transite	3600
Ebony	3600
Ohmstone	3600
Chemstone	3600
Colorlith	12-1800
Marinite 23	3600
Marinite 36	1800
Marinite 65	1800

Cutting Wheels (Abrasive)

Product	Wheel NO.		Wheel NO.
Transite	C-202-15-BS (Safety Wheel)	or	C16-222X (Steel Center)
Ebony & Ohmstone	"		"
Chemstone	"		"
Colorlith	"		"
Marinite 23	C-202-15-BS (Safety Wheel)	or	C16-14-X (Steel Center)
Marinite 36	"		"
Marinite 65	"		"

Wheels	16" X 1/4" thick	16" X 5/16" thick

Wheels Manufactured by: G. H. Bullard Co., Westboro, Mass.

Note: Wheel C-202-15-BS is recommended where ever possible.

Cutting Speeds	Variable by hand feed.
Stock holding equipment	Held by hand against gauge while cutting stock.
Safety	Wheel covered with heavy steel guard. Care must be taken not to bind wheel while cutting to cause breakage. Wheel Breaking extremely dangerous.
Crew	1, 2, 3 men; depending on wgt. lifted.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/7

D. Johns-Manville Engineered Planer Saw

Characteristics	Description
Machine	Machine converted from planer bed machine. Two motors placed on headder above stock. Motors adjustable laterally for various widths of cut and can be tilted to various degrees. Rate of feed governed by hydraulic system of cylinders. Feed controlled by valve. Equipment modified by Johns-Manville Eng. Dept's. See sketch in appendix, B.
Material	Transite, Ebony, Ohmstone, Chemstone, Marinite 23, 36, 65;
Capacity	Machine designed to strip stock on one or two edges, per machine cycle into various widths only. For thicknesses cut; see Cutting Speeds. Machine accommodates lengths up to 96".
Recommended thicknesses cut on machine.	See Cutting Speeds
Tolerance	± 1/32" or equivalent.
Maintenance	Usual maintenance of equipment designed for high speed production.
Power	2 - 10 HP recommended; Arbor Speed (See "Cutting Speeds") 550 AC; Direct Drive. S. A. Woods Motors
Cutting Wheels (Abrasive)	Manufactured by: Bullard Co., Westboro, Mass. 16" X 5/16" thick.; 1" arbor diam.; Wheel No. C16-222X, steel center abrasive wheel, for Transite, Ebony, Ohmstone, Chemstone. Wheel No. C16-14-X, steel center abrasive wheel, for Marinite 23, 36, 65.

Cutting Speeds - Planer Saw and Carriage Saw

Product	Thickness	No. Thicknesses Cut per Cycle	Feet/Min.	RPM Arbor Speed
Ebony and Ohmstone	1/4"	3	7.5	3600
Ebony and Ohmstone	3/8"	2	7.5	3600
Std. Transite	1/8"	6	16.6	3600
Std. Transite	3/16"	6	10.4	3600
Std. Transite	1/4"	4	12.0	3600
Std. Transite	5/16"	3	13.0	3600
Std. Transite	3/8"	3	10.4	3600
Std. Transite	1/2"	2	12.0	3600
Std. Transite	5/8"	2	9.4	3600
Std. Transite	3/4"	2	7.0	3600
Std. Transite	7/8"	1	14.0	3600
Std. Transite	1"	1	12.0	3600
Std. Transite	1 1/4"	1	9.3	3600
Std. Transite	1 3/8"	1	8.3	3600
Std. Transite	1 1/2"	1	7.6	3600
Std. Transite	1 3/4"	1	6.5	3600
Std. Transite	2"	1	5.6	3600
*Chemstone	1 1/4"	1	10.0	3600
Marinite 23	1"	3	17.0	3600
Marinite 36	1/2"	5	15 - 17	3600
Marinite 36	3/4"	4	"	3600
Marinite 36	7/8"	3	"	3600
Marinite 36	1"	3	"	3600
Marinite 36	1 1/4"	2	"	3600

*Cutting speeds for other thicknesses to compare with Transite.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/9

Product	Thickness	No. Thicknesses Cut per Cycle	Feet/Min.	RPM Arbor Speed
Marinite 65	7/16"	5	12-13	3600
Marinite 65	1/2"	4	"	3600
Marinite 65	3/4"	3	"	3600
Marinite 65	7/8"	3	"	3600
Marinite 65	1"	2	"	3600
Marinite 65	1 1/4"	2	"	3600

Stock Holding Equipment	Hand pressure type clamp at each end of stock on machine bed or air clamps.
Stock Handling Equipment	Stock handled manually to machine within limits of two man lift. Vacuum handling recommended on stock too heavy for two men.
Safety	Cutting Wheels covered with steel guard. No dangerous hazards if care is taken in keeping clear of moving bed, standing clear of cutting wheels for possible breakage. Care must be taken in setting clamps and stops so as not to interfere with cutting operation.
Crew	Two men.

E. Johns-Manville Engineered Carriage Saw or Billerica 2-way Planer Saw

Characteristics	Description
Machine	Machine converted from planer machine. Four motors placed in stationary position on headder supported by I-Beams in floor, above material to be cut.

	Motors adjusted laterally and vertically various lengths of cuts. Rate of feed governed by hydraulic system of cylinders. Rate of feed controlled by valve on hydraulic line. Machine may be set up to cut from one to three lengths of material per cycle of machine, depending on lengths. Material cut two sides. Modified by Johns-Manville Eng. Dept. See appendix for sketch, C.
	*The Billerica 2-way Planer Saw is basically a stripping and cut-off saw in one. It is designed to cut only full size sheets to size. Cutting Speed and wheel data is same as indicated under Planer Saw Page 5.
Material	Same as Planer
Capacity	Machine designed to cut off strips, cut on J-M Engineered Planer Saw, to various lengths. Machine set from 12" to 96" length. For thickness cuts see Cutting Speeds.
Maintenance	Usual maintenance of equipment designed for high speed production.
Power	4 - 10 HP Motors recommended; Arbor Speed (See "Cutting Speeds" for Planer); Direct Drive.
Cutting Wheels (Abrasive)	Same as J-M Eng. Planer Saw.
Stock Holding Equipment.	Material held by pneumatic push type air clamp, adjustable to various positions of cutting wheel.
Safety	Same as J-M Eng. Planer Saw
Crew	Two men

W E T C U T T I N G

Wet cutting may be used for all straight cutting where smoothness of cut is essential. The abrasive action of cut material and water flowing back by the saw and stock results in a smooth cut edge. The water acting as a coolant reduces heat and burning of stock and cutting wheels. Water also increases the length of wheel life. There should be available a sump for collecting slurry because of danger of clogging sewer systems.

EQUIPMENT USED BY JOHNS-MANVILLE

A. Coping Saw	
Characteristics	Description
Machine	Machine has stationary bed, equipped with one V-belt driven saw mounted on overhead V-rails. Rate of Feed Speed controlled by rheostat connected to direct current generator convertor. Movement of cutting wheel by screw feed thru two speed transmission. See Appendix D for sketch. Transmission placed in high speed feed position. Cutting speeds controlled by Jones-Motrola Tachometer Type "T". Machine equipped with three high pressure water jets, two directed at side of wheel - one at cutting edge of cutting wheel to reduce wheel heating at 65 lbs. pressure. Manufactured by Lincoln Iron Work, Rutland, Vt.
Material	Transite, Ebony, Colorlith and Ohmstone.
Capacity	Cut widths from up to 48", lengths from up to 96". For thickness see Cutting Speeds.
Recommended thicknesses cut on machine.	See Cutting Speeds. Coping (Wet)
Tolerance	± 1/32" or equivalent

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/12

Maintenance	Machine easily maintained and adjusted. Usual maintenance problems of heavy equipment.
Power	15 HP Motor; 1750 rpm; 550 AC; Sheave and V-belt driven; Arbor speed (See Cutting Speed for rpm.)
Cutting Wheels (Abrasive)	1. For cutting Ebony, Ohmstone thru 2" thick: Manufactured by Carborundum Co., Niagara Falls, N.Y.; 16" X 5/16" thick; 2 7/16" arbor diam.; Wheel No. C203TB-OQ-25. Bullard Co., Westboro, Mass.; 16" X 5/16" thick; 2 7/16" arbor diam; wheel No. C202.22. 2. For cutting Transite and Ebony 2 1/2" thru 4" thick; Bullard Co. - Wheel No. 16 - 14, 18" diameter X 5/16" thick X 2 7/16" arbor diam. 3. For cutting Colorlith: Diamond wheel No. 16932A-.093 Mfg. by: TY-SA-Man Machine Co. Knoxville, Tenn.

Cutting Speeds - Coping (Wet)

Product	Thickness	No. Thicknesses Cut per Cycle	Feet/Min.	RPM Arbor Speed
Ebony	1/4"	1	13.2	3600
Ebony	1/4"	2	13.2	3600
Ebony	3/8"	1	13.2	3600
Ebony	3/8"	2	13.2	3600
Ebony	1/2"	1	13.2	3600
Ebony	1/2"	2	9.6	3600
Ebony	5/8"	1	13.2	3600
Ebony	5/8"	2	8.3	3600
Ebony	3/4"	1	13.2	3600
Ebony	1"	1	10.7	3600
Ebony	1 1/4"	1	9.2	3600
Ebony	1 1/2"	1	7.9	3600
Ebony	2"	1	4.8	3600
Ebony	2 1/2"	1	2.8	2000
Ebony	3"	1	1.0	2000
Ebony	3 1/2"	1	.75	2000
Ebony	4"	1	.50	2000
Transite	2 1/2"	1	2.8	2000
Transite	3"	1	1.0	2000
Transite	3 1/2"	1	.75	2000
Transite	4"	1	.50	2000
Colorlith	1/4"	2	5.4	3600
Colorlith	3/8"	2	5.0	3600
Colorlith	1/2"	2	4.6	3600
Colorlith	5/8"	1	5.2	3600

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/14

Product	Thickness	No. Thicknesses Cut per Cycle	Feet/Min.	RPM Arbor Speed
Colorlith	3/4"	1	5.0	3600
Colorlith	1"	1	4.6	3600
Colorlith	1 1/4"	1	4.2	3600
Colorlith	1 1/2"	1	3.8	3600
Colorlith	1 3/4"	1	3.3	3600
Colorlith	2"	1	3.0	3600

Stock Holding Equipment.	Stock held by combination of C-Clamps and wooden wedges or pneumatic clamps against a guide rail on machine bed.
Stock Handling Equipment.	Stock handled by hand thru 1/2" thickness on full sheets; Vacuum lift handling equipment recommended for use on 5/8" thru 4" thickness on full sheets.
Safety	Cutting wheel covered with heavy steel guard. Care must be taken to properly dress wheel to reduce wheel breakage. Wet, slippery floor can be hazardous.
Crew	One man.

Abrasive Cutting Wheels

Abrasive cutting wheels are compounded from abrasive cutting particles held together by a bonding medium. Abrasive wheels give smooth, accurately cut surfaces together with satisfactory wheel life. Where extremely smooth surfaces are required, wet cutting has a decided advantage over dry cutting. The customer must decide which method will be used to meet his specifications.

To obtain smooth, accurate cut surfaces, the cutting wheel must have an accurately dressed parallel edge. A wheel that is not dressed properly, or has a beveled edge dressing has a tendency to give wavy cuts, and cause roughing of cut edges of material. It is important that the wheel is properly dressed from the standpoint of smoothness of cut and efficiency obtained from electric motors, as more power is required to operate a dull saw.

The modern cutting wheel possesses an interesting characteristic, peculiar to itself - that of sharpening itself, in effect, while it works. The grains on the surface of the wheel are either broken or pulled out under the stress of the work as they become dulled. This characteristic is not entirely true, however, in the cutting of J-M Products. The wheel, after several cuts, may become clogged with stock particles causing the wheel to lose its efficiency, therefore, frequent wheel dressings are necessary. Care should be taken not to dress wheels too often which results in excessive wheel usage.

It is important in wet cutting that sufficient water is available for best results. The water not only acts as a cooling agent but removal of waste material as well. The abrasive action of cut material and polishing action of side rub of wheel along edge of cut piece leaves a very smooth cut, which is not possible in dry cutting.

Diamond Wheels

Diamond wheels may be used for wet cutting on the same equipment but smoothness of cut will not be quite as good as with abrasive wheels. Rate of cut is somewhat greater and saw kerf is less. Both important advantages in use of diamond wheels.

Carbide Wheels

From experience at J-M Nashua plant, the company has found that Carbide Tipped Wheels have not proved satisfactory in cutting J-M Products.

Mechanical Condition of Equipment

The quality of work produced is dependent on the mechanical condition of the cutting equipment. To cut material at close tolerances all bearings, arbors, feeds, clamping arrangement, mounting of machine must be in good condition to reduce variances in the mechanism as undue vibration will cause rough edges, chipped edges, wavy cuts, and unsafe conditions.

Cutting Wheel Safety

To assure proper handling and use of cutting wheels, your attention is called to the booklet issued by the American Standards Association entitled "American Engineering Standards Safety Code for the Use, Care and Protection of Abrasive Wheels" - ASA - B7 - 1943.

K e e p C u t t i n g W h e e l s p r o p e r l y

g u a r d e d a t a l l t i m e s.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/17

S H E A R I N G

Asbestocite or Marine Veneer may be sheared very satisfactorily where specifications do not require a smooth edge. Shearing produces an irregular roughly cut surface which is caused by the fibers pulling and breaking apart at the cutting point. Some installations of wet machine products do not require a smooth edge and shearing is an economical means to cut stock to a rough dimension for use or further maching.

A. Shear	
Characteristics	**Description**
Machine	Scissor type action, one moveable blade for cutting. Machine made by the Peck, Stow and Wilcox Co., Southington, Conn. See Appendix E for sketch.
Material	Asbestocite, Marine Veneer
Capacity	Machines available for cutting 4 ft. or 8 ft. lengths
Recommended thicknesses cut on machine	1/8" and 3/16" thicknesses.
Tolerances	± 1/16" or equivalent.
Maintenance	Easily maintained and adjusted.
Power	5 HP Motor: 550 AC; 1140 rpm full load.
Cutting speed	Constant
Stock holding equipment	Pressure plate holds stock on downward movement of cutting action.
Safety	Blade guarded but caution should be used in operating machine.
Crew	One and 2 men.

Shear Blade

Since there is a certain amount of abrasive action on the shear blade in cutting Asbestocite and Marine Veneer products, a very hard steel is used to reduce abrasive wear, increase life of shear blade and produce a more sharply cut edge. The blades used on machines at Johns-Manville are manufactured by Peck, Stow and Wilcox Co. of special steels.

The cutting edge on the shear blade must be sharpened correctly for good shearing results, otherwise, instead of a cutting action being involved an improperly sharpened blade causes a tearing action at the cutting point. See Appendix F, Grinding Shear Blade.

The shear blade is set into the machine at a slight difference in plane to the lower shear knife, this difference is approximately 1/2" in four feet.

D R I L L I N G & C O U N T E R B O R I N G A L L P R O D U C T S

There are no special techniques required in drilling J-M Products other than equipment should be of proper design to handle the operation for maximum efficiency. The equipment should be in good mechanical condition which is required if quality work is to be produced at close tolerance. All drilling should be done dry, with provisions for adequate dust collection.
Any standard make of twist drill can be used in drilling J-M Products. Either Carbon, or High Speed Steel Drills up to 2" diameter are used. High speed steel drills give better service than Carbon steel from the standpoint of long life and frequency of sharpening. Carbide tipped drills perform well on Colorlith.

A. Preparation for Drilling	Reason
Have drill press firm on its base.	If separate bed is used to hold work, the drill and work will not be lined up at all times, thus enlarging and burring hole.
Be sure chuck is tight, both vertical and horizontal.	Vertical play makes it difficult to "feel" drill and will allow it to punch thru the bottom of work. Horizontal play allows the drill to run out, making it inaccurate and burring the edges.
Be sure drill is sharpened correctly and that it is not worn tapered.	A dull drill causes punching, rough holes, and excessive time for drilling. A tapered drill causes burring on top edge of hole.
Have stock on firm bed.	A loose bed allows stock to move, throwing load on drill, thus reaming and burring the hole.

B. Drilling Operation	Reason
The drill should be hand fed.	In stock over half inch thick the drill should be raised to free its flutes of chips, otherwise it will heat, bind and cut a ragged, uneven hole.

Release pressure on drill for last eighth inch stock.	Prevents punching and tearing edge of hole.
For very clean cut holes, use a piece of natural wood, Transite, or Metallic template under stock being drilled.	Allows drill to cut thru stock.
Drilling holes from 2" to 3" in diameter, use an insert tooth counter bore with an Armstrong Self Hardening steel cutter.	Best method.
Drilling holes from 3" to 22" in diameter, use a trepanning tool or fly cutter bar.	Best method.
Small holes in small pieces are drilled on sensitive bench drills. Drills up to 5/8" diameter may have to have the shanks cut off and turned down to fit small chucks.	Better control and "feel" of drill.
Faster rpm's are best in drilling - See data on drill rpm's.	Better results and less wear on drill.
Drill three quarters way thru stock with boring tool, turn piece over and finish drilling from other side.	Cleaner holes.
Drilling with counter bore, have lead guide hole large enough to fit freely and drill clear thru.	Prevents binding and movement of stock.

C. Possible Causes of Poor Quality Work

Causes	Reason
Holes run out of line and burr raised on top edge.	Drill press loose on base. Chuck loose in press. Drill sharpened too pointed. Drill worn tapered. Work not held steady. Scribe marks for hole to deep.
Holes not clean on bottom	Vertical play in chuck and drill. Drill too pointed. Forcing drill near end of cut. Speed too slow.
Drills get hot and gummed up.	Dull drill. Drill worn tapered. Speed too great. Crowding drill. Drill not free of cuttings.
Excessive Drilling Time.	Drills not sharpened correctly. Speed to slow. Drill fed too slow. Drill not free of chips.

Approximate Speeds of Drills

Diameter of Drill	rpm
Up thru 3/8"	850
7/16" thru 9/16"	600
5/8" thru 7/8"	450
1" thru 1 1/4"	250
1 3/8" thru 1 1/2"	170
1 5/8" thru 2"	70

Grinding Twist Drills

Twist drills should be ground, preferably on an automatic drill grinder, so that the cutting edge is a straight line on a 59° angle with the center line of the drill. The heels of the lips should be backed off 4° or 5° less than the cutting edges. See sketch showing grinding features. Appendix G.

Counter Boring

On holes from 2" to 60" in diameter, a trepanning tool or fly cutter bar is used with good results. The size of hole is regulated by moving the cutter in and out of the spindle. When using these bars it is necessary to reduce the speed. The problems encountered in the drilling section are applicable to counter boring.

Grinding Counter Bore Tools

Steel cutters in boring tools should be ground so that the tool edge is not at right angles to the spindles but so its extremity touches the work first. The heel of the tool is backed off about 5° to 10° from the cutting edge. See sketch showing grinding features - Appendix G.

Approximate Speed of Counter Bore.

	Rate of Feed	
Range	R.P.M.	Feed/R.P.M.
2" - 6"	260	.029
6" - 10"	162	.014
10" - 14"	102	.014
14" - 20"	40	.014
20" - 60"	40 - 29	(Depending on) (Hand feed)

MACHINING ALL PRODUCTS

J-M Products may be machined by various methods. Care should be taken to select the proper method of machining as much depends on selection of method in producing a quality piece at a reasonable cost.

EQUIPMENT USED BY JOHNS-MANVILLE

Lathe

J-M Products can be lathe worked to capacity of machine. Same procedure can be used as turning soft metals except that a faster rate of cut is possible. Rate of cut should not tear work but should leave a clean cut surface.

Range of Sizes	Type	RPM	Feeds/ Min.	Depth of Cut
0 thru 3 1/2"	rods, discs or rings	235	4 5/8"	1/4"
3 1/2" thru 4"	rods, discs or rings	135	2 3/4"	1/4"
4" thru 6"	-- discs or rings	135	2 3/4"	1/4"
6" thru 10"	-- discs or rings	40	7/8"	1/4"
10" thru 14"	-- discs or rings	26	9/16"	1/4"

Note: Last cut of Lathe reduced to 1/16"

Jig Saw & Band Saw

Curves and irregular cuts can be made with a jig saw (bow type, reciprocating action) or a band saw. Holes over 22" in diameter or cut-outs can be cut on a jig saw or band saw. Since the saw cut is fairly rough the saw cut must be smoothed with a sanding device. For an outside cut the saw cut may be sanded on a sand wheel. For an inside cut a sand wheel placed on an upright spindle works satisfactorily.

A coarse tooth blade of 5 teeth to the inch should be used on jig and band saw machines for best results. Care must be taken not to put too much pressure on the saws in cutting for safety against breakage.

A heavy duty jig saw or band saw with deep throat to allow turning and handling the work should be used.

Machine Specifications

Jig Strokes: 820/min.
Band Saw: 2900 S.F.M.
Power Supply: 2 hp
Blade Data: Mfg. by Olson Bros. Machine & Tool Co., Brooklyn, N.Y.
Jig blade - 1/2" wide, 15 gauge, 5 points per inch.
Band saw blade - 1/2" wide, 21 gauge, 5 points per inch.

Milling Machine

Characteristic	Description
Machine	Standard Horizontal Milling Machine Table Working surface 68" X 19" Size overall 72" X 19" T-slots 3 - 13/16" Distance between T-slots - 4 1/4" Swing of table 47° Range Longitudinal travel 35" Cross travel 14" Vertical travel 14" Manufactured by Cincinnati Milling Machine Co., Cincinnati, Ohio, Mach. No. 4 High Power Horizontal; Model No. HO.
Material	Transite, Ebony, Ohmstone, Chemstone, Colorlith, and Marinite Products.
Capacity	Accommodates stock 35" long; 32" wide between hub and cutter; all thicknesses of stock; all depths cut up to 4", all widths of cut.
Recommended thicknesses to be cut on machine	1/8" thickness thru 4".
Tolerance	± 1/32" or equivalent
Maintenance	Usual maintenance characteristic to milling equipment.
Power	10 hp Motor; Speed full load 1140 rpm; 550 volts; multiple V-belt driven.
Cutter data	Standard high-speed steel cutters similar to equipment used on metal. Mfg. by O. K. Tool Co., Milford, N. H.; Morse Twist Drill & Mach. Co., New Bedford, Mass. Browne & Sharpe Co., Providence, R.I.

Milling Speeds	Feed rate from 3/8" thru 15"/ min. Milling speed varies by depth and width of cut.
Stock Holding Equipment	Adjustable flat steel flange bolted to bed and wedges.
Safety	Keep clear of revolving cutter and moving table. Belts, pulleys, gears enclosed. Cutter shaft unguarded. No dust problem. Vertical shifting of table by automatic drive is hazardous due to hand adjustment handle revolving at high speed.

MACHINE BEVELING ALL PRODUCTS

Some installations require the edges of the panel or sheet to be beveled. Ebony, Ohmstone, Chemstone, Colorlith are beveled wet due to impregnation, Transite and Marinite Products are beveled dry. Panel to be beveled should be placed on table face down, and clamped in that position so that face of beveling wheel is in same plane as edge of panel. Positioning panel in this manner on machine tends to eliminate variances in width of bevel on edge of panel.

A. Wet Beveling	
Characteristics	Description
Machine	Modified Coping Saw. Machine has stationery bed equipped with direct drive beveling wheel, mounted on over-head V-rails. Rate of feed controllable by rheostate connected to direct current generator convertor. Movement of cutting wheel by screw feed thru transmission. Manufactured by Lincoln Iron Works, Rutland, Vt. Modified by Johns-Manville Eng. Dept.
Material	Ebony, Ohmstone, Chemstone, Colorlith.
Capacity	Any length bevelled desired thru 96"; Widths of bevels from 1/16" thru 1/2", on 45° angles.

Recommended thicknesses to be cut on machine	3/8" thru 4"
Tolerance	± 1/32" or equivalent
Maintenance	Usual maintenance problems of heavy equipment.
Power	15 hp Motor; Arbor Speed 1750 rpm; direct drive; 550 volts.
Beveling Wheel	Manufactured by Bullard Co., Westboro, Mass.; Wheel No. C4016x - 3" thick - 10" cup diam., Tested speed 6700 rpm; Recommended Speed 4500 rpm.
Beveling Speeds	13.2 feet/min.
Stock Holding Equipment	Eight air cylinders placed in a vertical position which hold panels being machined. Air cylinders adjustable to any size panel.
Safety	Cutting wheel positioned at back of machine, does not endanger operator. Wet surroundings can be hazardous.

B. Dry Beveling

Characteristics	Description
Machine	J-M DESIGNED; Working Surface 32 1/2" X 102" ; Beveling wheel attached to solid rails, screw feed, beveling action forward and reverse - feed, constant beveling speed.
Material	Transite, Marinite Products
Capacity	Any length bevel thru 96" long, width of bevel from 1/16" thru 1/2" on 45° angles. Thickness up to 3/4".

Recommended thicknesses to be beveled on machine	1/4" thru 3/4"
Tolerance	± 1/32" or equivalent
Maintenance	Usual maintenance problems of heavy equipment. Special care in cleaning and greasing of rails is good preventative maintenance due to dust problem.
Power	7 1/2hp Motor; 3600 rpm: Direct Drive.
Beveling Wheel	Manufactured by Bullard Co., Westboro, Mass., Wheel No. 4016X - 3" thick - 10" cup diam. Tested speed 6700 rpm; Recommended speed 4500 rpm.
Beveling Speed	30.75 feet/min.
Stock Holding Equipment	Concentric action air clamps, rubber cushioned, adaptable to all length stock.
Safety	Cutting wheel positioned at back of machine, does not endanger operator.
Hand Beveling	Bevels may be put on panels by hand or to touch-up machine bevels.
Equipment	1. Flat bastard file 1 3/8" X 14" double cut, 17 teeth per inch (Nicholson file).
Procedure	1. Hold file at 45° angle and use a stiff wrist motion to hold constant angle the length of the panel. 2. Smooth the formed bevel with a sand block and 120 grit paper.

Hand Tools

All J-M Products may be machined with common hand tools - hand drills, hand saws, etc.

If sawing is done by hand, a very coarse tooth hand saw should be used with 5 points to the inch, with a great deal of set in the teeth. Same care should be taken in drilling with hand drill as with power drills as same problems are likely to occur.

Special Jobs - Colorlith, Chemstone

Considerable technique is required in fabrication of the various materials for special application. Some of the techniques for fabrication of jobs more commonly encountered in the field are listed below:

A. Sink Cut-Outs

The method used for sink cut-outs is as follows:

1. Steps in operation for square corner sinks

a. Lay out dimension of sink hole to be cut on panel.
b. Drill 3/4" hole in all four corners of lay-out to allow for 1/2" wide jig saw blade to pass through.
c. Saw out opening on bench saw.
Note: The saw used in this operation is hydraulically lifted and lowered by cylinder. The stock is placed on bench table and saw raised through stock. The stock is pushed by the saw for cut-out. See picture of bench saw and controls and bench saw with round cornered sink in cut position.
d. After sawing, stock is removed from bench saw and corners are cut out with 1/2" jig saw.
e. Corners are filed by hand with coarse file to smooth corners.

2. Steps in operation for Round Corner Sinks

a. Layout dimension of sink hole to be cut on panel.
b. Cut out round corners of sink hole.
Note: Up to and including 3/4" radius corners, a drill is used in making round corners. Over 3/4" radius corners, a fly-bar and cutter are used. If fly-bar is used, a guide hole is drilled for proper radius and hole is cut with fly-bar.
c. After making round corners with drill or fly-bar, the sink opening is cut on bench saw by same method as for square corner sinks.

d. After sawing, stock is removed from bench saw and corners are filed with a coarse file to smooth area where saw and round corners meet.

No jig is used in the layout or cutting of sink cut-outs by the Nashua Method.

B. Recesses and Rebates

Nashua uses several methods for making recesses, depending on the dimension of recess and size of panel.

1. On round sink holes a fly-bar cutter is used, and material left between holes not cut is chiseled out by hand.

2. On square sink holes, the recess is made on a Cincinnati Milling machine and the corners chiseled out by hand. The machine is limited to what size panel can be worked on.

3. On long recesses along edges of panels, the recess is made on the coping saw with a wide wheel set at the proper depth.

C. Drip Grooves

We use a Skil Saw at Nashua for making drip grooves. 9 1/4" wide abrasive wheel is set at the proper depth and distance from the edge of opening, and the cut is made. Unfinished parts of the groove are chiseled out with a round, pointed chisel.

D. Finishing Edges

General:

Edges of panels may be finished to match the top surface by polishing the edge to a soft sheen.

Procedure:

1. Use a portable belt sander with 70 grit paper to remove deep scratches and saw marks.*

2. With a portable sander and 120 grit paper, hand buff to a polished finish.

*Note: Hold portable sander vertical to the edge in a tight grip to prevent rounding edges.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/30

Special Jobs (Continued)

E. Maching and Assembling Splines

1. Machining Splines:

a. Operation:

The machining operation consists of cutting a 1/4" wide by 1 1/16" deep groove with a resinoid abrasive wheel along the edge of panels to accommodate a 2" wide by 7/32" thick spline strip.

b. Description of Equipment:

Machining of splines is done on a Johns-Manville Engineered Planer Saw. This machine is a regular production machine for stripping 48" x 96" sheets to various widths. For splining, a special motor mount is installed to bring cutting motor to desired cutting position on material. The motor is rotated so that the abrasive wheel is horizontal to the table surface for spline cut. See sketch for details.

c. Power Requirements:

7 1/2 H. P. S. A. woods arbor type motor; arbor speed 3600 rpm; 550 volts AC; direct drive.

d. Abrasive Cutting Wheel:

Manufactured by Geo. H. Bullard Co., Westboro, Mass. 16" x 1/4" thick x 1" arbor hole; wheel No. C202-15-BS (Safety Wheel)

e. Stock Holding Equipment:

Stock held by air clamps or hand pressure type clamps.

f. Cutting Method:

Dry method; dust collection required.

g. Cutting Speed:

4 - 8 ft./min.

h. Tolerances:

± 1/32"

i. Safety:

Keep cutting wheel covered with steel guard. Care must be taken in setting clamps and stops so as not to interfere with cutting operation. Caution should be taken to have area guarded against possible wheel breakage.

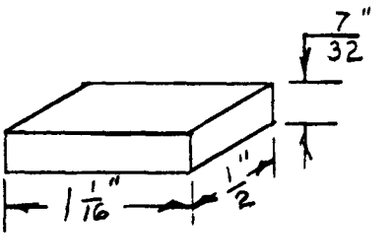
2. Assembling Spline Strips in Groove:

Spline strips are made from 7/32" thick Colorlith or Chemstone stock. Splines should fit loosely in groove to allow adjustment of panel in final assembly.

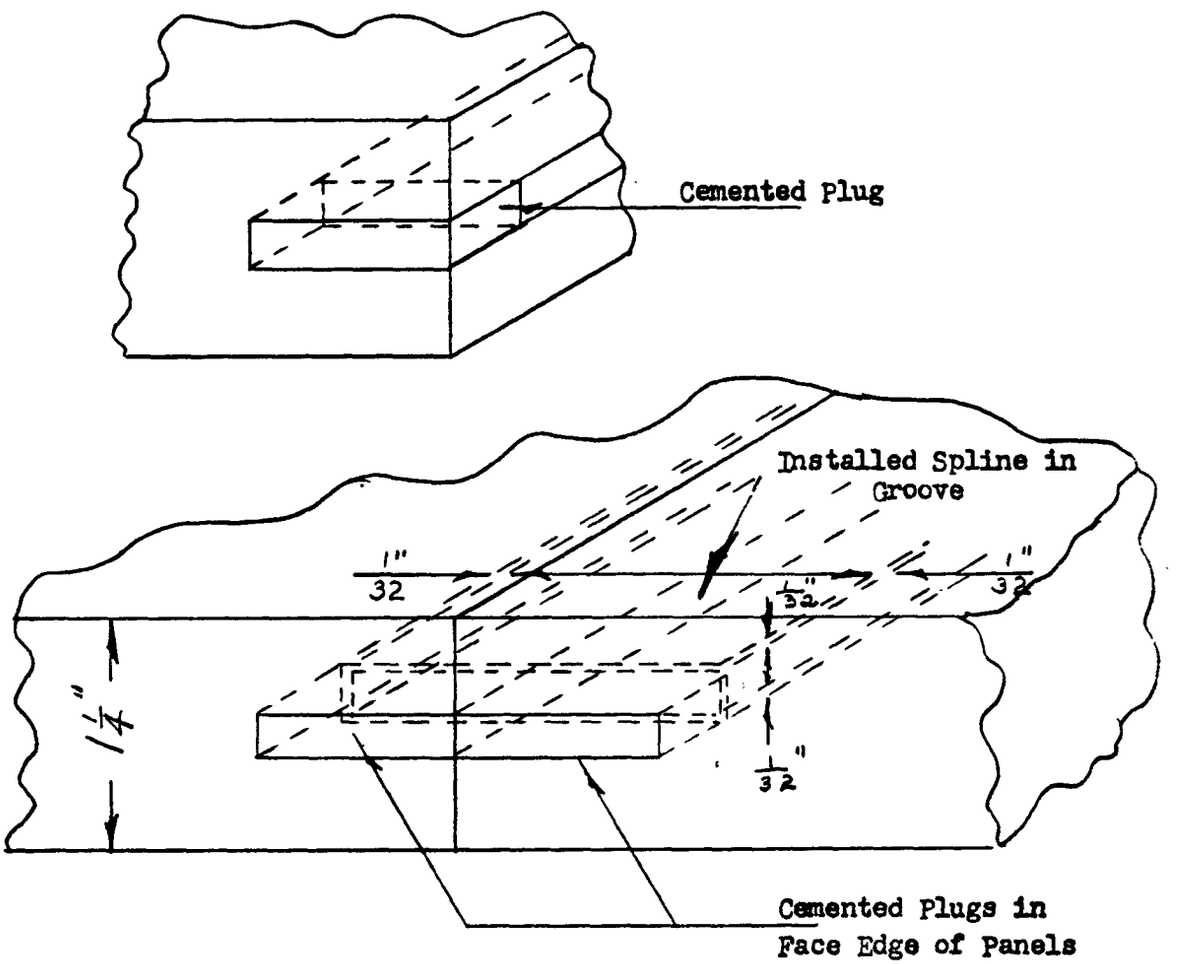
After spline cut is made, the groove on the front edge of the panel that shows is plugged to fill spline groove.

Steps for Plugging End of Groove:

1. Cut plug to dimension.



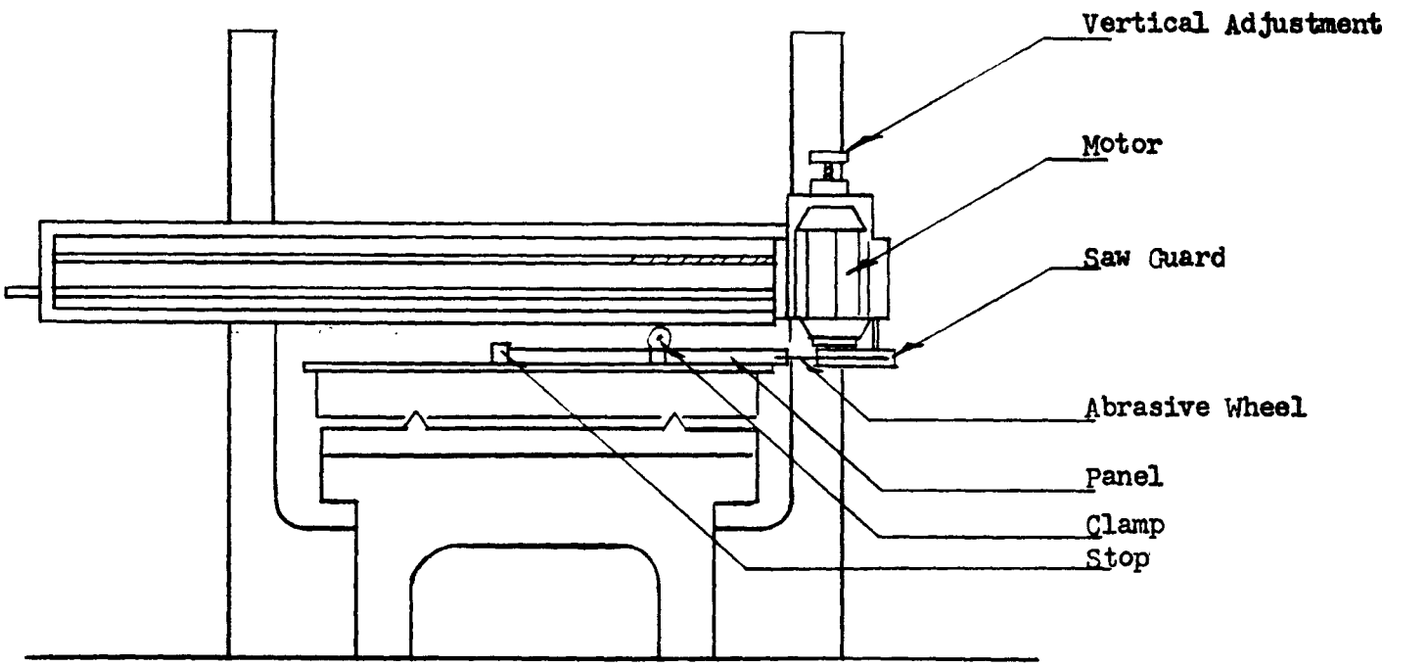
2. Cement plug into spline groove with Johns-Manville 616-B rubber base cement.



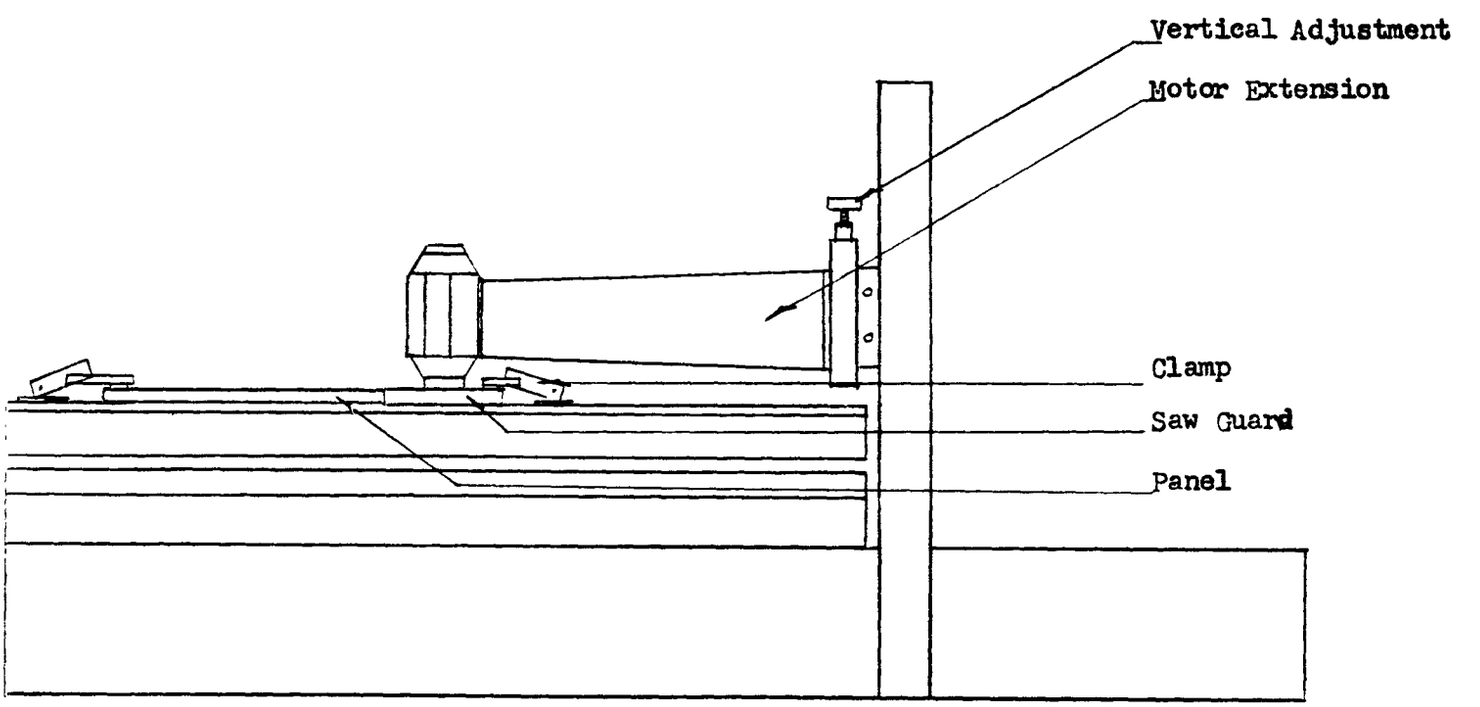
SKETCH OF TWO PANELS WITH INSTALLED SPLINE SHOWING CLEARANCES

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/32

Sketch of
Johns-Manville Engineered Planer Saw for Machining Splines



End View



Side View

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/33

Suggested Cutting Shop Equipment

We have listed below and on the following pages equipment we feel essential for a fabricator handling all board materials if he is to properly service his accounts. We wish to emphasis again that by "shopping around" bargains can be found in good used equipment. Machinery providing tolerances ± 1/32" is for the most part adecuate.

Again remember that dry fabricating must have adequate means for dust removal while wet operations reouire sludge removal facilities.

A. Most Important Equipment for a Cutting Shop

Cutting and Sizing Saw	Ty-Sa-Man Machine Co., Knoxville, Tenn.; Saw Model III Series.
Suggested Machine Requirements:	HP Min. 20. Max. Wheel diam. 18". Max. Straight Cutting Capacity - To accommodate longest cuts 8' for Nashua products or 10' for Billerica products. Max. Cross Travel-Min. of 8'. Max. Vert. Adjustment - 12". Carriage Feed - Screw feed. Controls - Electronic variable speed to 44" per min. Cutting Method - Equipped for cutting wet or dry. Clamping - Recommended Ty-Sa-Man clamping mechanism. Variable arbor speed from 1600 to 3600 rpm.
Bench Saw:	Manufactured by American #1. Model #6 or equivalent make.
Suggested Machine Requirements:	HP 15. Variable arbor speed - 1200 to 3600 rpm. Tilting table top - To 45° for making angle cuts and bevels. Saw Mechanism - Raising and lowering mechanism of cutting wheel for cutting sink cut-outs and radiator grills, etc. Saw Guide - Heavy saw guide for accuracy. Cutting method - Dry. Size - Heavy cast frame for rough usage.
Large Radial Drill:	Manufactured by Cincinnati Bickford Tool Co., Cincinnati, Ohio; Model 4D-166; 4' radial

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/34

Cutters:	High-speed steel cutters or carbide-tipped similar to those used on metal.
Clamps:	Adequate clamping.
Small-Speed Lathe:	Manufacturer - any standard make.
Suggested Machine Requirements:	To have chuck capacity of 8". To be used for small rods and tubes not adaptable to large lathe operation.
Post Drill:	Manufactured by Walker-Turner, Plainfield, N.J.; Serial No. 52E3B3.
Suggested Machine Requirements:	Have at least 10" swing. One HP motor; adjustable table height and swing; wide range of feed speeds and chuck speeds.
Small Belt Sander - 6"	Manufactured by Delta Power Tool Div., Rockwell Manufacturing Co., Pittsburgh, Pa.
Suggested Machine Requirements:	Have 6" belt, 1 HP motor, table adjustable from horizontal through 90° vertical. To be used for surface and edge sanding of small pieces, making small bevels, etc.
Large Post Drill:	Manufactured by Prentice Bros., Worcester, Mass.; Serial No. A1-12.
Suggested Machine Requirements:	1 HP motor; adjustable table height and swing; broad range of drill speeds and feed speeds; at least 13-inch swing.
Electric Band Drill with 1/2" Chuck:	Manufacturer - Any standard make.

Large Radial Drill (Continued)	drill, 11" column, quick change gear box, #5 MT in spindle, reverse in head, auxiliary box table, 5 HP motor at 1200 rpm or equivalent make.
Suggested Machine Requirements:	Machine to be rugged for drilling large diameter holes up to 2" and for use with fly-bar cutters for circle cutting of large radii, etc.
Bench Radial Drill:	Manufactured by Walker-Turner, E. Plainfield, N.J.; 1/2 HP motor; Serial No. 7-6248.
Suggested Machine Requirements:	To be well supported on a steel table to minimize vibration. Have a wide range of drill speeds for various materials and drill sizes. To be used for drilling small holes not adaptable for large radial drill.
Lathe:	Manufactured by South Bend - 16 inch x 10 feet. Precision Lathe or equivalent make.
Suggested Machine Requirements:	To be equipped with chuck capacity to 16 inch diameter stock for rings, discs, rods, etc., with center-rest attachment, follower rest, taper attachment, reversing 2 HP motor.
Jig Saw:	Manufactured by American Wood Working Mach. Co. or equivalent make, Williamsport, Pa.

Suggested Machine Requirements:	To be a "bow-type", spring reciprocating action machine for small square and round cut-outs, finishing up corners left by saws, and large circles or irregular cutting. Saw blades should be 5 points to the inch and resharpenable by 15 gauge x 1/2" wide. Machine should accommodate all size panels to 48" x 96".
Band Saw:	Manufactured by S. A. Woods Co. or equivalent make.
Suggested Machine Requirements:	Should be 36" throat for cutting large size circles and radii. Speed of blade should be approximately 2900 surface feet per minute. Blade: 1/2" wide x 21 gauge x 5 points to the inch and resharpenable.
Drill Grinder:	Capacity to 2 1/2" drill diameter. Manufactured by Black Diamond Saw and Machine Works, Inc., Natick, Mass.; Model OEM, Cap. 1/2 - 2 1/2" (Worcester drill grinder).
Dust Collector for Dry Cutting:	
Sump Basins for Collecting Sludge from Wet Cutting:	

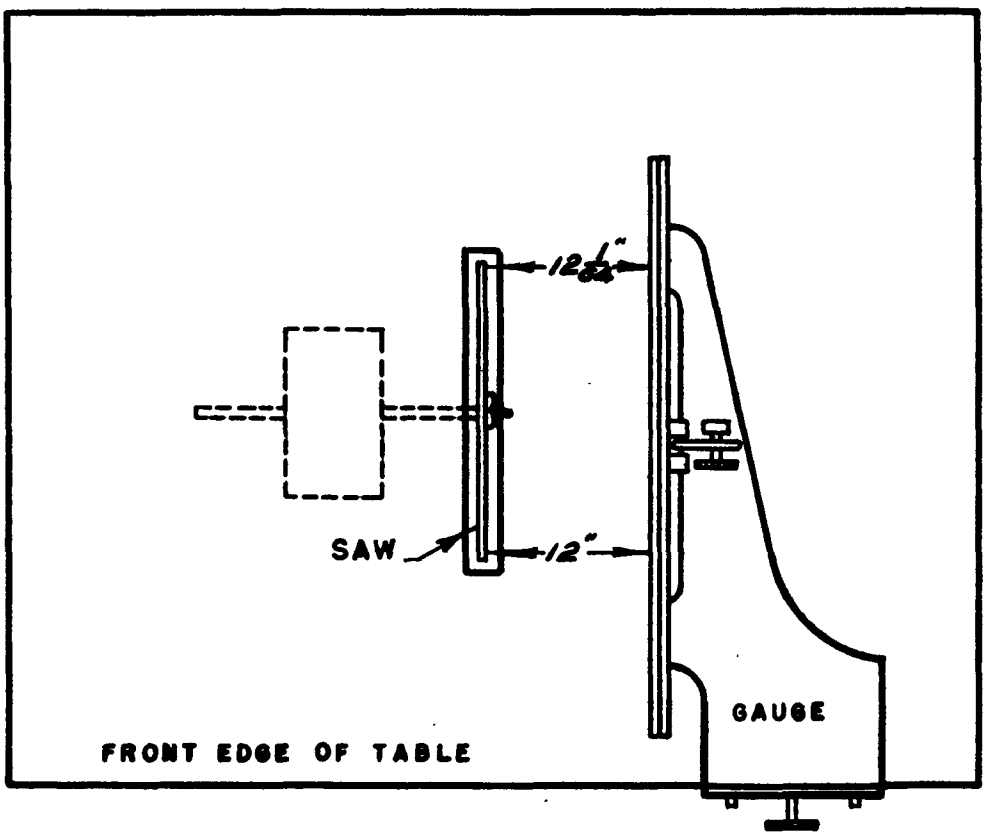
B. Next most important for a cutting shop:

Milling Machine:	Manufactured by Cincinnati Milling Mach. Co., Cincinnati, Ohio, Mach. No. 4 High power horizontal; Model No. HO or equivalent make.
Suggested Machine Requirements:	To be used for special grooves, slots, rabbets, adaptable to multiple operation.
Capacity:	Accommodate stock 48" long, 32" wide between hub and cutter, all thicknesses of stock.
Motor:	10 HP.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/37

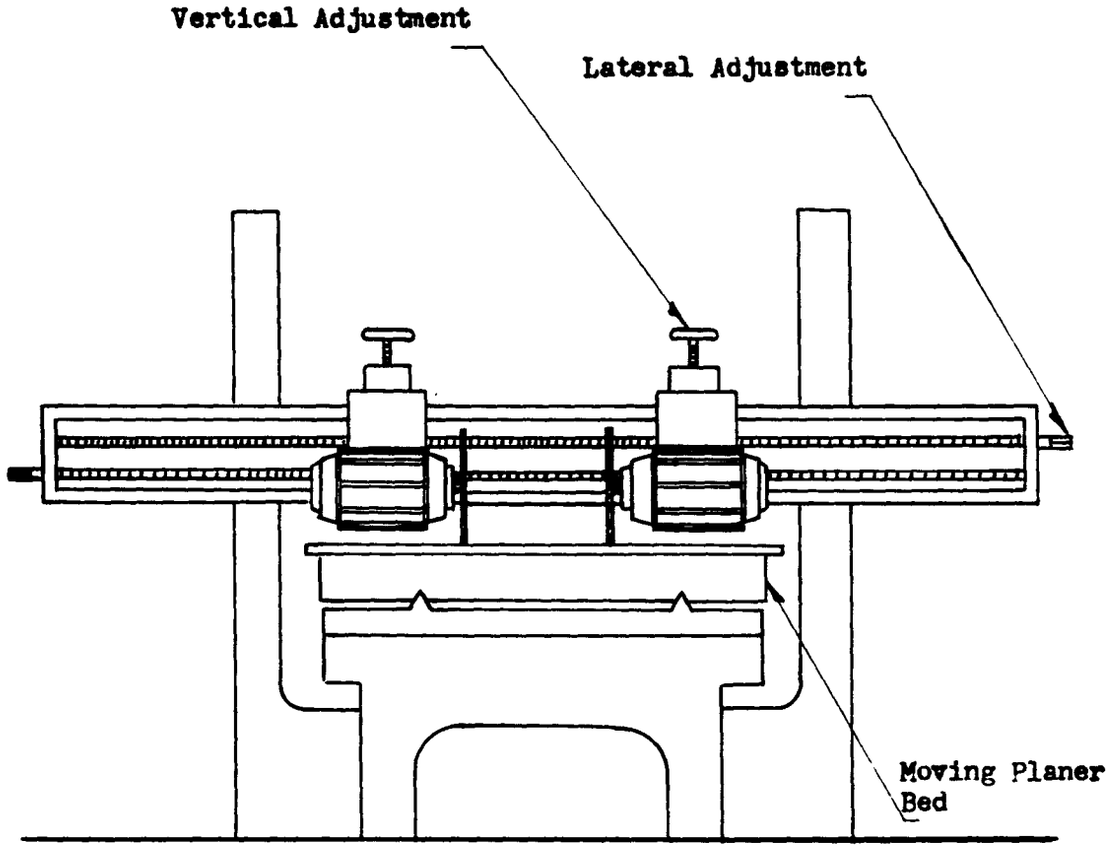
C. Other Essential Equipment:	
Small Tools:	Hammers, chisels, jibs of various sizes, squares, punches, wrenches, drills, etc.
Cutting Wheels:	Abrasive and diamond cutting wheels for various materials.
Band Saw & Jig Saw Blades:	Several replacements.
Sanding Belts:	Abrasives for small belt sander and hand finishing of various grits.
Work Tables:	Various sizes.
Box Shop Equipment:	Small swing saw for cutting crating lumber; supply 7/8" lumber; supply 7-d nails; banding equipment.
Handling Equipment:	Skids - 4 x 8 and 4 x 4; hand push trucks; hand lift truck; fork truck;

APPENDIX A



METHOD OF SETTING GAUGE TO PREVENT STOCK BINDING OR SAW HEATING.

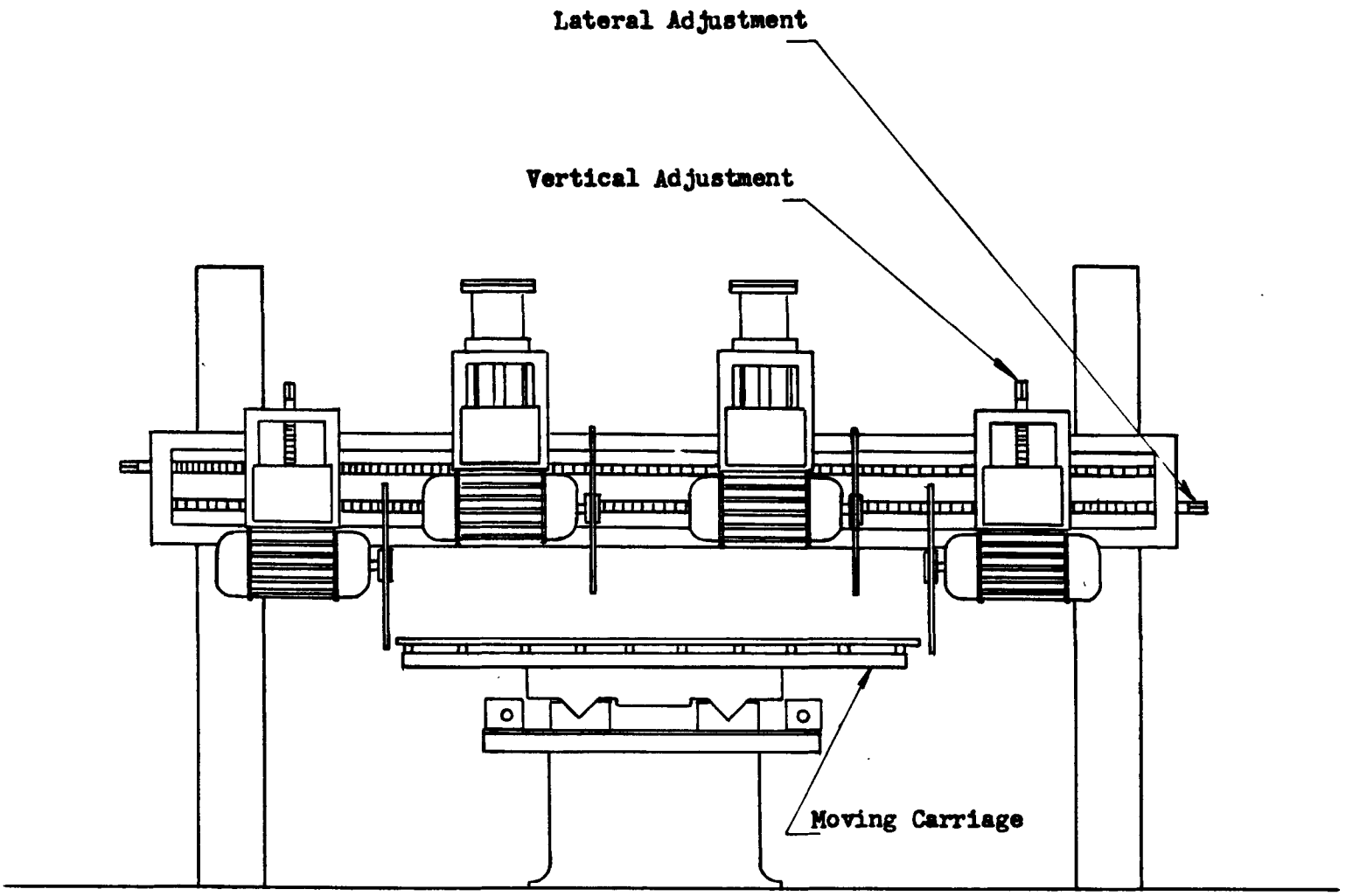
APPENDIX B



Sketch of

JOHNS-MANVILLE ENGINEERED PLANER SAW

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/40



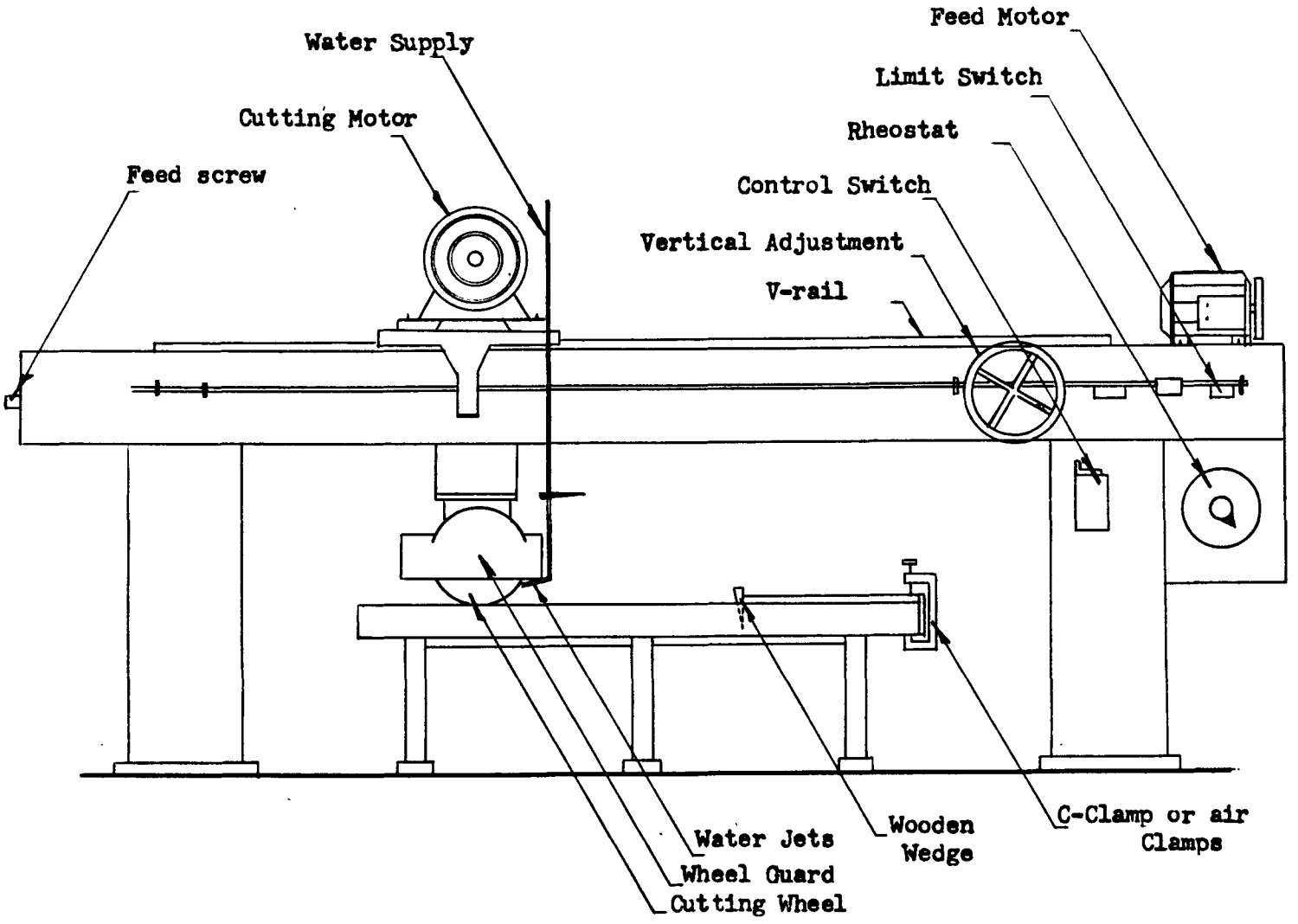
Sketch of

JOHNS-MANVILLE ENGINEERED CARRIAGE SAW

J.J.A.
4-28-54

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/41

APPENDIX D



Sketch of

COPING SAW MADE BY LINCOLN IRON WORKS

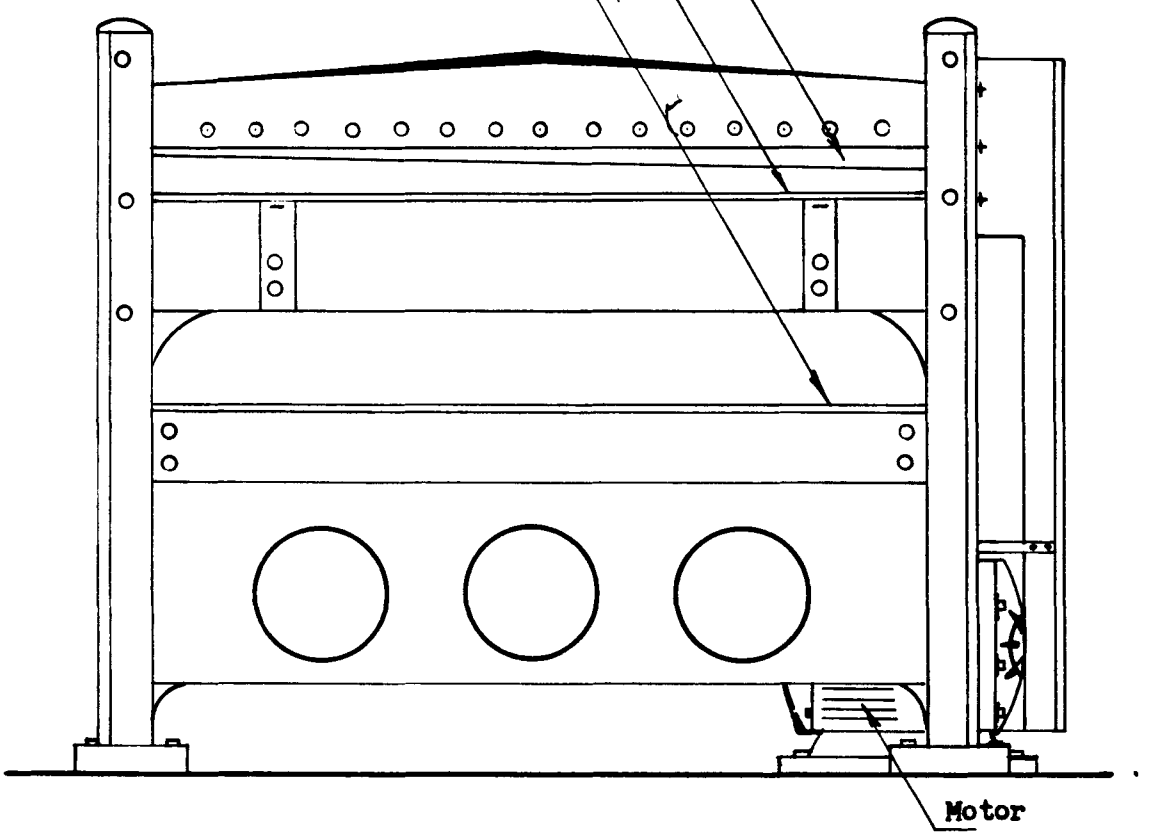
Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/42

APPENDIX E

Cutting blade set at angle of approx. 1/2" to horizontal in 4'.

Upper table at shearing position.

Lower table for receiving cut panels.

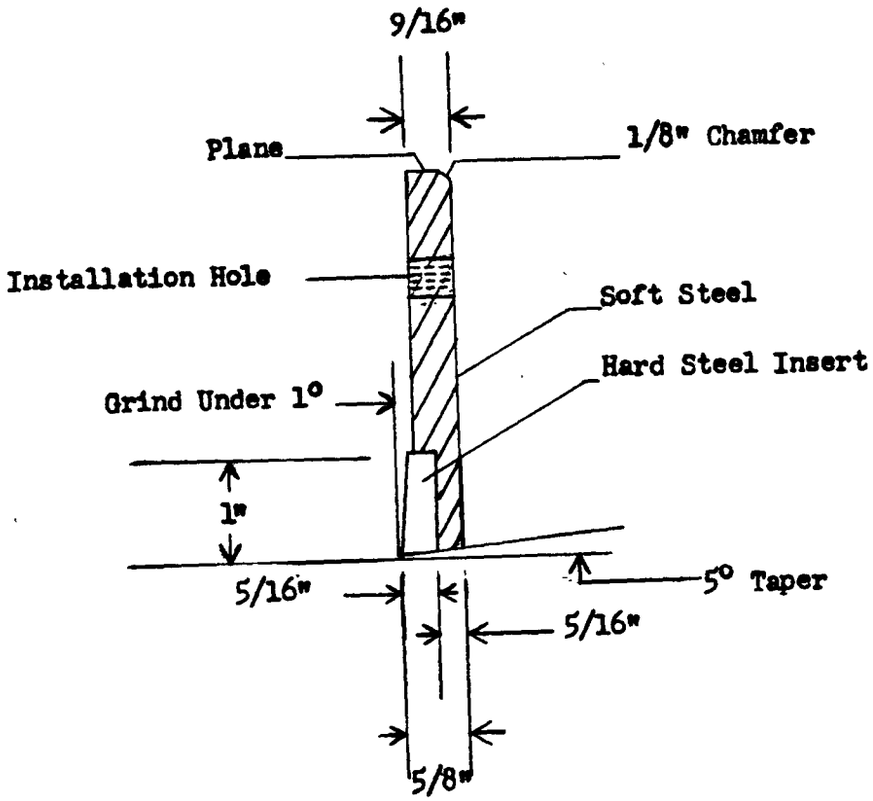


SKETCH
OF
FRONT VIEW OF SHEAR FOR CUTTING ASBESTOCITE AND MARINE VENEER.

Pressure Plate for holding stock while being cut - not shown

Published by AsbestosClaims.Law
asbestosclaims.law/library/11643/43

APPENDIX F

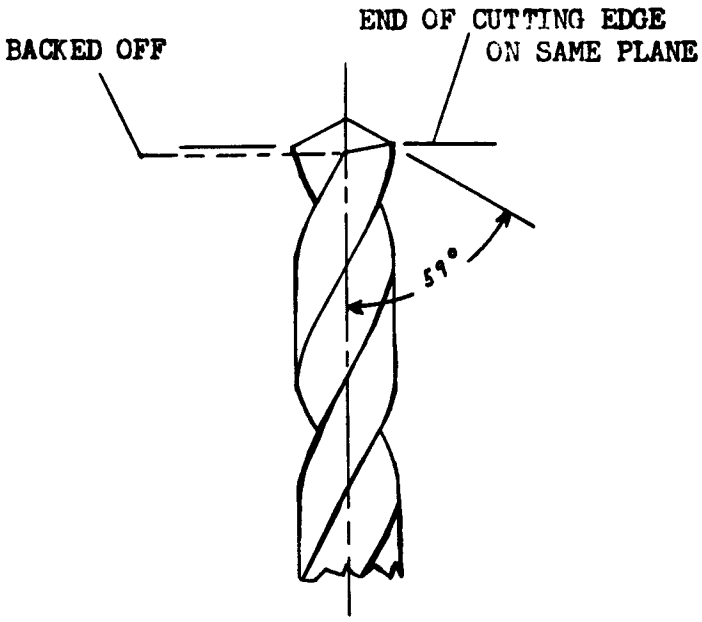


SKETCH
OF

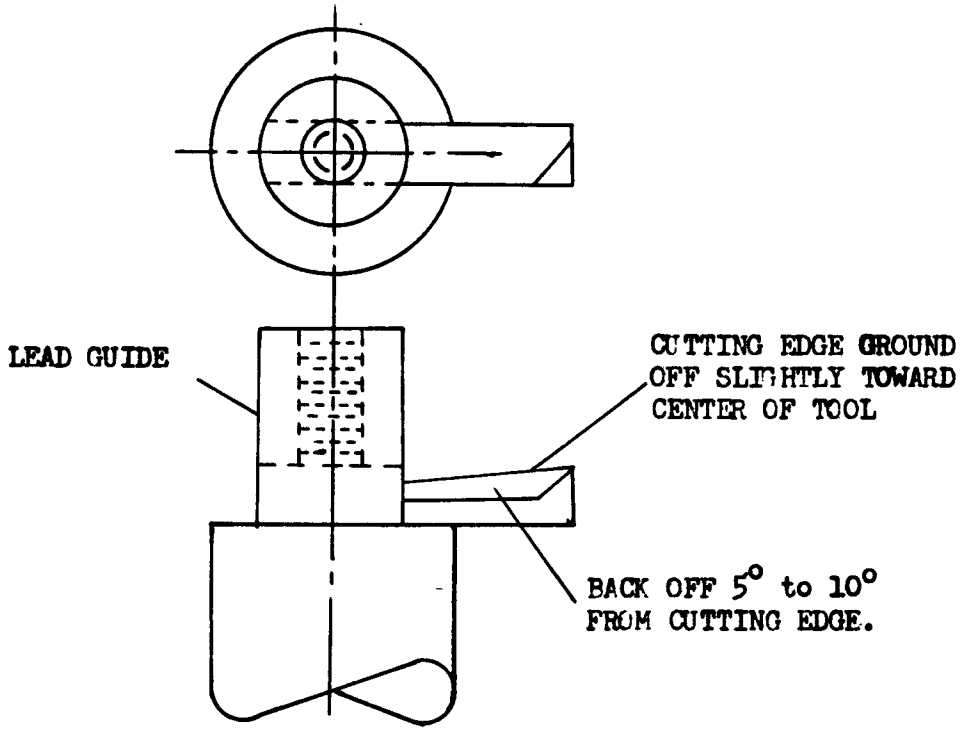
CROSS SECTION OF SHEAR

CUTTING BLADE SHOWING METHOD OF GRINDING

APPENDIX G



GRINDING TWIST DRILLS



GRINDING BORING TOOLS