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Technical Course on Criteria for the
Selection of Woodworking Machinery
Milan, Italy, 8 - 19 May 1978

SELECTION OF SAWMILLING EQUIPMENT*

by

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1. Selection of Headrig and Carriage

The following machines are being selected:

- a) Vertical Bandsaw with 1.6m pulley driven by a 110 kw motor.

A geared electric motor mounted on the column is used to tension the blades. The adjustment of both the saw blade and the upper blade guide is remote rolled.

b) Carriage equipped with dogs for clamping the log on to the head blocks. The distance between the saw blade and the knees is 1600 mm, large enough to dog logs up to 2m in diameter. Most dogs are adjustable. Fixed hook dogs are mounted to the head blocks to hold the logs parallel to the direction in which the carriage is travelling. The log turning device can either be mounted on the carriage or the log deck. They are used for aligning and positioning the log. They are also used for turning the log after slabbing. The setworks is electrically or hydraulically controlled.

The carriage sets off by about 10 mm during the return stroke. This prevents splintering or scratching the sawn surface or striking the back of the blade which could cause it to run off the pulley. Before the feed stroke an automatic operation will reset the log.

The carriage feed speed is controlled by electric or hydraulic drive or hydraulic transmission. The feed rate is infinitely variable and the rapid return stroke decreases idle time.

The push button control panel for the headrig, the carriage, the conveyors and the set-works are in control of the head sawyer. The set works is infinitely variable. When the operator presses the button, the dogs are in action to clamp the log and the knees push the log close to the saw blade before the board gauge is selected.

Break-down capacity

The volume (in cubic meters) of logs and the yield of converted sawn lumber depends on the quality of the log and the required grade of sawn lumber.

Therefore, basic data has to be developed to obtain a realistic estimate of the sawmill capacity. If all the other conditions remain constant, the log feed rate depends on blade quality and maintenance.

When converting medium-hard logs, four meters long and 1.5 m in diameter (about 7 m³ for each log) on the headrig the slab cut and 3 to 5 thin boards will be sawn before cutting 50 mm thick planks. Furthermore, all the logs more than one meter in diameter will be centre out to prevent splitting of full size heart boards.

The log breakdown time for different sawmilling operations is calculated in tables A and B.

Table A (Appendix 1)

Log break down capacity per hour is calculated by 14 m³/h. This figure is rather optimistic because work is usually slowed down for various reasons and practical production time will not exceed 80 per cent of the total available time.

It is well to remember when a plant is highly mechanized and the various phases of the production cycle are closely interlocked, a small problem generating downtime in the plant will decrease the output of the over all system. It may be assumed, however, that a plant with just one log sawing machine can convert 70-80 m³ of logs in an eight-hour shift.

Increased output calls for a plant with two headrigs; these band saws should be the same size so that bandsaw blades can be used on both headrigs.

If a certain volume to be sawn is less than 1.5 m in diameter, a small and a large carriage should be used. The smaller logs travel on the small carriage which normally operates at a higher feed speed.

A second headrig will certainly not double the hourly output which is calculated in Table B, even though the idle time for loading, unloading and turning will be the same, it will be the log sawing operation gaining less volume. On an average, the headrig capacity is about 55-65 m³ in an eight-hour shift.

A plant equipped with two headrigs pulley diameter 1.6 m and automatic carriage drive can cut 125-145 m³ of logs in an eight-hour shift providing that other conditions described above are met.

For a plant breaking down the same species but with a capacity of more than 120 m³ in an eight-hour shift, two headrigs and one self-centering band resawing machine are required.

The self-centering band resawing machine is basically derived from the vertical log band sawing machine, but instead of a carriage travelling to and fro, this machine has endless feed mechanism for the boards. Theoretically, this system should decrease the time lost for carriage return. The frame on the band resawing machine is equipped with a tensioning device for the blades and a remote control for rise and fall of the blade-guide. The feed mechanism could be fences on opposite sides of the table with motor driven feed rollers, chains or belts.

These two fences are both connected mechanically and electrically for moving symmetrically in relation to the blade. These fences guide the boards so they travel in a straight way parallel to the saw blade. The feed rollers on the fences turn at the same speed. The best solution is remote control with infinitely variable speed so that the operator can adjust the feed rate according to the features of the wood specie. The roller pressure is also adjustable. Where the thickness of the boards varies, a servo-control which automatically readjusts the fences is useful. When breaking down the same log dimensions as before and applying the same sawing technology with the exception that the boards sawn on the two headrigs will be twice as thick and center sawn at the band resawing machine, the calculation will follow the sample in:

Table B (Appendix 2)

Each of the two headrigs supplies the resawing machine with 36 boards 4 m long every 18 minutes. Therefore the resawing machine will have to work at the following (theoretical) average rate:

$$\frac{36 \times 2 \times 4}{18} = 16 \text{ m/min.}$$

However, in practice the resawing feed is not absolutely equal. Therefore the feed rate of at least 20 m/min is adjusted to saw 288 m of boards every 18 minutes.

When considering these figures the pulley diameter must be 1.6 m. The theoretical capacity of this sawmill - equipped with two headrigs with pulley diameter of 1.6 m and a self-centering resawing machine with pulley diameter of 1.6 m - is 14 m³ every 18 minutes which is about 46 m³/h.

In practice, as the operation is not working continuously, this sawmill would have a capacity of about 230-250 m³ of breakdown in one shift.

Summarizing these conditions, three output levels have to be considered:

- 1) Sawmill with one headrig, log, breakdown of 70-80 m³ per shift equals 10-11 logs of 1.5m in diameter and 4 m long.
- 2) Sawmill with two headrigs for log breakdown of 125-145 m³ per shift equals 10-11 logs of 1.5 m in diameter and 4 m long and 12-14 logs 1.2 m in diameter and 4 m long.
- 3) Sawmill with two headrigs and a self-centering resawing machine for a log breakdown of 230-260 m³ per shift which would be equal to 33-37 logs 1.5 m in diameter and 4 m long as mentioned above.

Selecting the standard type of a sawmill

The breakdown analysis indicated that the headrig with pulleys of 1600 mm in diameter is the most suitable machine for sawing large logs of the tropical species.

The following layout solutions are possible:

- 1) The partial layout solution includes the following machines and conveyors:
 - log deck cross conveyors items 11 and 12.
 - headrig and carriage (C).
 - conveying system for sawn lumber, waste and the boards from the log (items 14,34 and 35); waxy boards will pass the double edging circular saw for edging (F) to the cut-off saw (L) (items 15,39,40,41 and 42); some boards have to pass the single blade edging circular saw (H), (items 16,49 and 50); boards will then pass the sorting

line (item 17); the boards which are longer than the standard length (item 18); and a cross conveyor for transporting the finished products (items 54 and 55).

- 2) If one vertical log sawing machine has a theoretical output of 60-80 m³ in eight hours (see example above), the output can obviously be increased by increasing the number of sawing machines. A second log sawing machine has been provided in our global solution. It can either work independently or in connection with the first machine. In the latter case, the material can be turned from one machine to the other by means of items 13, 19, 27 and 22.

This second solution includes all the machines and conveyors used in the first outline plus the following items:

Feed conveyor (items 20 and 21).

Vertical band sawing machine (D).

Lines for transporting and discharging the lumber that has been sawn (items 22, 27, 23, 24, 25, 26, 36, 37, 44, 45, 46, 47, 52, 53 and part of 54).

Double edging circular sawing machine (G).

Single blade edging circular sawing machine (I).

These machines operate along the same lines as the ones on the other side of the plant.

- 3) Now we have the third solution, which includes all the machines and conveyors in the two preceding solutions plus a self-centering re-sawing machine (E), including the necessary conveyors (items 28, 29 and 30), the conveyors for transporting the lumber to the two double edging circular sawing machines (items 31, 38 and 43), the conveyors for transporting the lumber to the two single blade edging circular sawing machines (items 32, 48 and 51) and the conveyor for transporting the finished product to the final chain conveyors (item 33). The layout shows the two headrigs, the self-centering resawing machine and two circular cut-off saws, two double edging circular sawing machines and two single blade edging circular sawing machines. These machines increase the production capacity by full operational time of the log

band saws (headrigs).

These solutions have been completed by adding an external log feed line with a station for cutting the logs to length and a debarking line (items 1,2,3,4,5,6,7,8,9,10A and 10 B). All sawn lumber is transported to a sorting line and the sawdust to a bunker (items 56,57, P); with all the refuse material being collected in two different sections with hogging stations. The hogged chips are transported to a silo (items 58,59,60,61, N and O).

If the refuse material does not need to be hogged, conveyors 59 and 61 and the hogging section can be eliminated. Special containers can be placed at the four collection stations to accommodate this material.

It is not intended to solve the problem of sawing tropical logs but it is necessary to show different possibilities in log breakdown to meet various cutting requirements. Each company must find the solution best suited to its needs.

Sawmill machinery layout and its function: (Appendix 3)

- Item 1: Cross conveyor for transporting the logs from the yard to the cut off station and transfer to the debarking line;
- Item 2: Chain conveyor for feeding the logs to the cross cut chain;
- Item 3: Belt conveyor for transporting waste from the cross cut chain saw to the refuse container;
- Item 4: Trough roller conveyor, complete with mechanical stops for positioning the logs before cutting to length and a device for discharging the logs to one side for debarking;
- Item 5: Cross conveyor for log transport to the debarking machine;
- Item 6: Belt conveyor for transporting refuse from the debarking machine to the refuse storage area;
- Item 7: Cross conveyor for transporting the logs from the debarking machine to the sawmill log deck;
- Item 8: Trough roller conveyor for transporting the logs from the debarking machine and directly from the yard to the sawmill logdeck;

- Item 9: Cross conveyor for transporting the logs from the yard and the buffer storage area on the debarking machine to the sawmill log haul;
- Item 10: Trough roller conveyor where logs up to 6.60 m long are loaded on the right hand deck and logs up to 10 m long loaded on the left hand deck;
- Item 11: Cross conveyor for transporting the logs to the carriage;
- Item 12: Hydraulic log loader in front of the log carriage;
- Item 13: Roller conveyor for transporting sawn lumber from the headrig. This conveyor is equipped with a hydraulic return feeder;
- Item 14: Roller conveyor. The boards to be resawn are unloaded on the right while slabs, side cuts and refuse follow to the left.
- Item 15: Roller conveyor for transporting sawn lumber from the headrig where the boards to be edged by the double edging circular sawing machine are discharged to one side;
- Item 16: Roller conveyor: equipped with unloading unit for boards passing the single blade edging circular sawing machine;
- Item 17: Roller conveyor with unloading unit for lumber sawn at the headrig being conveyed to the sorting conveyors;
- Item 18: Roller conveyor for sawn lumber passing through the mill, equipped with an unloading device for boards more than 6.60 m long;
- Item 19: Cross conveyor; the lumber to be remanufactured is held here temporarily. The lumber can also be conveyed for reloading on to the log carriage.
- Item 20: Cross conveyor for transporting the logs to the carriage feed unit.
- Item 21: Hydraulic log loader in front of the log carriage.
- Item 22: Roller conveyor for transporting the lumber from the headrig. This conveyor is equipped with a hydraulic loader to handle returned lumber.

- Item 23: Roller conveyor. The boards passing the self-centering resawing machine are conveyed to the right; the refuse material, rejects and the boards for remanufacturing are loaded to the left;
- Item 24: Roller conveyor for transporting sawn lumber from the headrig while the boards passing the double edging circular sawing machine are loaded to one side;
- Item 25: Roller conveyor equipped with an unloading unit for boards passing the single blade edging circular sawing machine;
- Item 26: Roller conveyor equipped with unloading unit. Sawn lumber from the headrig will pass on to the sorting conveyors;
- Item 27: Cross conveyor; the lumber which returns held here temporarily. The lumber can also be reloaded on to the log carriage;
- Item 28: Cross conveyor for transporting sawn lumber from headrig passing to the self-centering resawing machine;
- Item 29: Cross conveyor for transporting sawn lumber from the headrig passing the self-centering resawing machine;
- Item 30: Self-centering feed works with grooved in-feed rollers;
- Item 31: Roller conveyor, equipped with unloading unit for boards which passed the self-centering resawing machine on to the conveyors on both sides leading to the double edge sawing machines;
- Item 32: Roller conveyor, equipped with unloader for boards on to the conveyors on both sides passing the lumber to the single blade edge sawing machines;
- Item 33: Roller conveyor, equipped with unloader for edged boards passing the self-centering resawing machine on to the sorting conveyors on both sides;
- Item 34: Cross conveyor for transporting the sawn lumber from the headrig for resorting or for other applications. This unit is equipped with a pneumatic system for turning the board's over;

- Item 35: Adjustable scissors' lifts for resorting the flitches or for packaging material which does not have to be sorted. These lifts are travelling on rails;
- Item 36: Cross conveyor for transporting sawn lumber from the headrig. This lumber will be used for other applications which do not require additional sorting. The unit is equipped with a pneumatic system for turning the boards over;
- Item 37: Adjustable scissors lift for resorting or for packaging material which requires no sorting. These lifts are travelling on rails;
- Item 38: Cross conveyor for transporting sawn lumber coming from the self-centering resawing machine and the headrig conveyed to the double edge sawing machine;
- Item 39: Cross conveyor for transporting lumber to the cut-off line and the double edge sawing machine;
- Item 40: Roller conveyor which supports the lumber during the cut-off operation and feeds it into the double edge sawing machine;
- Item 41: Roller conveyor located at the rear of the double edging sawing machine; equipped with an automatic device for separating the edgings;
- Item 42: Roller conveyor for transporting the boards which have been edged and loading them on to the sorting conveyor;
- Item 43: Cross conveyor for transporting the lumber from the self-centering resawing machine and the log sawing machine to the double edging sawing machine conveyor;
- Item 44: Cross conveyor for transporting lumber to the cut-off line and the double edging sawing machine;
- Item 45: Roller conveyor which supports the lumber during the cut-off operation and feeds it into the double edging sawing machine;
- Item 46: Roller conveyor at the rear of the double edging sawing machine; equipped with an automatic device for separating the edgings;

- Item 47: Roller conveyor for transporting the edged boards on to the sorting conveyors on the left and the lumber not to be graded (small boards and beams, etc.) is unloaded on the right, outside the sawmill;
- Item 48: Cross conveyor for transporting sawn lumber from the self-centering resawing machine and the log sawing machine to the single blade edging sawing machine conveyor;
- Item 49: Cross conveyor for feeding the boards to the single blade edging sawing machine. It is equipped with a pneumatic system for turning the boards over for the operator's inspection;
- Item 50: Roller cross conveyor for discharging sawn boards on to the sorting conveyor;
- Item 51: Cross conveyor for transporting the lumber from the self-centering resawing machine and the headrig to the single blade edging sawing machine conveyor;
- Item 52: Cross conveyor for boards passing the single blade edging sawing machine. It is equipped with a pneumatic system for turning the boards over for the operator's inspection;
- Item 53: Roller cross conveyor for unloading sawn lumber on to the sorting conveyor;
- Item 54: Cross conveyor for transporting the sawn boards coming from the headrig, double edging sawing machines, single blade edging sawing machines and the self-centering resawing machine to the sorting conveyor;
- Item 55: Cross conveyor for transporting of sawn boards to the sorting conveyor belt;
- Item 56: Conveyor belt for transporting the lumber to the sorting line;
- Item 57: Conveyor with six unloading units for sorting boards into the right storage bin on either side. The boards are sorted according to thickness and length;
- Item 58: Belt conveyor for transporting rejects and mill refuse from the headrig to one of the two refuse conveyors;

- Item 59: One of the two belt conveyors for transporting waste and rejects from the headrig, the cut-off line and, the edging sawing machines to one of the hogging machines;
- Item 60: Belt conveyor for transporting refuse and rejects from the headrig to one of the two refuse conveyors;
- Item 61: One of the two belt conveyors for transporting refuse and rejects from the headrig, the cut-off line and the edging sawing machines to one of the hogging machines.

Sawmill plant layout and description of lumber flow:

- A) Chainsaw for cutting logs to length
After cutting to length, the logs are either conveyed directly to the sawmill or to the debarking machine.
- B) Debarking machine with rotating cutter head and rail-mounted carriage.
(Besides the rotating cutter debarking machines, rotor type debarking machines are widely used; but this type of machine is only suitable for relatively small diameter logs and they cannot be applied for debarking of tropical logs.)
The logs are fed to this machine after ^{being} cut to length; after the debarking operation they can either be temporarily stored in the yard or conveyed to the sawmill. The logs which are stored in the yard can be sent to the sawmill by means of the independent conveyor (Item 9).
- C) Vertical headrig with pulley diameter of 1600 mm.
The logs are loaded on to the carriage after being cut to length debarking or directly from the yard.
This machine breaks down lumber for the self-centering resawing machine, boards for the single blade edging sawing machine, boards with centre defects, sound boards which pass directly to the sorting line, lumber for resorting lumber more than 6.60 m conveyed outside the sawmill and rejects.

The machine can also breakdown logs into halves flitches and blocks to be returned or transported by conveyors 27 and 19 to the other headrig

- D) Vertical headrig and carriage with pulley diameter of 1600 mm.
The logs are loaded to the carriage after being cut to length and debarking, or directly from the yard. The log breakdown includes: slabs, side cuts, boards for resawing, boards for edging, boards with centre defects, sound boards which pass directly to the sorting line, material such as rejects and refuse. This machine can also breakdown logs into halves, flitches and blocks to be returned or transported by conveyors 27 and 19 to the other headrig for additional processing.
- E) Self-centering band resawing machine with pulley diameter of 1600 mm.
The lumber sawn by the headrig passes to this machine to be resawn into bars for the two cut-off and edging stations; boards with centre cracks pass on to the single blade edging sawing machine and sawn lumber^{is} transported to the sorting line.
- F) and G) Double edging circular sawing machines
Boards from the two headrigs and the self-centering resawing machine pass on to these machines; edged boards pass on to the sorting line, edgings are unloaded automatically.
- H) and I) Single blade edging circular sawing machines with chain feed for centering boards; waste material is discharged to one side and the boards are fed straight out on rollers.
The lumber from the two headrigs and the self-centering resawing machine is conveyed to these machines to be edged and passed along to the sorting line.
- L) and M) Circular cut-off sawing machine.
Boards from the headrig and the self-centering resawing machine are conveyed to this machine to be double edged.
- N) and O) Hogging machines
The refuse from the headrig, the cut-off sawing machines, the double edging sawing machines and single blade edging sawing

machines is conveyed to these machines. The chips are transported to the silos by vacuum conveyor.

- P) Brushing machine for removing sawdust from the edged boards.

TABLE A

SINGLE HEADRIG SAWMILL.
 HEADRIG OPERATION TIME FOR LOG BREAKDOWNS. LOG: 4 m long, 1.5 m diameter







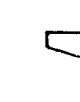



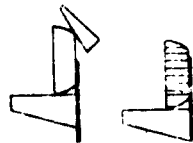
	Height aver. m	Feedspeed m/min	Cycle time sec.	Total time sec.
 Log loading on to the carriage, log rotating and centering	0.4	30	30	30
 Selecting the position and slab sawing	0.7	15	20	20
 Sawing 4 boards		67	18	72
 Carriage return 5 times			4	20
 Dog release for resetting the log, log lifting and rotating to the sawn surface on to the knees; log dogging and resetting the knees moving the clamps forwards			60	60
 Selecting the position and sawing the opposite slab	0.4	30	20	20
 Cutting 4 boards	0.7	15	18	72
 Carriage return 5 times		67	4	20
 Moving the knees towards the blade for center sawing	1.5	12	40	40
 Unloading the flitch on to the log deck, release the dogs turning, positioning and dogging the flitch carriage return, align the flitch and saw edged boards	0.25	35	95	95
Sawing 4 boards	0.35	30	9	45
Carriage return five times		67	4	20
Sawing 24 boards	0.6	18	15	360
Carriage return 24 times		67	4	96
Dog release, reposition and turn the remaining flitch dog it and align the flitch	0.25	35	20	20
Sawing 4 boards from the remaining flitch	0.35	30	9	36
Carriage return 4 times		67	4	16

TABLE A (Cont'd)

	Height aver. m	Feedspeed m/min	Cycle time sec.	Total/ time
0.25	35	70	70	
0.35	30	9	36	
0.6	67	4	20	
	18	15	360	
	67	4	96	
Grand Total Time				1700
Seconds				

Dog release, loading the second flitch
on to the carriage, align and dog it, carriage return
and sawing the waney slab
Sawing 4 boards
Five carriage return 5 times
Sawing 24 boards
Carriage return 24 times



Dog release, rotating the remaining flitch
positioning against the knees dog it and align it
Saw sixth edged board
Cutting four wane edged board
Carriage return 5 times



$$\frac{1700}{60} = 28.33' \rightarrow 30'$$

Log breakdown capacity per hour: 14 m³

N.B.: Sawing and carriage time return calculated for a 4.5 m carriage length.

COMMENTS RE PRODUCTION WHEN USING TABLE B

Double headrig sawmill with band resawing machine. Operation time for log breakdown 4m long log 1.5m in diameter headrigs.

Loading the log on the carriage, rotating and centering.

Selecting the position and cutting the slab.

Cutting 2 side boards.

Carriage return strokes: three

Release the dogs, lifting and rotating the log setting the saw surface to the knees setting the dogs and readjust the knees.

Positioning and cutting the second outside slab.

Cutting 2 side boards.

Carriage return strokes: three.

Moving the knees towards the blade so that the centre of the log is lined up and cutting the log through the centre.

Unloading the flitch on to the waiting area, release the dogs, positioning the remaining flitch, dogging it, carriage return stroke, aligning the flitch and cutting the third outside slab.

Cutting 2 boards from the outside portion.

Carriage return strokes: three

Cutting 12 boards to be resawn.

Carriage return strokes: twelve

Release the dogs, positioning at the saw surface resting against the knees, dogging, aligning the lumber and cutting the fourth outside slab.

Cutting 2 side boards.

Carriage return strokes: two

Release the dogs, loading the other half of the log on to the carriage, aligning and dogging it, carriage return stroke and cutting the fifth outside slab.

Outting 2 side boards.

Carriage return strokes: three

Cutting 12 boards (which will be resawn on the resawing machine).

Carriage return strokes: twelve

Releasing the dogs, rotating the flitch, positioning it so that the surface rests against the knees, dogging it, aligning the lumber and cutting the sixth outside clab. Cutting two boards from the outside section.

Carriage return strokes: 3

$$\frac{1043}{60} = 17.38' \text{ ----} \rightarrow 18'$$

Output is 23m³/h for each headrig.

- Note:
- (a) Cutting time and return stroke calculated for 4.5m carriage stroke;
 - (b) This table differs from table 'A' because the boards cut by the headrig are pre-cut for resawing.

TABLE B

SAWMILL WITH TWO HEADRIGGS AND A RESAW, LOG BREAKDOWN TIME, LOG: 4 m long, 1.5 in diameter

	Height average m	Feed Speed m/1	Cycle time sec.	Total time sec.	Number of boards for resawing
Log loading on to the carriage, rotating and centering			30	30	
Selecting the position and slab cutting	0.4	30	20	20	
Sawing 2 boards	0.7	15	18	36	2
Carriage return 3 times		67	4	12	
Dog release for resetting the log, lifting and rotating the sawn surface on to the knees			60	60	
log dogging and resetting the knees					
Selecting the positioning and sawing the opposite slab	0.4	30	20	20	
Sawing 2 boards	0.7	15	18	36	2
Carriage return 3 times		67	4	12	
Moving the knees towards the blade for centre sawing	1.5	12	40	40	
Unloading the outer flitch to the log deck releasing the dogs turning, positioning, dogging the flitch, carriage return, aligning the flitch and sawing the wavy edge	0.25	35	95	95	
Sawing 2 boards	0.35	30	9	18	2
Carriage return 3 times		67	4	12	
Sawing 12 boards (which will be resawn at the band resaw)	0.6	18	15	180	12
Carriage return 12 times		67	4	48	
Dog release for resetting, turn the remaining flitch, reposition and dog it, align it and saw the wavy boards	0.25	35	20	20	
Sawing 2 boards out of the remaining part	0.35	30	9	18	2
Carriage return 2 times		67	4	8	

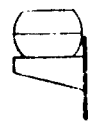
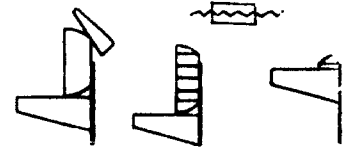


TABLE B (Cont'd)

	Height average in	Feed Speed m/1	Cycle time sec.	Total time sec.	Number of boards for resawing
Dog release for resetting the flitch, loading, aligning, dogging and carriage return, sawing the fifth boards	0.25	35	70	70	
Sawing 2 boards	0.35	30	9	18	2
Carriage return 3 times		67	4	12	
Sawing 12 boards to be resawn	0.6	18	15	180	12
Carriage return 12 times		67	4	48	
Dog release for resetting the remaining flitch part, positioning and dogging against the knees,	0.25	35	20	20	
aligning the flitch and sawing the sixth wavy edged boards	0.35	30	9	18	2
sawing 2 boards		67	4	12	
Carriage return 2 times					
				<u>1043</u>	<u>36</u>

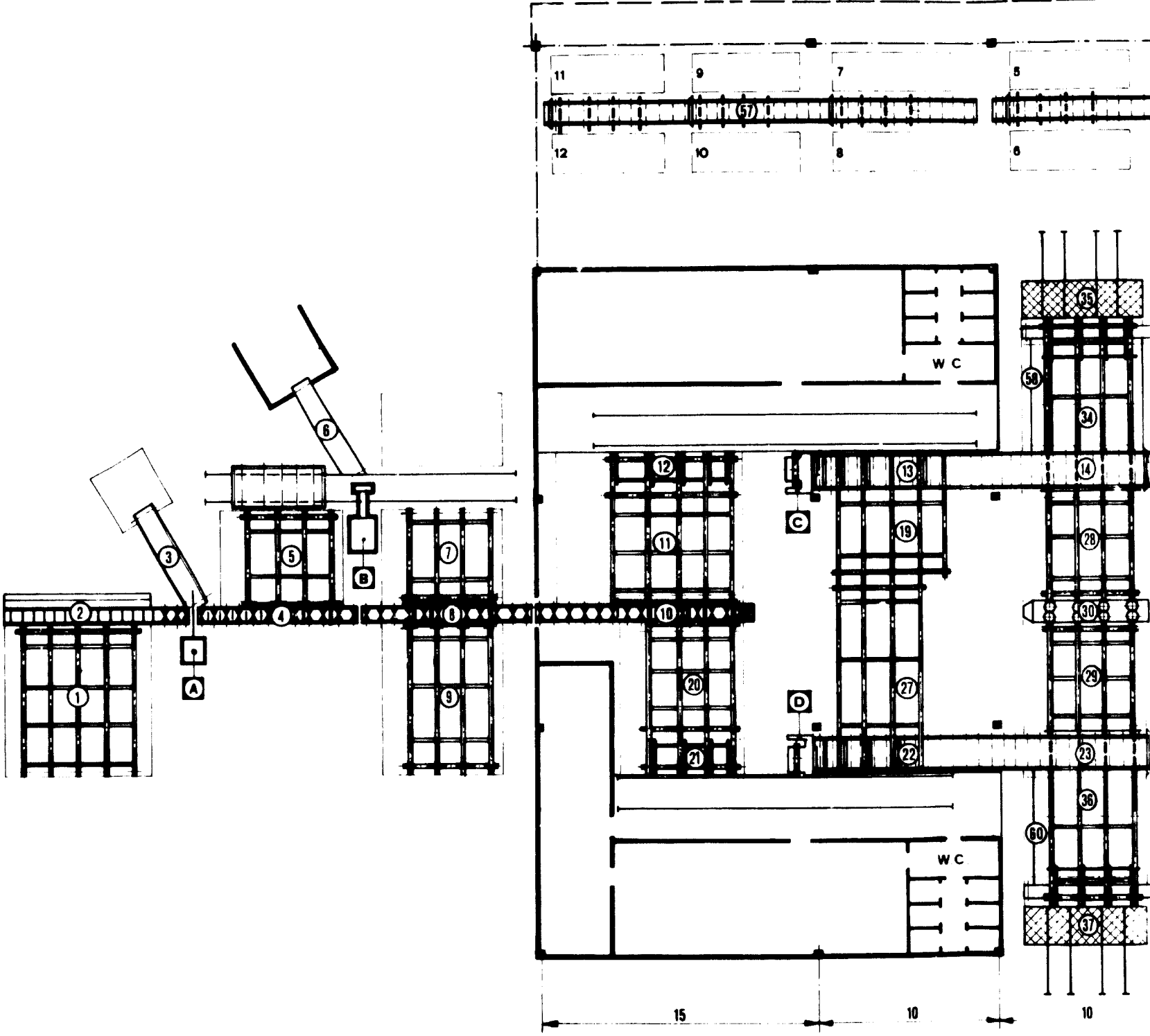
- 19 -



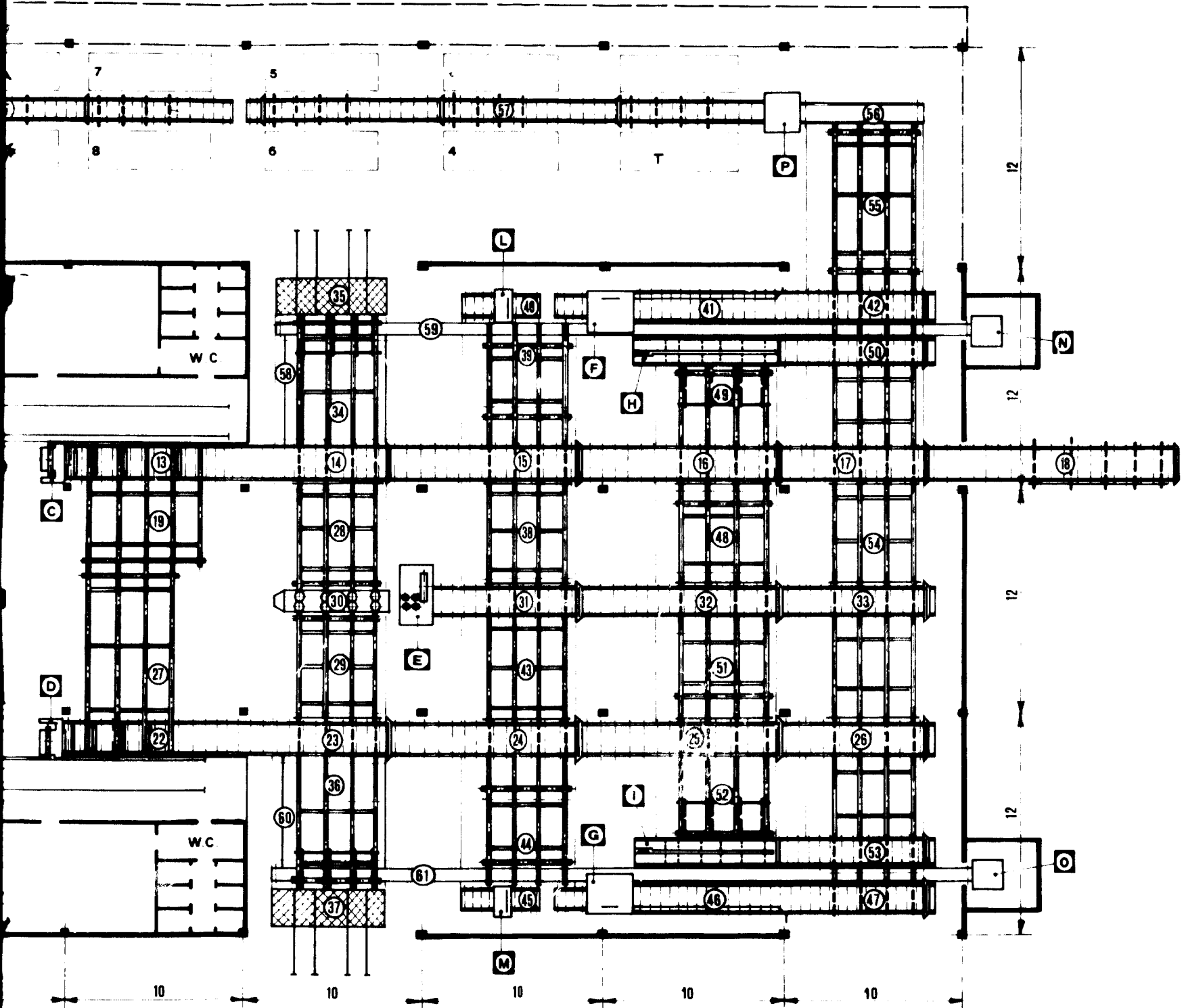
$$\frac{1043}{60} = 17.38 \rightarrow 18$$

Log breakdown capacity per hour: 23 m3 for each headrig.

SAWMILL MACHINERY LAYOUT AND ITS FUNCTION



SAWMILL MACHINERY LAYOUT AND ITS FUNCTION



1-79



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