



Log Scaling – Ontario Log Rule

The Ontario Rule is just one method used in the forest industry to measure (scale) the volume of a sawlog in FBM prior to processing. The unit of measurement is expressed in board feet (FBM). One board foot measures 1 inch by 12 inches by 12 inches. The forest industry uses a thousand board feet (MFBM) as a convenient unit of measure.

Other scaling methods used in the industry include the Doyle Rule, Schibner Rule, International Rule, and the Cube-Grade method used by the Ontario Ministry of Natural Resources. With the exception of the Cube-Grade method, all these scaling methods are measured in imperial units (FBM).

Volume Calculation

The formula used in the Ontario Rule to determine the volume of a log takes into consideration the allowances for kerf and slab lost during the sawing process. The formula to calculate the net volume is as follows:

$$FBM = (0.55D^2 - 1.2D) \times L \div 12$$

Where D = the top diameter of the log measured in inches and L = the length of log measured in feet (all calculations are to be completed to three decimal places). Table #1 shows the volumes in fbm for a variety of diameters and log lengths.

Measuring Procedures

To determine the volume of your log pile, each log must be measured in the following fashion:

Diameter in Inches Inside Bark at Small End of Log	Length of Log (in feet)				
	8'	10'	12'	14'	16'
4	3	3	4	5	5
5	5	6	8	9	10
6	8	10	13	15	17
7	12	15	19	22	25
8	17	21	26	30	34
9	22	28	34	39	45
10	29	36	43	50	57
11	36	44	53	62	71
12	43	54	65	76	86
13	52	64	77	90	103
14	61	76	91	106	121
15	70	88	106	123	141
16	81	101	122	142	162
17	92	115	139	162	185
18	104	130	157	183	209
19	117	146	176	205	234
20	131	163	196	229	261
21	145	181	217	254	290
22	160	200	240	280	320
23	176	219	263	307	351
24	192	240	288	336	384
25	209	261	314	366	418
26	227	284	341	397	454
27	246	307	369	430	491
28	265	331	398	464	530
29	285	356	429	499	570
30	306	382	459	536	612
31	328	409	491	573	655
32	350	437	525	612	700
33	373	466	559	653	746
34	397	496	595	694	793
35	421	526	632	737	842

Log lengths are measured in full feet. There is an allowance for an extra 6 inches for trimming (known as broomage) at the sawmill for logs measuring up to 15 feet in length. For logs measuring from 16 to 18 feet, the broomage allowance should not exceed 8 inches. Logs are usually processed in 8, 10, 12, 14 or 16-foot lengths, however, logs destined to be sent to a veneer mill will be cut into odd lengths.

Small end diameters of the log are measured inside the bark and recorded in one-inch diameter classes and rounded off to the nearest inch.

Defects

Interior defects are ones that show on the end of the surface of the log. The defect is contained in the heart of the log in a manner that will allow for the sawing of a normal slab and at least one sound board from all sides of the log. Examples of interior defects include heart rot, shake, punk and buttermilk rot. Deductions for interior defects are calculated on the board foot volume basis by applying the formula:

$$\text{FBM} = (\text{diameter of defect in inches})^2 \times (\text{length of defect} \div 12) \times \frac{3}{4}$$

Interior defects shown on both ends of the log are referred to as being a *continuous* defect. The diameter for continuous defects is obtained by averaging the diameter of the defect at both ends of the log. Defects only shown at one end of the log are called *partial*, and are considered to extend halfway through the length of the log.

Example #1 – a 20-inch log 16 feet long has a 10-inch *continuous heart defect*. The gross volume equals 261 fbm. A 10-inch interior defect reduces the volume by 100 fbm. The net volume of the log is 161 fbm.

Table #2 - Deductions for Exterior Defects (Ontario Rule)						
Top Diameter	Percentage Defect					
	10%	20%	25%	33 1/3%	50%	66 2/3%
	Diameter Reduction					
4						
5				1	1	1
6			1	1	1	1
7		1	1	1	2	2
8		1	1	1	2	2
9		1	1	1	2	3
10		1	1	2	3	3
11	1	1	1	2	3	4
12	1	1	1	2	3	4
13	1	1	2	2	3	4
14	1	1	2	2	4	5
15	1	1	2	3	4	5
16	1	2	2	3	4	6
17	1	2	2	3	5	6
18	1	2	2	3	5	7
19	1	2	2	3	5	7
20	1	2	3	3	6	7
21	1	2	3	4	6	8
22	1	2	3	4	6	8
23	1	2	3	4	7	9
24	1	2	3	4	7	9
25	1	3	3	4	7	10
26	1	3	3	5	8	10
27	1	3	3	5	8	10
28	1	3	4	5	8	11
29	1	3	4	5	8	11
30	1	3	4	5	8	12

Example #2 – a 23-inch log 10 feet long has a 6-inch *partial heart defect*. The gross volume for a 10-foot log is 219 fbm. The volume of the defect is 12 fbm. The net volume of the log is 207 fbm.

Exterior Defects appear on the circumference of a log and can be found under a number of different conditions. These include a defect on the surface of the log that extends towards the circumference enough to prevent the sawing of a slab and sound board from all sides; lightning scars and seams extending along the log; and a crook or sweep in a log.

Deductions for exterior defects are made on a percentage basis. The percentages are categorized as 10%, 20%, 25%, 33 1/3%, 50% and 66 2/3%. Table #2 shows the appropriate diameter deduction based on these percentage groupings that apply to all log lengths.

Example #1 – a 16-inch log containing a 25% crook would have a reduction in diameter of 2 inches. The net diameter of the log would be 14 inches.

Example #2 – a 22-inch log has a fire scar at the butt end which requires an estimated 10% reduction. The gross diameter will be reduced by 1 inch for the fire scar to a net diameter of 21 inches.

Culls are logs in which over 2/3 of the board foot volume is defective.

Log Grading Specifications

The Ontario Rule is used to estimate the net volume of a log, however, the quality of the log must also be determined. Both the size (volume) and quality (grade) of your logs will dictate their real financial value. A number of factors must be considered in determining the grade of a log. Some of the factors used in determining the grade of a log include:

- The position of the log in the tree (i.e. butt or upper);
- The minimum top diameter of the log (grade 1 log – butt 12'+ or upper 14'+);
- Exterior defects (crook, sweep, seams or heavy branching); and
- Interior defects (heart rot, shake or heart check).

There is no industry standard regarding the method to be used in determining the volume or grade for sawlogs. The owner-operator of each mill can use the method of their choice. The woodlot owner should request the mill's log-making specifications prior to commencing cutting activities in their woodlot.

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