NEW BRUNSWICK SCALING MANUAL

4th EDITION

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Forest Management Branch
Natural Resources

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ACKNOWLEDGEMENT

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DEFINITIONS

The following definitions apply to this manual:

accuracy means the degree to which individual measurements are in agreement with an accepted reference value when taken under similar conditions;

Act means the *Scalers Act*;

Board means the Board of Examiners appointed under the *Scalers Act*;

bolt(s) means any primary forest product equal to or shorter than the 2.60 m class;

check scale means a scale conducted by the Department which is used as a standard for assessing the performance of a licensed scaler;

check scaler means a Department employee, designated to perform check scales;

Chief Scaler means a Department employee who oversees provincial administration of regulated scaling and sits as a member of the Board;

contract means a contract entered into between a Producer Association and a forest industry with respect to the purchase of primary forest products. This contract includes scaling arrangements;

Crown lands means all or any part of the lands vested in the Crown that are under the administration and control of the Minister and includes any water upon or under the surface of such lands;

Department means the Department of Natural Resources;

endorsement means a designation within a scalers licence number which denotes the specific method(s) of measure for which the scaler is licensed to perform;

foreign material means any material extraneous to primary forest products such as earth, ice, snow and branches, any of which add mass to a load of primary forest products;

licensee means the holder of a Crown timber licence and includes the holders executors, administrators, successors, heirs and assigns;

marketing	means buying, selling or offering for sale, and includes advertising, financing, assembling, storing, packing, shipping and transporting in any manner;
mass	means the property of a body that is a measure of its inertia and that is commonly taken as a measure of the amount of material that it contains and that causes it to have weight in a gravitational field;
Minister	means the Minister of Natural Resources;
moisture content	means the mass of water in wood expressed as a percentage of its total mass;
operating plan	means a plan proposed by the licensee and approved by the Department which documents activities to be undertaken on the licence on an annual basis. This plan includes scaling arrangements;
ovendry	means a condition in which the wood has ceased to lose moisture after being subjected to a temperature of 103 ± 2° C in a ventilated oven, for the purposes of determining moisture content;
piece	includes logs, poles, tree lengths, posts or pilings and weir stakes;
precision	means the degree of similarity among a series of measurements taken under similar conditions;
primary forest products	any unmanufactured product of forest trees of hardwood or softwood species, as well as wood chips and biomass produced at or on the harvest site;
Producer Association	includes marketing boards, co-operatives and other associations established for the marketing of primary forest products;
Regional Inspector	means a Department employee who oversees regional matters of regulated scaling under the direction of the Chief Scaler;
regulation	means the General Regulation – *Scalers Act*;
regulated scaling	means scaling of primary forest products harvested from Crown lands or scaling of primary forest products which are marketed through a Producer Association under a contract;
rough wood	stacked roundwood that has not been debarked aside from loss of bark due to normal harvesting, processing and trucking operations;

scale	means to measure primary forest products;
scaler(s)	means any person licensed by the Minister to scale primary forest products;
scaling arrangements	means a document which provides terms of scaling and conversions that will be applied in transactions between two parties. These arrangements must provide adequate detail for the Department to conduct random check scales and investigate complaints, when necessary;
smallest top diameter	means the smallest diameter, inside bark, which can be measured through the geometric centre at the top end of a log, pole, post, piling or weir stake;
smallest butt diameter	means the smallest diameter, inside bark, which can be measured through the geometric centre at the butt end of a treelength;
Transportation Certificate	means a document which contains details for a load of primary forest products in transit and which is required to be possessed, produced or delivered under the *Transportation of Primary Forest Products Act*;
treelength	means a felled merchantable tree that has been processed to remove limbs and top;
wood processing facility	means a mill in which primary forest products are manufactured into secondary wood products.

INTRODUCTION

This manual has been developed for use by *Scalers* in the Province of New Brunswick. The content is based on requirements set forth in the *Scaling Act, Chapter S-4.1* and the *General Regulation - Scaling Act 83-190*, as well as current *Department* policy directives. The province also participates and cooperates with CSA Canada and promotes conformance to CSA Standard 0302.1-09/0302.2-09.

Scalers must comply with this manual when performing *regulated scaling* in the province of NB.

Legislative changes or Department policy directives dated after this printing may override procedures in this manual. Scalers may consult with a *Regional Inspector* or the *Chief Scaler* for information on overriding changes.

Accurate *scaling* is of utmost importance. A scaler's measurements are relied upon for accurate accounting of *primary forest products*. The need for fair and accurate measure extends to all parties involved including woods workers, landowners, forestry operators, *producer associations* and forest product industries.

Scalers must ensure correct measure for all "*without fear, favor or affection*".

1. Scaler Licensing, Responsibilities and Accountability

1.1 Proficiency Requirements

Scaler licence applicants must be at least nineteen years of age and have two years of experience assisting in scaling of primary forest products. Graduation from a recognized forest technical program or university forestry program may be considered as equivalent experience. References are required to attest that the applicant is trustworthy and of good character.

Each candidate must submit a completed application form to the Department prior to a scaling examination. This application records the type of licence applied for and the applicants scaling experience. Application forms are available at local Department offices or online at http://www.gnb.ca/0078/index-e.asp.

Candidates are required to pass examinations set by a *Board* of Examiners appointed by the Lieutenant Governor in Council under the authority of the *Scalers Act*.

1.2 Scalers Examination

Provincial scaling examinations are generally scheduled once annually, usually in May. Local Department offices may be contacted for information regarding specific dates and locations of upcoming examinations.

Application may be made to write a component, or all components of the exam, depending on the type of scaling licence sought.

1.3 Scaler Licensing

Following the scaler examination process, a candidate is informed of their results (pass/fail) on a licence component basis. When a candidate first passes any component of the licensing exam and before being issued a licence, they are required to take an “Oath of Office of Scalers” in the manner and form prescribed by *regulation*. This oath must be filed with the secretary of the Board. This oath is effective for the term of the licence and for the term of all licence renewals. If the scaler does not renew their licence and applies for a licence at a later date, a new oath will be required.

Upon receipt of the signed “Oath of Office of Scalers”, the Department issues the candidate a licence certificate and wallet card, under the signature of the *Minister* of Natural Resources. These documents include a designated scaler licence number. If a scaler upgrades their licence on a subsequent exam a new licence certificate and wallet card will be forwarded at that time.

On their initial licence a candidate is designated with a four digit licence number. This number will be retained indefinitely. If the licence is not renewed by the end of its term and the scaler is re-licensed at a later date, this four digit licence number will be reactivated. This four digit licence number will be suffixed by one or more letter codes,

which denotes the *endorsement(s)* currently issued to the individual. A scaler may only perform regulated scaling in accordance with their licence endorsement(s) as follows:

Endorsement	Application
G	General licence which is required for: • *mass* scaling, and • scaling of individual units by procedures described in this manual (excluding FBM scaling) including samples that impact volume, product or species accounting; log and pole scaling using approved m^3 tables; and treelength scaling using approved m^3 tables (small butt)
S	Stacked measure m^3 (st)
F	FBM – NB Log Scale

The letter code suffix on a scalers licence is subject to future changes based on a scaler's success on any subsequent examinations and/or licence renewals.

The following examples illustrate some potential types of licence endorsements:

1492G	means the scaler has a general licence only
1492S	means the scaler has a stacked measure licence only
1492F	means the scaler has a FBM licence only
1492GS	means the scaler has a general and stacked measure licence
1492GSF	means the scaler has a general, stacked measure and FBM licence. This is a complete licence

1.4 Scaler Licence Renewal

Scaler licences are issued for a term of (5) years. Each scaler licence will have an expiry date. It is the responsibility of the licence holder to apply for licence renewal before the expiry date. Renewal applications will be accepted in the 120 day period preceding expiry of a licence. If renewal is approved, a new licence will be issued for a period of five years beginning the day after the expiry date of the current licence. If a licence holder fails to renew before expiry of their licence, they will no longer be licensed to perform regulated scaling and will be required to reapply under the same requirements as a first time applicant if they wish to hold a scalers licence at a future date.

The normal calendar date for expiry of licences will be June 30, with the effective date for new and renewed licences being July 1.

Scalers wishing to renew their licence are required to submit a renewal examination application form to the Secretary of the Board. Application forms are available at local DNR offices or online at http://www.gnb.ca/0078/index-e.asp.

The applicant will need to demonstrate on their application that they have accomplished one or both of the following:

1. scaled primary forest products cut on Crown lands or primary forest products marketed through a Producer Association within a five year period before the expiry date of the licence; or
2. attended a scaler refresher course approved by the Board no more than one year before the expiry date of the licence.

Local Department offices may be contacted or the Department website may be referenced for information regarding specific dates and locations of upcoming renewal examinations as well as approved scaler refresher courses.

The Minister may issue a renewed licence based on a recommendation from the Board. The Board recommends to the Minister those applicants deemed suitable for renewal. The Minister may renew a scalers licence with the same endorsements previously held or may limit the renewal to specific endorsements. Where the Minister limits the renewal endorsements, and the applicant wishes to restore the endorsements the applicant will be required to examine under the same process as a first time applicant.

Licence upgrades will be possible within the term of a five year licence, however, upgrades are dependant on successful examination on a provincial scalers examination. Where a licence is upgraded, the re-issued licence will designate the effective date of the upgrade, however the licence expiration date will not change.

1.5 Scaler Duties and Responsibilities

This section reinforces the basic duties of all scalers.

A scaler shall become familiar with the *scaling arrangement*s of the *operating plan* or *contract* under which scaling will be performed and ensure scaling is performed in accordance with those terms. Scaling arrangements normally include identification of the parties under the contract, the scope of the wood source to which the contract applies, the scaling location, the units of measure, the *scale* method by product and species, conversions / sampling / deduction methodology if applicable as well as scaler identification.

A scaler shall make a scale report, for their employer, for each truckload, section of truckload, pile or sample of primary forest products scaled. This report shall include the origin of the wood, the *transportation certificate* number or pile number, date of scale, the species and product, gross volume , specific detail on deductions (if made), net volume, the mass (gross, tare, net) if mass scaled, conversions if applied and scaler name, signature and scaler licence number.

A scaler shall scale fairly and correctly, to the best of his/her ability and in accordance with the regulations, all primary forest products that the scaler is employed to scale.

A scaler shall report volumes of primary forest products in accordance with product/species specifications that are in effect at the time of the transaction. This includes Crown Timber Utilization Standards or product specifications included in a contract.

Scalers shall submit their books and records of measurement for the inspection of an officer of the Department authorized by the Minister when called upon to do so, and shall furnish any information and documents that the officer may require. A copy of all original scale records shall be maintained, or be accessible, by the scaler for a minimum period of one year from the date of the scale.

When required to do so by the Minister, a scaler shall make a sworn return upon forms supplied by the Department. This return shall contain certified copies of the measurements on which the return is based.

If a scaler neglects or refuses to comply with the provisions of the *Act*, regulations, or this manual; or is convicted of an offence under the *Act*, the Minister, upon the advice of the Board, may cancel the Scaler's licence.

A scaler who willfully makes false measurements or makes false returns in the discharge of the scalers duties under the *Act* commits an offence.

A person who hinders, obstructs or interferes with a scaler in the discharge of the scalers duties commits an offence.

Under the "Oath of Office of Scalers" all scalers make oath and say:

1. I will perform the duties of Scaler without fear, favour or affection.
2. I will scale correctly all primary forest products cut upon *Crown Lands* or marketed through a Producer Association.
3. I will make true scale reports to the Department of Natural Resources, or its agents, when so required.

1.6 Complaints

A complaint regarding a scale of primary forest products may be lodged by any party impacted by a scalers measure. The complaint process is documented in the regulation.

Scalers must be familiar with the course of actions during a complaint and ensure that they do not hinder, obstruct or interfere with the process when it is initiated by a complainant.

1.7 Check Scales

The Department has a responsibility for evaluating the performance of scalers relative to *accuracy* and compliance under the *Act*, regulation and this manual .

Licensed scalers can expect to have a *check scale* performed by a *check scaler* at any time. The results of check scales will be shared with the licensed scaler and may be shared with their employer. Records of check scale results are maintained by the Department.

A scaler shall be deemed *not meeting standards* if the scalers accuracy is beyond the maximum acceptable tolerance (i.e. volume difference, as compared to the check scaler) on three (3) or more check scales throughout any year period, as verified by the Regional Inspector and/or Chief Scaler. When this happens the scaler is advised of their performance and corrective assistance is offered. If a further check scale indicates a satisfactory adjustment has not been made, the scaler may be requested to appear before the Board.

The maximum acceptable tolerance (volume difference) for a check scale on net results is:

any general scaling	3 % +/-
any sample scaling	2 % +/-

Notwithstanding the above maximum acceptable tolerances, scaler measurement practices, compilation methods and product or species identification are assessed. Unreasonable variance from procedures in this manual, extreme volume variances or improper product / species identification on any particular check scale may be deemed *not meeting standard*, at the discretion of the Regional Inspector and/or Chief Scaler.

If a scaler appears before the Board for not meeting standard, all check scales or documented records of scaling performance will be under review for a previous three year period.

2. General Procedures

2.1 The Scalers Act and Regulation

The *Scalers Act Chapter S-4.1* is the legislative authority under which scaling is regulated in the Province of New Brunswick. The *Act* covers the general areas of examinations, licensing, duties of scalers and offences.

The General Regulation 83-190 is written under the authority of the *Act*. This regulation includes some specific details on applications including complaints and scalers oaths.

Copies of the *Act* and General Regulation 83-190 can be viewed at website: www.gnb.ca/0062/acts/index-e.asp.

2.2 Application of Regulation and Manual Depending on Source of Primary Forest Products

For the most part, the regulation and this manual are applied consistently, regardless of the origin of primary forest products. There are, however, some notable differences between scaling primary forest products from Crown land vs primary forest products marketed through a Producer Association. Some of these notable differences include:

a) Scaling in FBM is not a recognized form of measurement for primary forest products harvested on Crown lands, however FBM scaling (NB Log Scale) is a recognized form of measure for products marketed through a Producer Association.

b) For Producer Association transactions, the principle founded in common law that two parties may enter into a contract with each other is recognized. It is understood that terms of scaling for Producer Association transactions will be consistent with this manual unless otherwise specified in the contract.

   Note: The Department requires a copy of the contract for any regulated scaling. The scaling arrangements within the contract serve to provide confirmation of variations (or no variations) from this manual and also provide important information regarding location of scale, method of scale, products, species, sampling and conversion methods and identification of scaler(s).

2.3 Units of Measure

On a national level, the cubic metre, or m^3, is the standard unit of measure referenced for expression of wood supply inventories, allocations, royalty values and delivered volume. The m^3 is a “static” (or unchanging) unit of measure that provides forest managers a common reference unit from pre-harvest planning to final harvest reporting. This allows for credible analysis, fair comparison and sound decision making throughout the management process.

All other regulated scaling units of measure are “non-static”. In other words, they are variable depending on the characteristics of the wood and do not provide a sound base for advanced analysis and management, without conversion to a common “static” unit.

There are, however, definite efficiencies in using other forms of initial scale due to the quickness of measure. In some cases producers are reimbursed directly on original measure. This could be $ / tonnes or $ / m³(st).

Mass measure and stacked m³ can be used with sound conversion factors to reliably express delivered volume in m³. In NB all crown land timber management is based on m³ volume.

In NB, scaling can be performed in the following units of measure for the products specified:

- **m³** - logs, *treelength*, poles/posts & pilings with the use of approved volume tables. The m³ unit is also the standard measure for multiple products which are directly scaled, primarily during sample scaling.

- **stacked cubic metres or m³(st)** – veneer (non-hardwood), studwood, pulpwood, OSB, palletwood, lathwood, fuelwood, cedar products

- **mass in tonnes (t) or kilograms (kg)** – all products

- **board foot measure (FBM)** - logs which are marketed through a Producer Association.

- ***piece* / permit** – ships knees, weir brush, ribbons, top poles where specified in conditions of a permit or contract

Where the volume of primary forest products is converted from one unit of measure to another, the conversion factor shall be that conversion factor specified by Appendix A or that conversion factor and method which the Minister may approve.

Where the mass of primary forest products is converted to volume, the conversion factor shall be a conversion factor approved by the Minister; and the conversion factor shall account for deductions of bark, moisture, rot and *foreign material* through sampling procedures approved by the Minister

Throughout this manual the following meanings shall apply:

cm	centimetre
m	metre
mm	millimetre
m^3	cubic metre
m^3(st)	stacked cubic metre
m^3/m^3(st)	cubic metre per stacked cubic metre
t	tonne (1000 kg)
kg	kilogram
FBM	foot board measure
$>$	greater than
$\leq$	equal to or less than
$=$	equals or equal to

Length, height and width measurements of piles of m^3(st) products are divided into 0.02 m units with the boundary between units on the odd number as illustrated below:

2.44 m class = $>$ 2.43 - $\leq$ 2.45
2.46 m class = $>$ 2.45 - $\leq$ 2.47
2.48 m class = $>$ 2.47 - $\leq$ 2.49

Length measurements for logs are divided into specified 0.20 m units as per Appendices L and M, and as illustrated below:

8 class = $>$ 2.40 - $\leq$ 2.60
9 class = $>$ 2.70 - $\leq$ 2.90
10 class = $>$ 3.00 - $\leq$ 3.20

Note: a 10 cm gap exists between log length classes. The defined boundaries of the length classes are intended to promote proper utilization by not allowing excessive trim length within the classes. Therefore, logs that are longer than a specified length class (ie. between classes) shall be scaled as belonging to the next larger length class. In effect, the above noted examples of log length classes can be considered as follows:

8 class = $>$2.30 - $\leq$2.60
9 class = $>$2.60 - $\leq$2.90
10 class = $>$2.90 - $\leq$3.20

Length measurements for poles, posts and pilings are divided into 0.60 m units with the boundary between units on the odd number as illustrated below:

7.0 m class = $>$ 6.70 - $\leq$ 7.30
7.6 m class = $>$ 7.30 - $\leq$ 7.90
8.2 m class = $>$ 7.90 - $\leq$ 8.50

Length estimates for log defects are divided into 0.50 m units with the boundary between units on the mid point between classes as illustrated below:

0.5 m class =	$> 0.25 - \leq 0.75$
1.0 m class =	$> 0.75 - \leq 1.25$
1.5 m class =	$> 1.25 - \leq 1.75$

Diameter measurements (when in 2 cm classes) are divided into even 2 cm units with the boundary between units on the odd numbers as illustrated below:

10 cm class =	$> 9 - \leq 11$
12 cm class =	$> 11 - \leq 13$
14 cm class =	$> 13 - \leq 15$

Diameter measurements (when in 1 cm classes) are divided into 1 cm units with the boundary between units on the mid point between classes as illustrated below:

10 cm class =	$> 9.5 - \leq 10.5$
11 cm class =	$> 10.5 - \leq 11.5$
12 cm class =	$> 11.5 - \leq 12.5$

2.4 Piling

All piles or samples of primary forest products that are to be scaled shall have a minimum cleared space of one metre on every side.

Primary forest products on which applications are made for special royalty rates shall be piled separately from other primary forest products, unless the scaler has estimated the volume of the primary forest products from a pre-cut inspection.

All piles of primary forest products that are to be scaled shall be placed on skids. However, if merchantable primary forest products are used for skids or bed logs, a scaler shall include their volume in his scale (if they are part of the load or pile).

Primary forest products with different royalty rates shall be piled separately.

Where primary forest products are to be scaled in stacked cubic metres:

a) all hardwood species shall be piled separately from softwood

b) all hardwood species*, except poplar may be piled together

c) poplar shall be piled separately

d) all softwood species*, except cedar may be piled together, and

e) cedar* shall be piled separately

* with the same royalty or stumpage rate

Where primary forest products are not piled in accordance with the above conditions, the scaler shall record the whole pile as the primary forest product having the greatest royalty value, or shall provide product/species accounting based on sampling data satisfactory to the Department.

A scaler may refuse to scale any primary forest products which, in the scalers opinion, are not piled or spread out in a manner that allows the scaler to properly measure or piling is not in accordance with requirements set in this manual. In this case, the scaler shall notify the person responsible for piling of the specific concern and request that the primary forest products be re-piled in accordance with requirements. If a piling issue cannot be resolved between the parties the Department should be contacted for resolution.

2.5 Pile Marking

Scalers, when marking scaled piles or pieces on the harvest block or in a mill yard, shall ensure all markings are clear and legible as well as durable to weather conditions. When marking the scaler shall:

a) ensure that all piles (bush scale) are numbered consecutively or in the case of mill yard piles ensure that the Transportation Certificate number is marked on the pile;

b) ensure that numbers are marked on the face of each pile in such a location as to be readily legible from the road, trail or yard access being used;

c) mark on the face of each pile in such a location as to be seen and readily legible from the road or trail the date scaled and the scalers initials;

d) in the case of piles of logs, have the number of pieces of each species contained in the pile marked on the end of the pile. A scaler may require species to be piled separately;

e) ensure the length of each log is marked on the top end of the log by length class. Alternatively, logs of the same length class may be piled together (and grouped separately) with the length class clearly marked on the pile;

f) in the case of treelength, have the number of pieces marked on the end of the pile.

g) in the case of logs and treelength, place a prominent mark (ex. paint dot or lumber crayon mark) on the scaled end of the pieces measured. This indicates that the piece has been measured.

Note: for mass samples see further marking requirements in Section 7

2.6 Excessive Defects

Where, in the opinion of the scaler, primary forest products contain such excessive defects that it is impossible to scale and obtain a reasonable measurement, the scaler may recommend to the Minister that the primary forest products be scaled at a *wood processing facility*.

Upon receipt of a recommendation of a scaler, the Minister may order that the primary forest products are to be scaled:

a) on the harvesting block, or

b) at a wood processing facility

Note: For all primary forest products, rot is a defect but red stain is not a defect, unless specified in a contract.

2.7 Rounding Rules

The following rules shall apply for rounding numerical data when calculating volumes:

a) when the first digit dropped is less than five, the last digit retained shall not be changed.

Examples:
12.174 m³(st) = 12.17 m³(st)
432.733 m³(st) = 432.73 m³(st)

b) when the first digit dropped is greater than five, or if it is five followed by at least one digit, the last digit retained shall be increased by one.

Examples:
12.157 m³(st) = 12.16 m³(st)
86.7651 m³(st) = 86.77 m³(st)

c) when the first digit dropped is exactly five, followed only by zeros, the last digit retained shall be increased by one if it is odd, but not changed if it is even.

Examples:
12.135 m³(st) = 12.14 m³(st)
12.145 m³(st) = 12.14 m³(st)

2.8 Scaling Instruments

Scalers shall only use tapes and scale sticks that do not exceed the limits of error as shown in Appendix R.

3. Scaling of Primary Forest Products in Stacked Cubic Metres

3.1 General

The stacked cubic metre, or m^3(st), may be used to scale primary forest products cut to uniform lengths of equal to or less than the 2.60 m class, if in piles containing not less than 2.00 m^3(st). In some cases, stacked measure of products greater than 2.60 m in length may be approved, where related conversion factors are approved by the Minister.

Piles of primary forest products that are to be scaled in stacked cubic metres shall contain only *bolts* of the same length. Normal variation associated with processing is acceptable.

A scaler may refuse to scale a pile of primary forest products in stacked cubic metres, if the pile is improperly piled. This means a pile, which has excessive airspace and a solid cubic content less than the m^3/ m^3(st) factor in Appendix A. This is commonly associated with crosspiling.

3.2 Measurement and Compilation in Stacked Cubic Metres

Where primary forest products are to be scaled in stacked cubic metres, a scaler shall measure and record the height, length and width of the pile.

A scaler shall determine the average length and height of a pile by making measurements on both the back and the front of the pile. The same amount of height measurements shall be made on both sides of the pile.

A scaler shall measure the height of a pile by placing the hook of the scale stick under the bottom of a bolt in the lowest rank or tier of the pile and reading the perpendicular height to the top of a bolt in the top rank or tier (see Figure 1). Care should be exercised to avoid taking heights on oddly placed bolt ends that would over-represent or under-represent pile height. Height measurements shall be made at regular intervals along the face of the pile. The first measurement shall be made at a point one half the distance of the chosen interval from one end of the pile. The more irregular the height of the pile, the more height measurements shall be made (see Figure 2).

A scaler shall measure and record each height measurement of a pile in 0.02 m units. A scaler shall calculate and record the average height to the nearest 0.02 m unit.

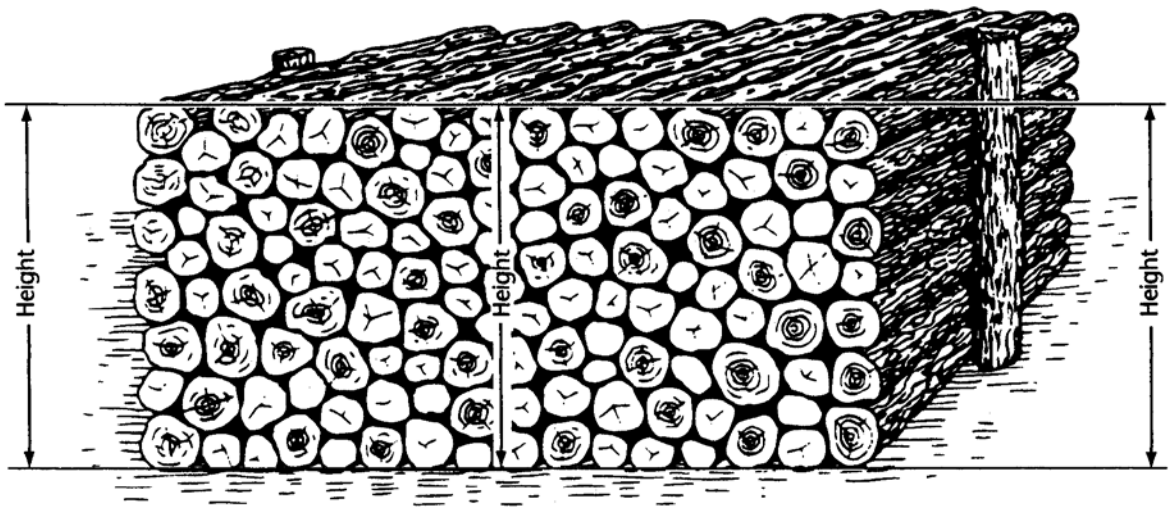


Figure 1. Regular height of stack

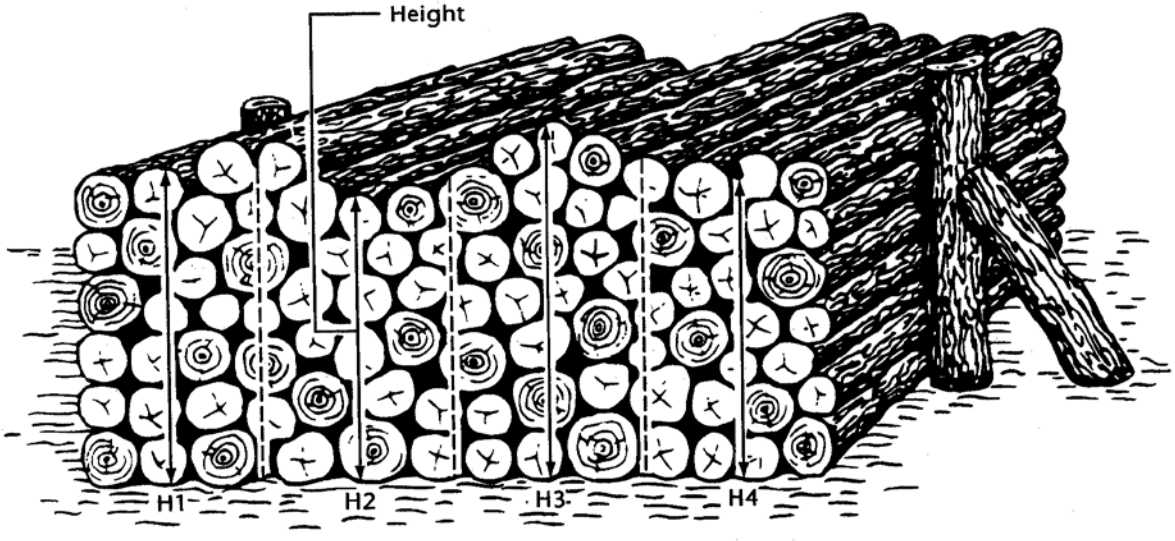


Figure 2. Irregular height of stack

Example: The following height measurements have been taken on a pile of pulpwood:

Side 1	Side 2
1.96	1.98
2.08	2.06
2.48	2.24
2.24	2.18

$$\text{Average height} = \frac{\text{sum of heights}}{\text{number of height measurements}}$$

$$= \frac{17.22}{8}$$

$$= 2.152$$

$$= 2.16 \text{ m}$$

Note: The boundary between 0.02 m size classes is on the odd number. In the preceding example the 2.16 class boundaries are > 2.15 m - ≤ 2.17 m, therefore the recorded average height is 2.16 m.

Averages of measurements are always placed in even cm classes (ie. recorded to the nearest 0.02 m unit). Length, height and width measurements, either individual measurements or averages, never end in an odd number.

The length of a pile is the distance between the exterior edges of the bolts on each end of the pile. When a pile of primary forest products drops off in height at one or both ends to form a slope, the length measurement shall be taken:

a) to a point where half the height of the pile intercepts the line of the slope (Figures 3 and 4); or

b) at the points that describe the maximum length of the pile (Figure 5).

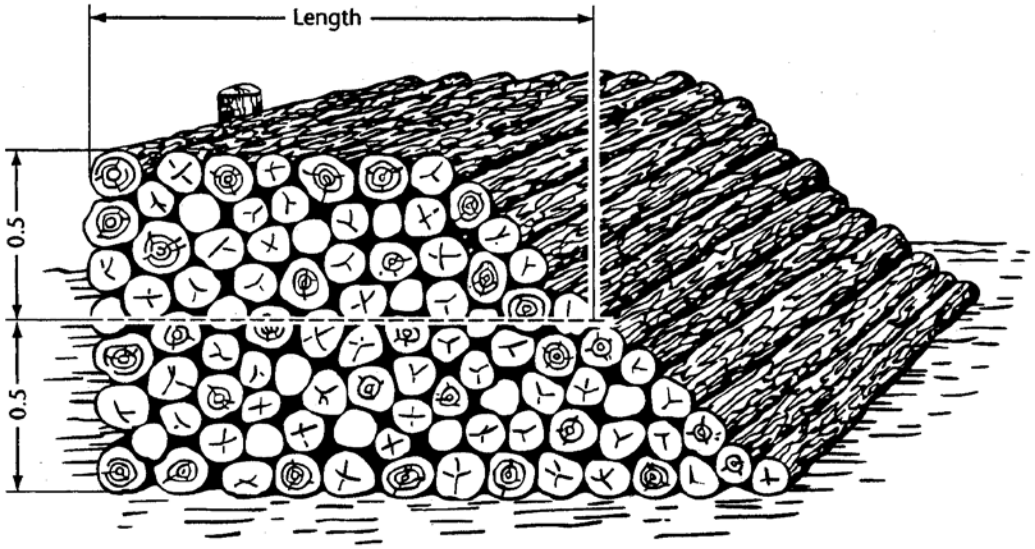


Figure 3. Length of stack with one sloping end

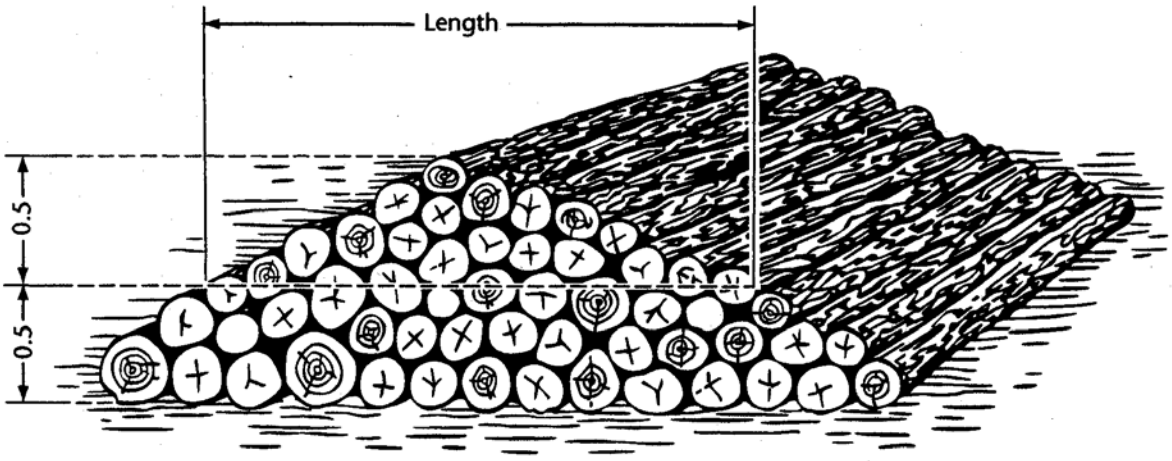


Figure 4. Length of stack with both ends sloping

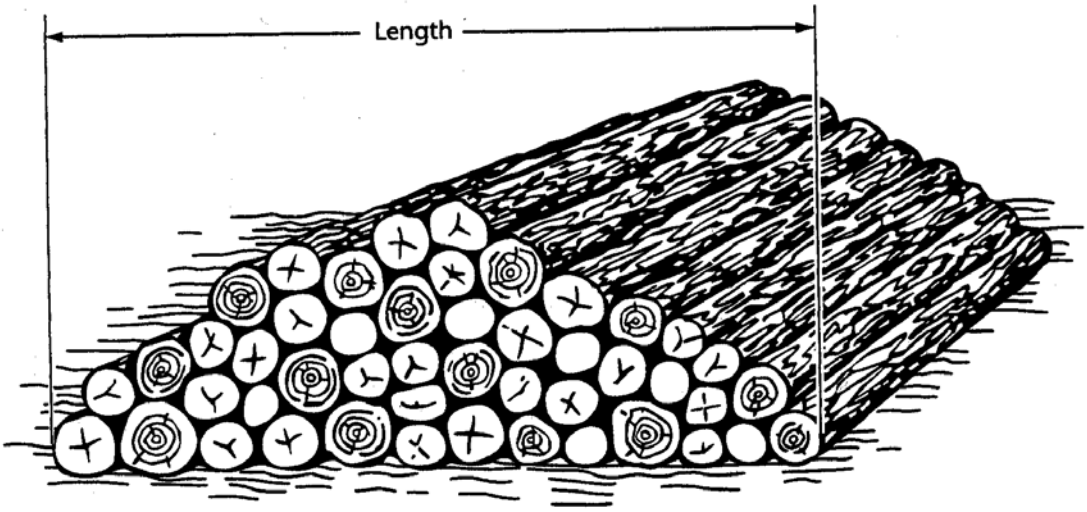


Figure 5. Length of stack measured at points that define the maximum length

Where a pile is on a slope, a scaler shall measure lengths parallel to the bottom of the pile (or the slope of the ground) and heights perpendicular to the bottom of the pile (Figures 6 and 7).

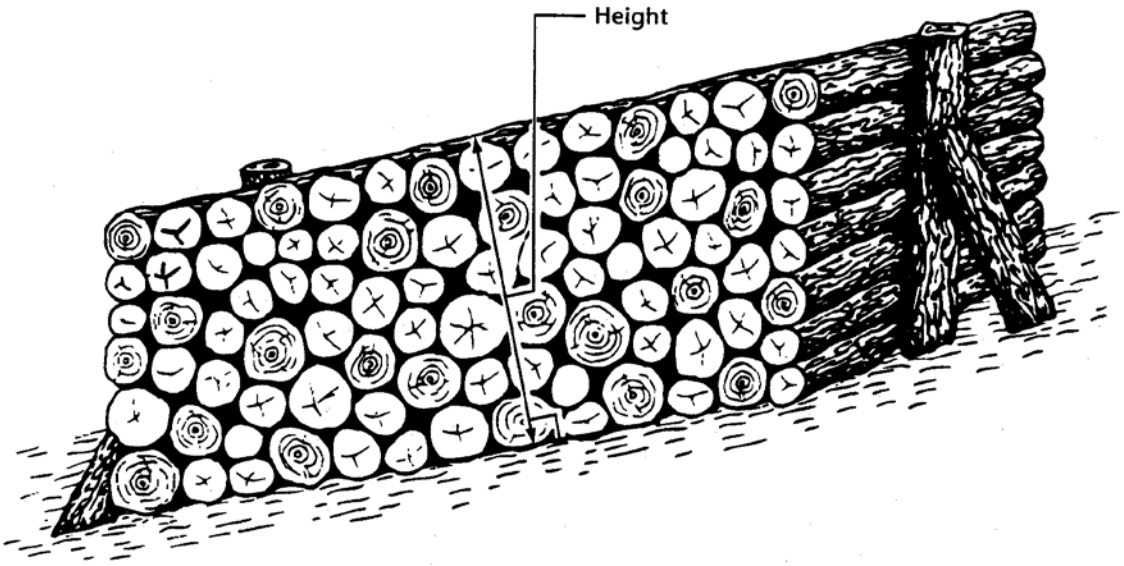


Figure 6. Height of stack parallel to slope of ground

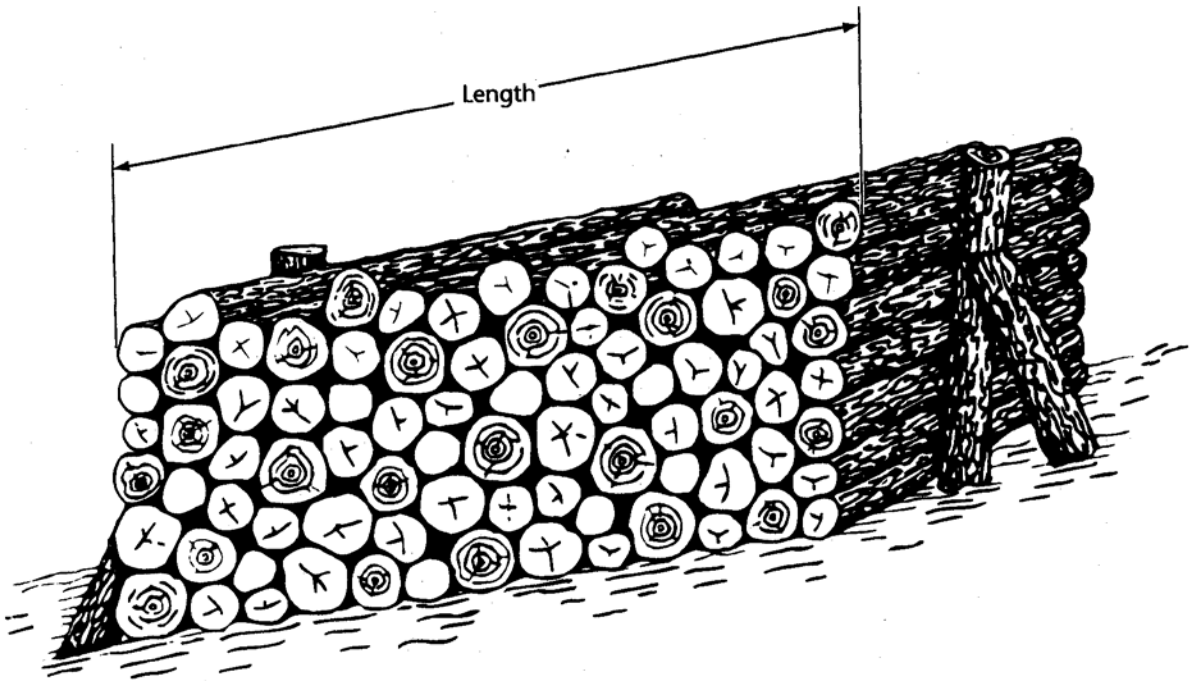


Figure 7. Length of stack (on ground) on slope

A scaler shall measure and record each length measurement of a pile in 0.02 m units. A scaler shall calculate and record the average length to the nearest 0.02 m unit.

Height measurements must be related to the type of length measurements employed (or vice versa). If the total length of the pile is measured, heights must be taken throughout the full length of the pile (see Figure 8). When the length of the pile has been estimated at less than the full length, height measurements must be taken, within the range of the estimated length, at points that reflect the height of the squared pile. This practice is normally referred to as “squaring up the pile” (see Figure 9).

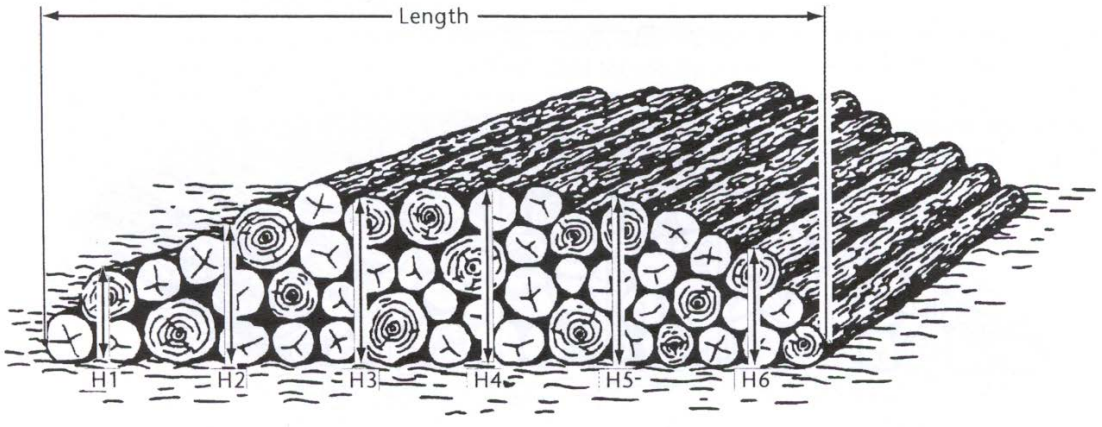


Figure 8. Height of stack with total length

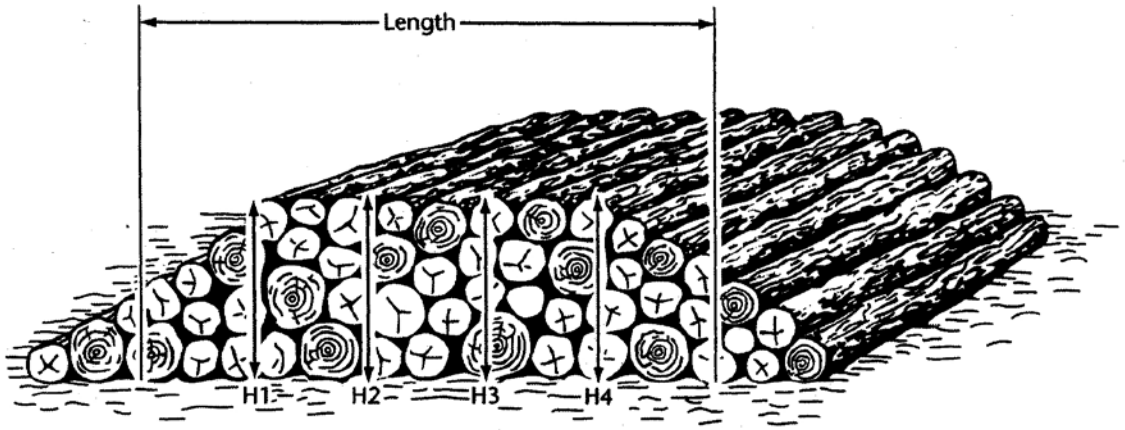


Figure 9. Height of stack with length estimated at less than total

A scaler shall measure and record each width of the pile (length of bolt) measurement in 0.02 m units. The width of the pile is the average length of the bolts in the pile. A scaler shall determine the average lengths of bolts in a pile by measuring as many bolts as are necessary until satisfied that the average of such measurements is representative of the actual pile width. A scaler shall calculate and record the average width to the nearest 0.02 m unit. Where products lengths are not the same and the scaler cannot be satisfied of the pile width average, then the scaler may refuse to scale the pile and recommend another method of scale.

When a scaler has determined the average length, height and width of a pile of primary forest products, the gross pile volume is then calculated in stacked cubic metres by using the following formula:

GPV = (L)(H)(W)

Where GPV = gross pile volume normally expressed to 0.01 m^3(st)

L = average length of pile, m

H = average height of pile, m

W = average width of pile, m

Example:

L = 12.76 m
H = 2.14 m
W = 2.50 m

GPV = (L)(H)(W)

= (12.76 m)(2.14 m)(2.50 m)

= 68.266

= 68.27 m^3(st) (This may be an odd number)

3.3 Deductions – Stacked Cubic Metres

When making deductions for defects or voids in primary forest products, scaled in stacked cubic metres, the scaler shall:

1. On piles that are less than 2.44 m in width:

    a) Alternate the side of the piles on which defect or void measurements are made.

    b) On uneven numbered piles, measure defects on the side away from the road or trail, and on even numbered piles, measure defects on the side facing the road or trail.

    c) Make deductions for a visible defect as if it extended through the length of the bolt.

2. On piles that are 2.44 m or greater in width:

    a) Measure defects on both sides of the pile.

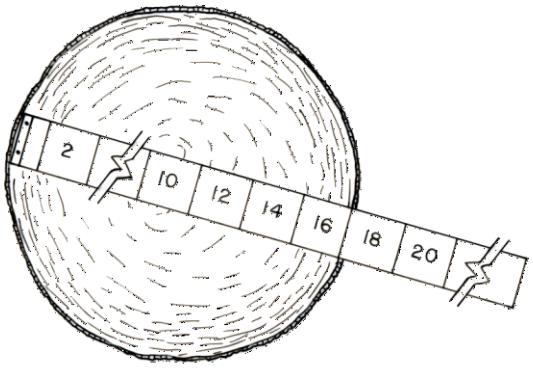
    b) Make deductions for visible defect as if it extended for half the bolt length.

Deduction tables, included as appendices take into account the length of the wood and the appropriate bolt or half bolt deduction.

The diameter measurement of defects or voids, including cull bolts, shall be recorded in 2 cm units (classes). If a defect is irregular the diameter is averaged. Defect measurements are made on the cut face of the bolt along a plane perpendicular to the longitudinal axis of the bolt.

When determining cull deductions, if the diameter of a scaled piece coincides with the boundary between classes, that piece shall be measured and recorded to the lower class.

Example:

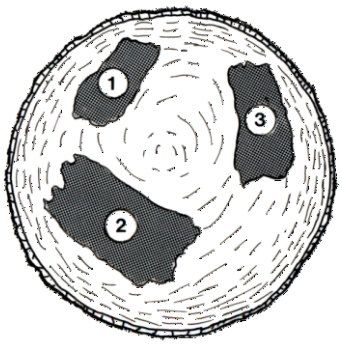


In this example, the inside bark diameter of this bolt falls exactly on the boundary between the 16 and 18 cm size class. The diameter of this bolt is 16 cm class.

Where several defects are scattered over the surface of a bolt, a scaler may:

a) make a deduction for one defect having a diameter equal to the square root of the sum of the products of the diameters of each defect, expressed to the nearest 2 cm unit.

Example:



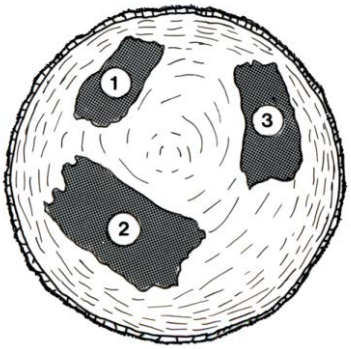
Defect 1 = 2 cm by 6 cm
2 = 4 cm by 10 cm
3 = 2 cm by 8 cm

Deduction = square root **{**(2x6)+(4x10)+(2x8)**}**
= square root **{**12 + 40 + 16**}**
= square root **{**68**}**
= 8.2 = 8 cm class

Assuming this is a 2.50 m bolt of rough softwood pulpwood the volume deduction would be 0.011 m^3(st) (see Appendix B); or

b) make a deduction for each defect separately by its average diameter, expressed to the nearest 2 cm unit.

Example:



Defect 1 = 2 cm by 6 cm
2 = 4 cm by 10 cm
3 = 2 cm by 8 cm

Deductions 1 $= \frac{2+6}{2} = \frac{8}{2} = 4$ cm

2 $= \frac{4+10}{2} = \frac{14}{2} = 7 = 6$ cm

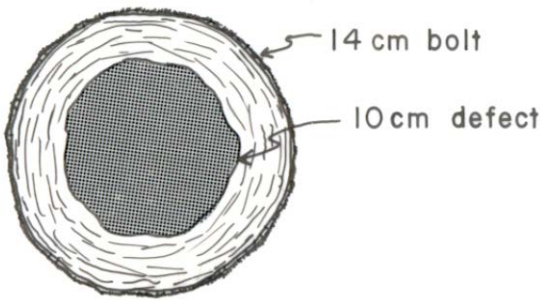
3 $= \frac{2+8}{2} = \frac{10}{2} = 5 = 4$ cm

Assuming this is a 2.50 m bolt of rough softwood pulpwood, the volume deduction would be 0.003 + 0.006 + 0.003 = 0.012 m^3(st) (see Appendix B).

Where the (diameter of a defect)^2 is greater than half the (diameter of the end being measured)^2, the bolt or half bolt is a cull and a scaler shall make a deduction equal to the total diameter of the bolt or half bolt.

Example:

1. Is this bolt a cull?

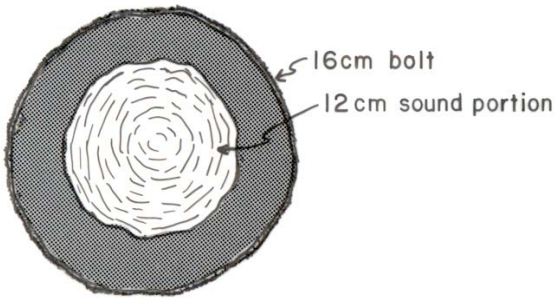


Bolt diameter^2 = 14 x 14
= 196 cm^2

Defect diameter^2 = 10 x 10
= 100 cm^2

Since 100 is greater than half of 196, the bolt is a cull and a deduction equal to a 14 cm bolt is made.

2. Is this bolt a cull?



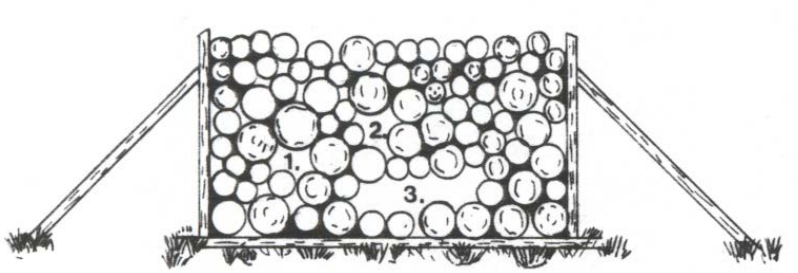
A 16 cm bolt has a sap rot leaving a sound portion of 12 cm.

Bolt diameter^2 16 x 16 = 256
Sound portion^2 12 x 12 = 144
Defective portion = 112 cm^2

Since 112 cm² is less than half of 256 cm² the bolt is not a cull. However, a deduction equal to the square root of 112 = 10.58 = 10 cm must be made for the sap rot.

A void is an unnecessary air space in a pile of stacked primary forest products, large enough to accommodate at least the equivalent volume of the average bolt in the pile (or ½ bolt on the side of piles >2.44 m in width). If the space is large enough to accommodate at least the equivalent volume of the average bolt in the pile, then the space is a void and a deduction shall be made. If it is not large enough, then the space is considered normal airspace and no deduction shall be made. Voids need to be viewed as three dimensional (ie. height, width and depth). Voids are rarely uniform in shape. A scaler must take special care to determine the unnecessary airspace, aside from normal airspace associated with adjacent pieces. The scaler must estimate the volume of the unnecessary airspace to determine if a void exists and if so the appropriate deduction (diameter) to make.

Example:



Average size bolt in the pile of Softwood Pulpwood = 14 cm.

This is determined or estimated by the scaler.

Pile width is 2.50 m.

Airspace 1: Dimension of **unnecessary airspace**: 12 cm high x 18 cm wide x 1.0 m deep

Based on the above dimensions the scaler estimates that the unnecessary airspace would only accommodate a 12 cm bolt. Consideration was given to the depth of the void which only extends 1.0 m. Since the average size bolt is 14 cm the airspace is <u>not</u> a void and no deduction is made.

Airspace 2: Dimension of **unnecessary airspace**: 20 cm high x 16 cm wide x 1.25 m deep (½ pile width)

This airspace is large enough to accommodate at least an average size bolt, therefore a deduction is made. In this case a 16 cm deduction would be appropriate with consideration given to a reasonable fit of a bolt and the associated normal airspace in the defined cavity.

Airspace 3: Dimension of **unnecessary airspace**: 20 cm high x 80 cm wide x 60 cm deep

This type of airspace may be created by a band of snow or ice in winter or if a bolt is cross piled.

In this case, the scaler needs to assess the wide opening on the face of the pile in relation to the <u>short depth</u> of the opening. This is a visual assessment of unnecessary airspace. In this case a 24 cm deduction would be appropriate.

Note: 0.20 m X 0.80 m X 0.60 m = 0.096 m^3 of airspace. This roughly equates to the deduction volume of a 24 cm piece in Appendix B.

Where a void exists in a pile of primary forest products, a scaler shall make a deduction equal to the volume of the largest bolt that could reasonably be accommodated in the void.

A scaler may calculate the deduction for a defect or void:

a) by measuring the diameter and then determining the volume of the deduction from the appropriate table (species / product) contained in Appendix B, C, D, E, F, G, H, I, J or K, or

b) by applying a percent reduction of the gross volume where the scaler can demonstrate consistency with deduction volumes determined using method (a), or

c) by any other means which the Minister may approve.

At the top of Appendices B, C, D, E, F, G, H, I, J and K there is a formula for calculating the deduction in stacked cubic metres to be made when the diameter of the defect, cull bolt or void has been determined. For the purposes of illustration, the formula in Appendix B will be explained. The other noted appendix formulas are developed in a similar manner.

Appendix B shows the deduction values of defects or voids, by diameter, in stacked cubic metres for 2.50 m Rough Softwood Pulpwood. The formula reads:

$m^3(st)$ = A x L x *Rough Wood* Factor

A = $(0.00007854)(\text{diameter of defect cm})^2$

[1] L = 1.25 m (this is ½ bolt length for 2.50 m pulp)

[2] Rough Wood Factor = 1.7135

Example: 10 cm defect in 2.50 m Rough Softwood Pulpwood

$m^3(st)$ = A x L x Rough Wood Factor

= $(0.00007854)\ (10cm)^2$ x 1.25 m x 1.7135 $m^3(st)/\ m^3$

= 0.0098175 m^3 x 1.7135 $m^3(st)/\ m^3$

= 0.0168 $m^3(st)$

= 0.017 $m^3(st)$

If the diameter of a defect or void is not contained in Appendix B, C, D, E, F, G, H, I, J or K, a scaler shall calculate the volume of the defect or void, in accordance with the formula prescribed by Appendix B, C, D, E, F, G, H, I, J or K.

Where the actual length of bolts or half-bolts is greater than or less than the appendices formula length (L), the values in the tables of Appendices B, C, D, E, F, G, H, I, J and K shall be increased or decreased by the percentage that the length of the bolts or half-bolts exceeds or is less than the appendices formula length (L).

[1] half bolt length for all products 2.44 m or greater in length.

[2] 1 ÷ 0.5836 (Conversion Factor from Appendix A). Essentially, the conversion factor, or $m^3/m^3(st)$, is converted to a Rough Wood Factor, or $m^3(st)/\ m^3$.

4. Scaling of Primary Forest Products in Cubic Metres

4.1 Measurement and Compilation in Cubic Metres

Scaling in cubic metres or m^3, as referred to in this section, actually means determination of volume using *piece* dimension measurements applied to cubic metre volume tables. These volume tables have been previously developed through sampling procedures.

Where required, the *smallest top diameter* and the *smallest butt diameter* must be measured through the geometric center. The geometric center of a piece is that point on the end cut surface of the piece through which the scale stick is hinged so that there is as much wood fibre on one side of the stick as there is on the other (see Figure 10). It is not necessarily the same point as the pith, the biological centre of the piece.

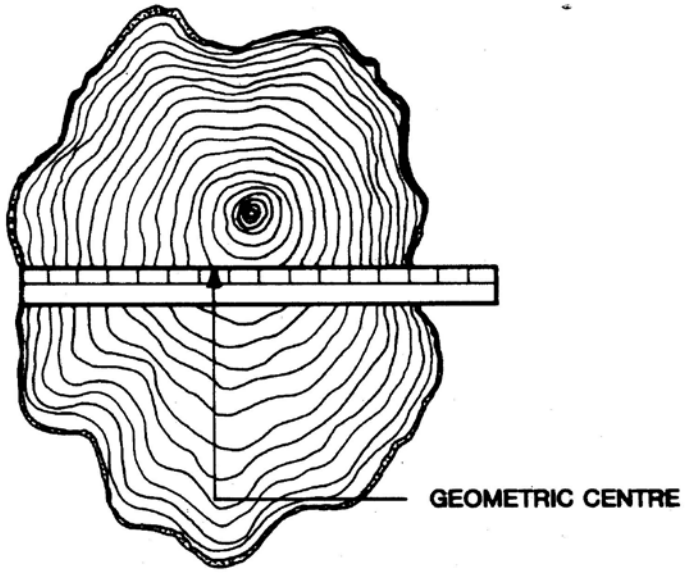


Figure 10. Geometric centre

The scale of any primary forest product in cubic metres may be either complete or partial. In the case of a partial scale, the scaler shall measure a sufficient number of pieces until satisfied that the measures are representative of all pieces in the pile. Scaling arrangements may set a minimum percentage of pieces to be measured. The greater the range in dimensions, the higher the percent of partial scale (ie. the greater the number of pieces required to be scaled). When doing a partial scale, the scaler shall include cull pieces (ie. no merchantable volume) in the calculation of the average net volume per piece.

Example: On an operation, 320 spruce logs were scaled with a net volume of 82.480 m^3. This included 3 culls. The total number of spruce logs on the operation was 525. What is the average net volume per piece and the total net volume of all pieces on the operation?

Average net volume per piece = 82.480 ÷ 320 = 0.258 m^3
Total net volume = 0.258 x 525 = 135.450 m^3

4.2 Logs

Logs are scaled by measuring the smallest top diameter in 2 cm classes and the length in specified 0.20 m classes. The volume, in m^3, is determined from the table contained in Appendix L for softwood logs and Appendix M for hardwood logs.

Logs that are longer than a specified length class shall be scaled as belonging to the next larger length class. See Section 2.3 *Units of Measure* for more clarification on log length classes.

4.3 Poles, Posts, Pilings and Weirstakes

Poles, posts, pilings and weirstakes may be scaled by measuring the smallest top diameter in 2 cm classes and the length in 0.6 m classes. Using these measurements, a scaler shall determine the volume of spruce, tamarack, jack pine and red pine poles, posts, pilings and weirstakes from the table contained in Appendix O and the volume of cedar poles and posts from the table contained in Appendix P.

4.4 Treelength

Treelengths, softwood or hardwood, may be scaled by the smallest butt diameter method. When using this method to scale treelength a scaler shall:

a) measure and record the smallest butt diameter, and
b) determine the volume from the appropriate treelength cubic metre volume table, which the Minister has approved.

A scaler must ensure that the small butt measurement incorporates normal contours and depressions, along the edge of the cut surface, when determining the placement of the scale stick across the geometric centre. Abnormally deep cracks, crevices or indentations affecting the butt surface area may be disregarded, if the point of measurement would grossly misrepresent actual stem volume. Cracks, crevices and indentations may be the result of natural or mechanical damage and may be fresh or healed wounds (ex. lightning scars, splits, harvesting damage).

A scaler must understand how a treelength volume table is constructed, in order to properly use a table. These tables are constructed based on measurements of treelength samples from a designated area. The felled treelength samples are individually measured using the stem analysis method (see Stem Analysis section 7.3). The sample results are then sorted by smallest butt diameter. The average volume of all trees in each diameter class is then determined as well as the frequency (number of trees) in each diameter class. These values are then fitted to a curve resulting in the construction of a local volume table, applicable to the area from which the data was collected.

Note: the practice of treelength scaling by the smallest butt diameter method has diminished in recent years, primarily due to the shift to mass scaling at mills. This form of treelength scaling also has some inherit problems that have lead to its limited use. There are significant local variations in stem tapers and shapes making reliable local volume table construction difficult and costly. Harvesting patterns and equipment types can also

influence stump heights and butt shapes thereby impacting volume table relationships either during sampling or when applying table values. It is recommended that the Department be consulted prior to volume table sampling or application.

4.5 Deductions – Logs m³

When scaling logs in cubic metres, a scaler shall make deductions for those defects, which show on either or both ends of the piece. The diameter of a defect, or the average of two diameter measurements where the defect is irregular, shall be measured and recorded in 2 cm classes.

A scaler may calculate the deduction for a defect:

a) by measuring the diameter of the defect and estimating the length of the defect in 0.5 m units; then determining the deduction from the table contained in Appendix N (Note: the estimate of the length of the rot is based on the scalers experience for the species involved, as well as the surface area and degree of rot), or
b) by applying a percent reduction where the scaler can demonstrate consistency with deduction volumes determined using method (a) , or
c) by such other method which the Minister may approve.

Where the diameter of the defect is not contained in Appendix N, a scaler shall calculate the volume of the defect in accordance with the formula and method prescribed by Appendix N.

A scaler shall not make any volume deduction for:

a) checks or splits, scars, crook, sweep or other irregularities in form;
b) worm holes;
c) abnormal discoloration that is not due to rot;
d) red stain.

Rot is a defect.

Any log with more than one-third of its gross volume defective by rot, crook, excessive knots, sweep and/or seam shall be classified as a pulpwood log unless more than one-half of the gross volume of a log is defective by rot in which case a deduction equal to the total gross volume of the log shall be made.

The impact of form defects are based on visual assessments made by the scaler. Some knowledge of form defect impact on lumber recovery is required.

The volume impact of sweep can also be determined mathematically using the following method:

1. Using the side of the log which most exposes the sweep (see Figure 11), determine the actual centerline of the log along the length.
2. Using a straight edge (ex. scale stick) establish the straight line between the geometric centres at each end of the log.

3. Determine the maximum measurement (variation in cm) between the actual log centerline and the straight line between geometric centres at each end.
4. Apply the following formula to determine the volume impact:

$$\text{Sweep \%} = \frac{\text{Variation (cm)} - 3^*}{\text{inside bark diameter (cm) at small end of log}} \times 100$$

$$\text{Example} = \frac{10-3}{34} \times 100$$

$$= 21\%$$

* 3 is a constant number used for logs in the 8-10 length class. For logs in the 11–13 length class use a constant number of 4 and for logs in the 14–16 length class use a constant number of 5.

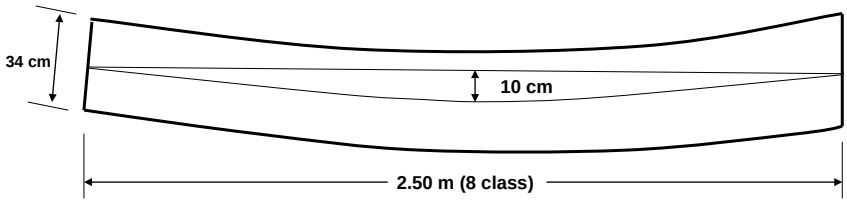


Figure 11. Volume impact of sweep

Example 1:

Rot extends only a portion of the length of a spruce log (see Figure 12).

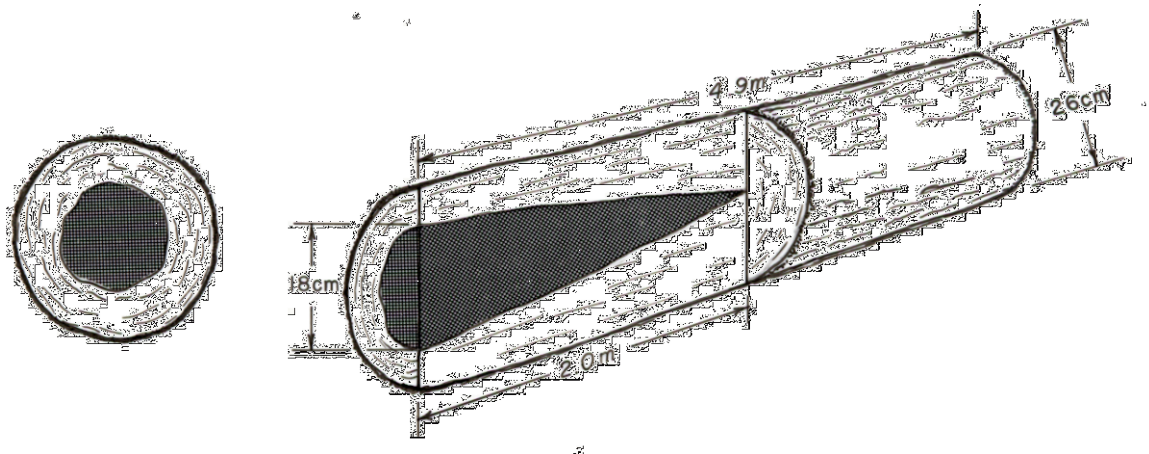


Figure 12. Rot showing on one end of log

Gross Log Volume = 26 cm top, 4.9 m length (16 Class)
= reference Appendix L = 0.356 m³

Volume of rot: = 18 cm (butt rot) x 2.0 m (estimated length)
= reference Appendix N = 0.025 m³

Net Log Volume = Gross Volume – Rot Volume
= 0.356 – 0.025
= 0.331 m³

Example 2:

Rot extends the full length of a spruce log (see Figure 13).

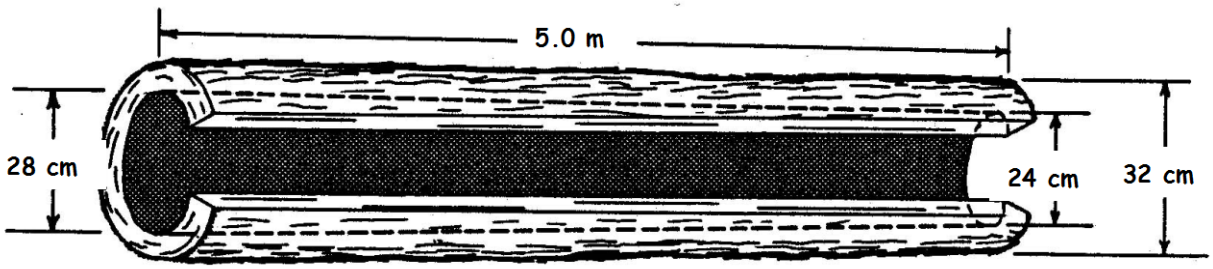


Figure 13. Rot showing at both ends of log

Gross Log Volume (32 cm top, 5.0 m length (16 Class)

Reference Appendix L = 0.529 m³

Volume of Rot (from Appendix N)

Butt Rot:	28 cm x 5.0 m	= 0.154 m³
Top Rot	24 cm x 5.0 m	= 0.113 m³
Total Rot Volume		= 0.267 m³

Net Log Volume = Gross Volume – Rot Volume
= 0.529 – 0.267
= 0.262 m³

<u>This log is a cull</u> since 0.262 m³ represents only 49.5 % of the gross log volume of 0.529 m³ (ie. greater than 50 % defective due to rot). In this case a deduction equal to the gross volume of the log shall be made.

Note: Where the log length does not correspond exactly with the length of rot given in Appendix N, use the length of rot shown in the Appendix which is closest, but does not exceed the log length (see notes in Appendix N).

4.6 Deductions – Treelength m³

Treelength volume tables may be either gross or net. In most cases, treelength tables are net tables. These net tables have a cull factor, or rot factor built into them to account for rot (see Developing Cull Factors, section 7.5). The scaler must be aware of which type of table, gross or net, is being used as royalty (or stumpage) is generally based on net volume. If a gross table is being used, a percentage reduction approved by the Minister shall be applied to the gross scale of all tree lengths to arrive at a net volume, if required.

5. Scaling of Primary Forest Products in Mass

5.1 General

All regulated mass scaling transactions must be performed under the direction of a licensed scaler. The scaler has the responsibility to ensure that the load is weighed in accordance with this manual and that all reasonable measures have been taken to ensure the weigh scale device is functioning properly on a daily basis. This includes regular testing and ensuring maintenance is undertaken, as required (see Section 5.4).

Where mass to volume conversions are being applied to the transaction the scaler must ensure scale documentation is accurate and complete as it relates to conversions. This includes verification of product, species and date. The scaler should also note obvious conditions of wood that could impact the mass of the load (ex. excessively dry) and bring this to the attention of the *licensee* or Producer Association as this may require an alternative conversion or sampling.

5.2 Measurement and Compilation in Mass

When scaling primary forest products by mass, a scaler shall determine the mass by the use of motor vehicle scales or such other appropriate weighing machine that conforms to the *Weights and Measures Act (Canada)* and any regulations thereunder.

The weigh scales must be of sufficient capacity to determine the mass of the loaded vehicle in one operation.

A scaler shall:

1. weigh the primary forest products together with the vehicle on which the products are being transported and determine their combined mass, and,
2. after unloading of the products, weigh the empty vehicle and determine its mass, and,
3. determine the mass of a load of primary forest products by subtracting the mass of the empty vehicle from the mass of the loaded vehicle

Note: stored tare weights shall not be used, unless approved by the Minister

The mass of a load of primary forest products shall be determined and expressed to the nearest 10 kg or 0.01 t and shall include, if present, bark, moisture, rot and *foreign material*.

Weigh scales shall measure with both accuracy and *precision* within a tolerance of 100 kg. Weigh scales found by the Department to be functioning outside either of these tolerances may be closed until they are serviced and shown to be functioning properly.

Where mass is converted to cubic metres, a mass to volume conversion shall be applied, as approved by the Minister. Mass to volume conversion factors will account for

deductions of bark, moisture, rot and foreign material through sampling procedures approved by the Minister, and no further deductions shall be made (see Developing Mass / Volume Relationships, Section 7.7).

Where deductions of bark, moisture, rot and foreign material are not accounted for in a conversion to cubic metres a scaler may make deductions for defects by

- a percentage reduction of the gross mass through procedures approved in scaling arrangements, or
- measuring defect volume and converting to mass through procedures approved in scaling arrangements, then subtracting the mass of the defect from the gross mass

5.3 Measurement Canada

Measurement Canada enforces the *Weights and Measures Act and Regulations*, which applies to weigh scales used to measure primary forest products. The Department cooperates with Measurement Canada through a working relationship to aid both agencies in an effort to ensure compliance with the legal requirements of both federal and provincial legislation.

5.4 Weigh Scale Maintenance and Testing

Weigh scale maintenance and testing is critical to ensuring consistent and accurate measurement of primary forest products. The following visual inspections, usage tests and weight indicator tests are minimum practices that must be included in all scale operators routine scale maintenance programs. Scalers must provide details of testing and maintenance to the Department upon request.

If problems are detected, beyond acceptable tolerances, immediate attention is required to remedy the problem. Scale owners and operators are legally responsible to ensure corrective action is taken. If this is not possible, other means of measurement are to be used.

Special attention should be given to seasonal conditions that create problems with debris buildup, such as mud and ice around the platform and load cells. Freeze and thaw weather conditions create particularly troublesome conditions for weigh scale platforms. Scalers must ensure special attention to testing and maintenance under these conditions.

5.4.1 Visual Inspection

- Approach and ramps must be level and plane with the weigh scales for a distance of at least 3 metres on each end.
- Scale approach, platform and surrounding area should be free of foreign material
- Scale load cell unit should be free and clear of debris (ice, snow, water, mud or dirt)
- Under the scale and ends should also be free and clear
- Note the function of the weight displays. Compare indicator, scoreboard and printer to ensure consistency.

- Scalers must be aware of visual signs that a weigh scale device may not be functioning properly. These signs include slow or sluggish reading outputs or indicators that do not return to zero after the load is removed. Platforms should be free and clear to normal movement.

5.4.2 Usage Tests

- For attended scales, verify that the operator is zeroing the scale before a load is supported on the truck scale. The operator must have visual confirmation that the load being weighed is fully supported on the scale and only then prints the weight.
- For fully unattended scales, an automatic means must be displayed to the driver that the indicating element of the scale has returned to zero and the operator may drive onto the weigh scales. A printed ticket should not be given unless there is an automatic means to ensure that the load is fully supported on the weighing device.
- When loads are removed from scales, observe the time required for the display to return to zero. The scale must return to zero within a few seconds (note: high wind may cause fluctuations of 10 -20 kg).

5.4.3. Section Test

- This test must be performed at least once per week and should be done more frequently during freeze and thaw conditions. Records of section testing must be maintained on site by the scaler.
- This test will indicate whether the device is weighing with precision at all points on the platform and will provide indication of a malfunctioning load bearing point (load cell).
- The test is carried out by using a test vehicle (straight truck or loader) with a recommended minimum weight of 20000 kg, although a lighter weight test vehicle may be used if necessary.
- To test the sections, first zero the scale and then move the test vehicle onto the scale as close to the inbound end as possible and record the weight. Ensure that the load being weighed is fully supported on the scale. Move the test vehicle three to five positions on the scale (full coverage from end to end) and record the weight each time. The same procedure is then repeated by turning the vehicle around and moving it across the scales in the opposite direction.
- The difference between the highest and lowest reading gives the precision error found on the scale. The scale is not within tolerance if the error is greater than the limits, as defined under Weights and Measures Regulations. This tolerance is incremental based on the weight of the test vehicle.
- A tolerance guideline, for Motor Vehicle scales weighing in 10 kg increments, is as follows:

Test Vehicle Weight	Tolerance
20000 kg	30 kg
40000 kg	60 kg
60000 kg	80 kg

Example: Weights direction 1: 25400 25420 25400 25520
Weights direction 2: 25390 25410 25410 25510

Greatest difference is 25520 – 25390 = **130** kg

In this case, the precision error exceeds tolerance therefore maintenance is required immediately. The error also exceeds the 100 kg Department tolerance and therefore would be subject to closure until serviced and shown to be functioning properly.

6. Scaling of Primary Forest Products in FBM

6.1 General

The New Brunswick Log Scale (commonly referred to as the NB Log Rule) does not conform to CSA Standard 0302.1-09. It is a diagram rule, as opposed to a mathematical or formula rule, and was devised more than a century ago. Use of the NB Log Scale was discontinued on NB Crown lands in 1995. This method of scale, however, remains regulated for primary forest products harvested from private woodlots and which are marketed through a Producer Association.

6.2 Measurement and Compilation in FBM

The NB Log Scale (Appendix Q) displays the amount of lumber in board feet, which may be sawn from logs of different sizes under certain assumed conditions. It is an approximation of manufactured volume. Some influences that may affect actual volume sawn include changes in market requirements, machinery, sawing practices and the skill of the sawyer and / or edgerman.

Factors which could increase the volume sawn from a given log over the scaled volume (ie. over-run) are:

Strong top diameters
Fast Taper
Sawing 2”, or 3” or thicker stock
Defects not as serious as estimated
Narrow saw kerf
Sawing scant

Conversely, factors which could adversely affect the volume sawn from a given log (ie. under-run) are:

Hidden defects
Inaccuracy of mill machinery
Sawing special sizes

The scaling of primary forest products, in board feet, requires the measuring and recording of the length of the log in feet, and the diameter, inside bark, of the top end in inches. The length shall be measured from the point of any scarf (cut or notch) at the butt to the top end and recorded to the nearest foot. The diameter at the top end, inside bark, shall be recorded to the last full inch after dropping all fractions.

Any log having a length greater than those lengths prescribed by Appendix Q shall be scaled as two or more logs with a taper of one inch per eight feet of length.

In the example (see Figure 14), the diameter would be recorded as 7”. The over-run on the diameter should be taken into account when allowing for minor defects. The length would be recorded as 16’.

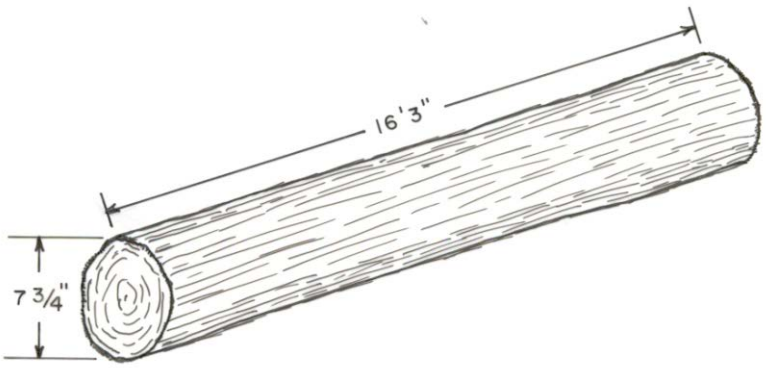


Figure 14. Determining log dimensions – FBM

The scaler shall make diameter measurements in a consistent manner, with the scaling stick held either horizontally, vertically or diagonally, without attempting to determine the smallest diameter (see Figure 15). However, if the sawn surface to be measured is abnormally shaped with a difference of two or more inches between two inside bark diameters taken at right angles to one another, the scaler shall record the mean diameter to the last full inch (see Figure 16).

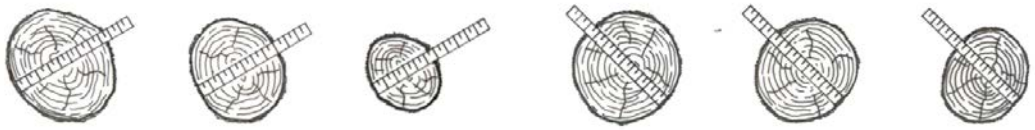
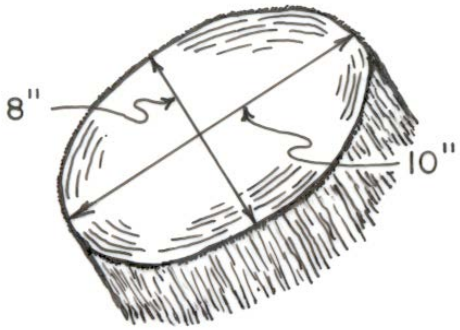


Figure 15. Consistent scale stick measurements



Record as a 9" diameter

Figure 16. Mean diameter

To convert the measurements of length and diameter of logs into board-foot volume, the scaler shall use the New Brunswick Log Scale, Appendix Q. Estimations of board foot volume may be determined using the "Rule of Thumb", Appendix U.

A scale of primary forest products in board feet may be either complete or partial.

Where a scaler undertakes a partial scale, the scaler shall measure the diameter and length of a sufficient number of pieces until satisfied that the measures are representative of all the diameters and lengths in the pile. The average net volume per piece shall be multiplied by the total piece count to determine the total volume of the load or grouping of logs.

Where a scaler undertakes a partial scale, cull pieces shall be included in the calculation of the average net volume per piece.

Example: In a partial scale of 320 logs, 128 were actually scaled and these included 4 culls. The net volume of the 124 merchantable logs was determined as 3968 board feet; the average net volume per log would be 31 board feet (3968 ÷ 128). The total net scale would be 31 x 320 which is 9920 board feet.

6.3 Deductions - FBM

Log measurement would be a simple matter if all logs were straight and sound. However, many logs contain certain defects that reduce the volume of merchantable lumber that may be sawn from them, consequently the scaler must allow for these defects in the scale. For FBM scaling it is required that the logs be spread out for visual inspection by the scaler, as both rot **and** form defects are considered when determining the net volume.

The scaler must take into account only those defects that are visible. When making deductions for defects, especially minor ones, the scaler shall take into account any over-run in top diameter.

Example: A 16' log with a top diameter (i.b.) of 12¾" would be scaled as a 12" diameter for a volume of 96 bd. ft. Since the diameter is 12¾" it would

have an approximate volume of 108 bd. ft. or an over-run of some 12 bd. ft. Therefore, in this case, a minor defect of 6 bd. ft. for butt rot could be ignored.

Also, no deductions shall be made for any defects lying outside the cylinder projected from the top end of the log as there is no allowance made for taper in the New Brunswick Log Scale (see Figure 17).

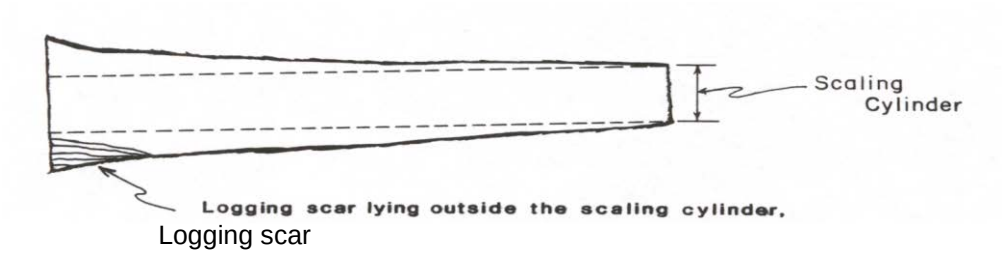


Figure 17. Logging scar lying outside the scaling cylinder

Unless otherwise specified in a contract, rot is a defect but red stain is not.

No deductions shall be made for sound green knots unless occurring in abnormal quantities to the extent that lumber recovery would be severely affected.

Deductions for defects may be made either by a reduction of length and / or by a reduction of the diameter, or by a percent reduction of the gross volume, or by such other methods as approved by the Minister.

If there are several defects showing on the end surface of a log, so grouped as to prohibit the sawing of a one-inch board between them, they shall be considered as one defect.

Logs with more than one-half of its gross volume defective shall be considered as a cull and a deduction equal to the total gross volume of the log shall be made.

The scaler, after determining the board-foot volume of any defect, may reduce the gross volume of the log by the calculated volume of the defect, and from the New Brunswick Log Scale locate the volume figure closest to the calculated net figure, then tally the corresponding length and diameter.

Example: A 12’ log with a top diameter of 10” has a gross volume of 48 bd. ft. It has been determined that the volume of heart rot in this log is 13 bd. ft., therefore the net volume is 35 bd. ft.

From the New Brunswick Log Scale this log could be tallied either as a 12’ log with a top diameter of 9” (36 bd. ft.) or a 9’ log with a 10” top diameter (36 bd.ft.).

As an alternative deduction method, the scaler may identify the log length measured under the New Brunswick Log Scale, and then locate the volume figure under that length closest to the calculated volume of the defect. The corresponding diameter with the length would be tallied as a deduction log. When using this method, care must be taken to identify cull logs which would require a full deduction of the gross log dimensions.

Defects in logs are often grouped into three categories, namely interior, exterior and form. It is possible that any one log may be affected by more than one type of defect. For example, butt rot (interior) and sweep (form) may be associated in the same log.

To aid the scaler in making deductions for defects, the following examples in this section are shown. The scaler must remain aware that strong diameters can offset minor defects.

Interior Defects occur on the inside of the log and commonly consist of:

a) butt rot
b) top rot
c) heart or center rot
d) shake
e) heart or star check
f) patchy rot

The diagram or blocking out method may be employed in allowing for interior defects. The surface dimensions (two diameters) of a defect appearing on the end of a log or the average of two diameters if it is irregular, shall be recorded to the nearest inch. The length of defect is estimated in feet.

Example: An area of butt rot measures 6” by 5” and the scaler estimates its length as 4’. The volume to be deducted is:

$$\frac{6” \times 5” \times 4’}{15} = 8 \text{ f.b.m.}$$

Note: 15 is used for a divisor instead of 12. This is to account for the ¼” saw kerf, which causes 20 % of the log to be lost in sawing. This allowance for saw kerf has already been accounted for in construction of the N.B. Log Scale Table.

Butt or top rot

When estimating the length of butt or top rot defects (see Figure 18), the scaler should consider the degree of rot, the species and the surface area of the rot.

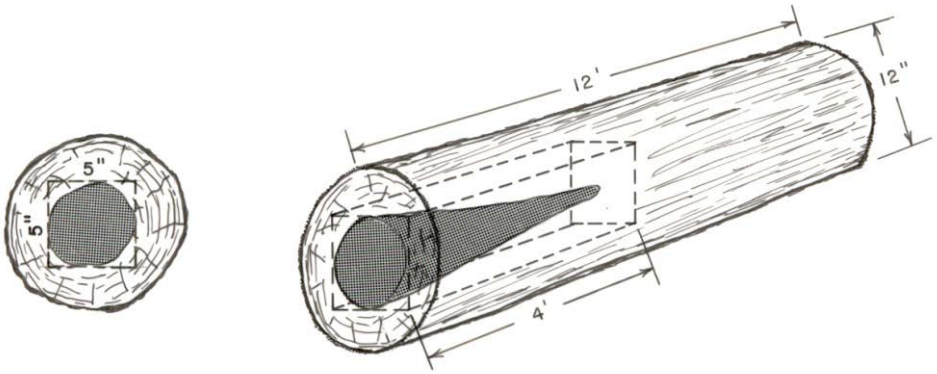


Figure 18. Blocking out butt or top rot

Volume of rot = $\frac{5" \times 5" \times 4'(\text{est. length})}{15}$
= 7 f.b.m.
Gross scale of log = 72 f.b.m.
Net scale of log = 72 – 7 = 65 f.b.m.

The log would be recorded as 13' log and 11" diameter (65 bd. ft.)

Heart or center rot

A reduction in length or diameter may be made to allow for a defect; however major defects such as heart or center rot (see Figure 19) usually require a reduction in diameter.

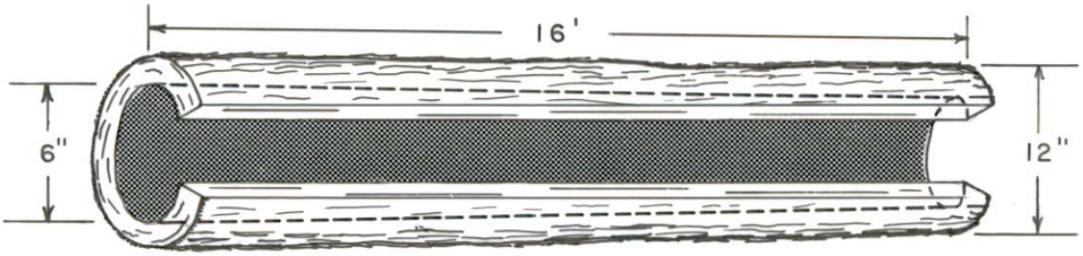


Figure 19. Heart or centre rot extending full length of log

Volume of defect = $\frac{6" \times 6" \times 16'}{15}$
= 38 f.b.m.
Gross scale of log = 96 f.b.m.
Net scale of log = 96 – 38 = 58 f.b.m.

This log could be recorded as 14' long and 10" diameter (56 bd.ft.), or a 10' long and 12" diameter (60 bd.ft)

Shake

Shake is the separation of the wood along the annual rings in a log. It is very common in hemlock, but it may occur in any species. If detected on both ends of a log it may be

assumed that this defect extends through its entire length. If observed on one end, usually the larger, it probably extends half the length of the log. Deductions are usually made by the diagram method (see Figure 20). This defect is common in hemlock, which is usually squared, rather than sawn into one-inch boards.

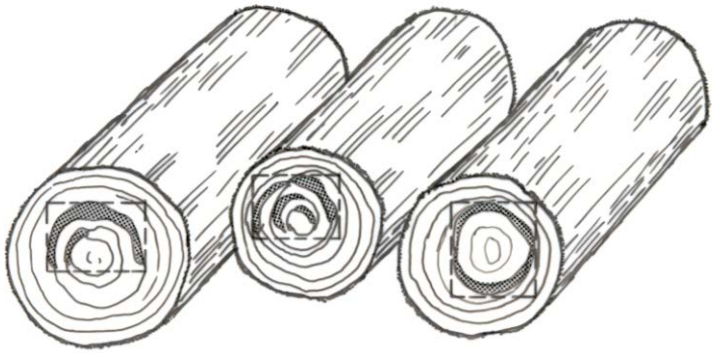


Figure 20. Shake

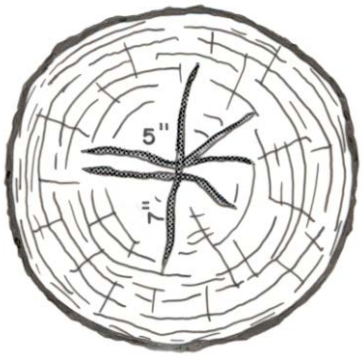
Example: Shake measures 6” x 7” and extends the length of the log, which is 14’.

$$\text{Volume of deduction} = \frac{6\text{”} \times 7\text{”} \times 14\text{’}}{15}$$

$$= 39 \text{ bd ft.}$$

Heart or Star Check

Caution should be exercised by the scaler in making deductions for heart or star check (see Figure 21) as in many instances it is superficial and would be removed when the lumber is trimmed in a mill. In most instances it may be ignored.



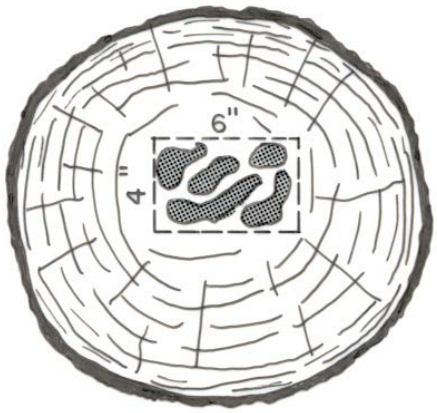
Average diameter of check = 6”

$$\text{Volume of deduction} = \frac{6\text{”} \times 6\text{”} \times \text{estimated length}}{15}$$

Figure 21. Heart or star shake

Patchy Rot

This situation is not uncommon in White Pine, and may be more scattered than in the diagram (see Figure 22).



$$\text{Volume of defect} = \frac{4\text{”} \times 6\text{”} \times \text{estimated length}}{15}$$

Figure 22. Patchy rot

It may be necessary to block out the individual defects as follows:

2” x 3” = 6 sq. in.
2” x 2” = 4 sq. in.

$$\text{Volume of defect} = \frac{10 \text{ sq. in.} \times \text{estimated length}}{15}$$

When considering deductions for exterior defects the scaler should first determine whether or not the defect lies within the scaling cylinder. If outside, it can be ignored, but if any portion of the scaling cylinder is affected by the defect, due allowance must be made for it.

Defects in this category include:

a) lightning scars, gum seams and frost checks
b) scars at or near the butt resulting from log skidding, fire, etc.
c) scars resulting from porcupine chew and similar injuries
d) saprot
e) worm holes
f) barber chair and bucking splits.

In some instances it may be practical to use the diagram method, but more often a percent deduction of the gross volume is estimated for exterior defects. The estimated board foot volume of the defect can then be accounted for by reducing the diameter or length accordingly.

Lightning Scars, gum seams and frost checks

These defects may extend straight along the length of the log or spiral around it.

The scaler, in making allowance for this type of defect, should take into consideration the depth of the scar, and the possibility of rot being associated with this injury. If it is a recent injury it may only be superficial.

In the example (see Figure 23) approximately 15% of the log is defective, therefore the net volume = 96 – 14 = 82 bd. ft., and as such could be tallied as a 16’ log with a top diameter of 11” (80 bd. ft.).

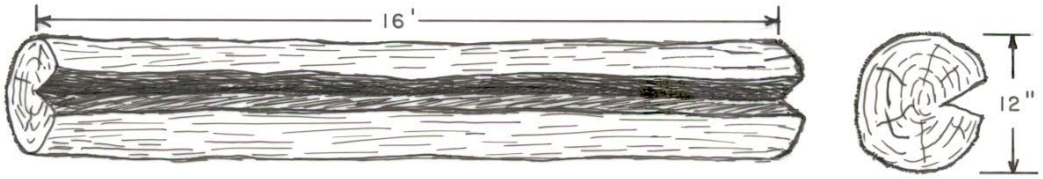


Figure 23. Scars and seams

In the example (see Figure 24) the estimated defect is almost half of the gross volume of the log, therefore the net volume is 130 – 64 = 66 bd. ft. and the log could be tallied as a 11’ log with a top diameter of 12” (66 bd.ft.).

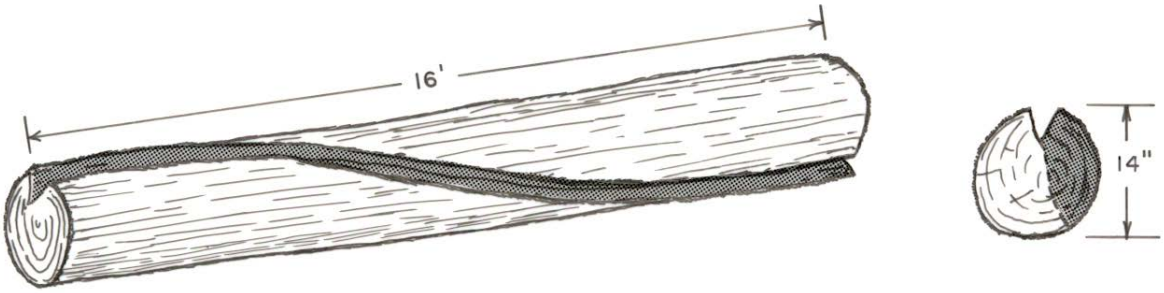


Figure 24. Spiral seam

Scar at or near the butt resulting from log skidding, fire, etc. (see Figure 25)

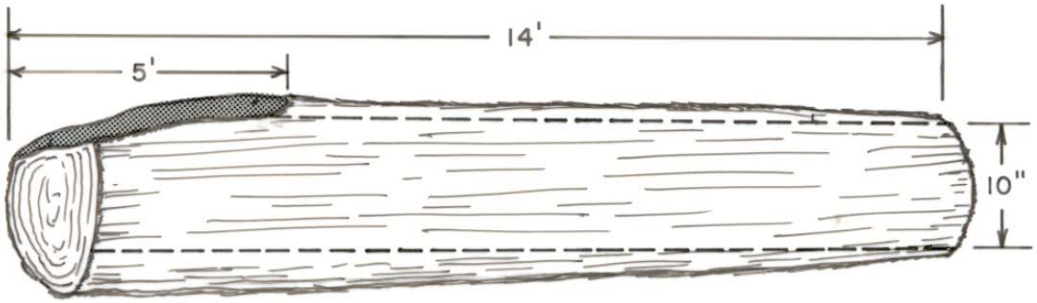


Figure 25. Scar at butt

Scars resulting from porcupine chew and similar injuries

The effect of porcupine scars or similar injuries can vary greatly depending on the extent of the injury, its location on the log and more particularly on its age. A tree may have been injured years ago with the result that the scar or scars will be quite deep. Recent scars often can be ignored, as they frequently have no effect on the scaling cylinder. Where allowance must be made, it can be done either by blocking out, or in severe cases by reducing the diameter of the log.

Saprot

The usual procedure is to scale the sound portion inside the ring of saprot (see Figure 26). If the saprot is extensive the scaler should check to determine that it does not exceed 50% of the logs gross volume, otherwise it would be culled. Worm holes are often associated with saprot.

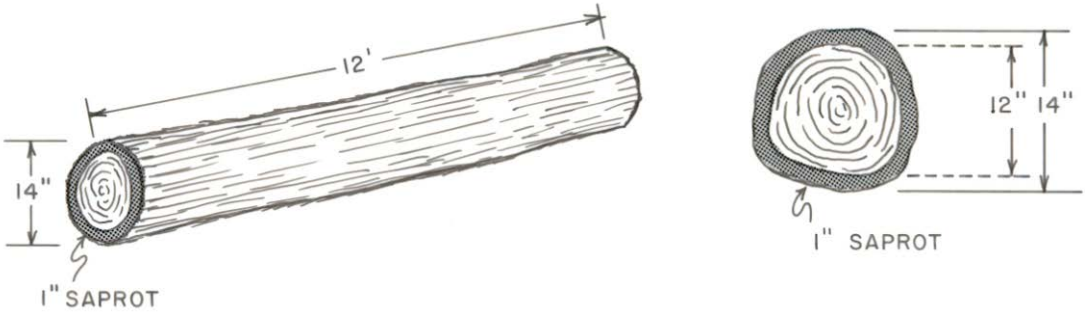


Figure 26. Saprot

Gross Scale: 12’ log, 14” top diameter = 98 bd. ft.

Net Scale: 12’ log, 12” top diameter = 72 bd. ft.

Worm Holes

Worm holes or worm track are generally the result of cambium miners burrowing in sapwood of trees. This is a particular concern in high grade hardwood logs, where the sealed wounds create defects in the grain.

Scalers should not be misled by bark borers, which usually restrict their activities to the area just beneath the bark on felled wood. The occasional shallow hole created by a borer is of little consequence but a number of such holes can be considered a defect.

Barber chair and bucking splits

Although the effect of these two are similar it is not unusual for the barber chair, unless severe, to be outside the scaling cylinder as it occurs on the butt log. The bucking split may be found between either the first and second log cut from a felled tree, or the second and third logs (see Figure 27). The resulting damage to the log may be determined by blocking out or by estimating the percent deduction and then reducing the diameter or length of the log accordingly.

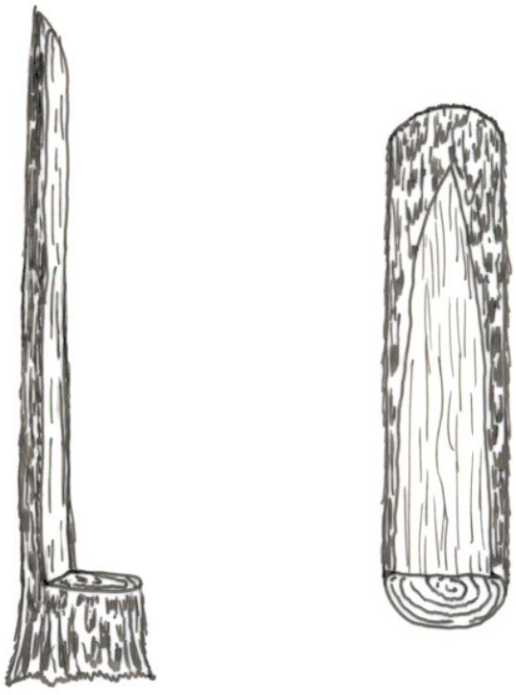


Figure 27. Barber chair and bucking split

Defects of Form include:

a) sweep
b) crook
c) crotch or forked top

Sweep

Allowance for sweep may be made either by deducting a percent of the gross volume of the log (see Figure 28) or by a simple reduction in the log's length.

Example: A 16' log, with a 10" top diameter, has an estimated 25% sweep. Reduce the gross volume by 25% (16 bd. ft.) for a net scale of 48 bd. ft. In this case reduce the length by 4' so that a 12' log with a 10" top diameter would be tallied (48 bd. ft.).

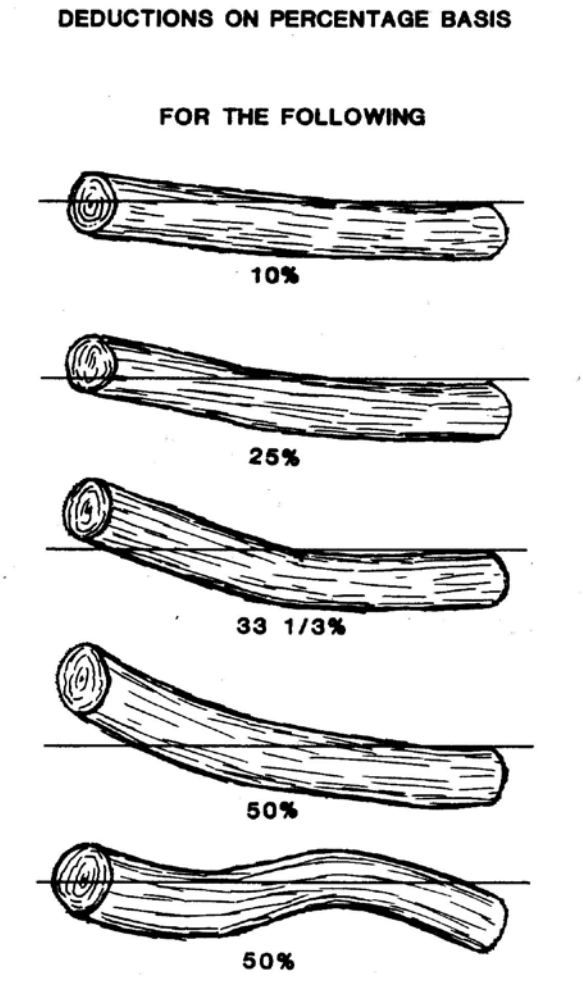


Figure 28. Sweep percentage deductions

Crook

Crook is a defect that usually occurs at either end of the log. As a consequence it is common practice to allow for it by reducing the length of the log to the point where the crook begins (see Figure 29). It should be noted that crook at the butt can be deceiving if there is any amount of butt flare.

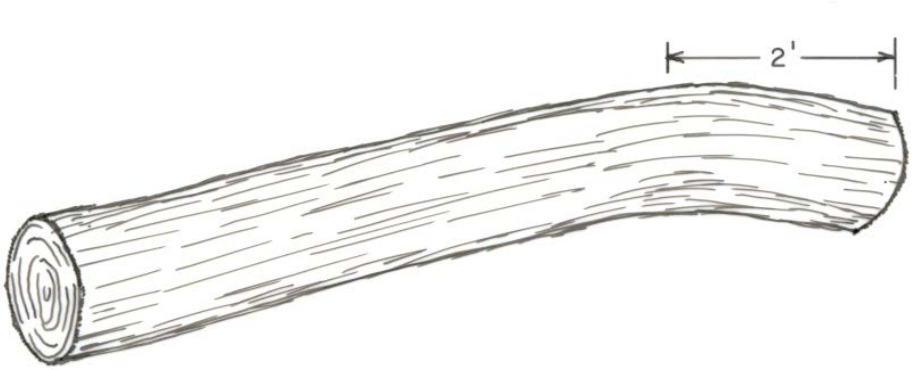


Figure 29. Crook

Gross Scale: 12’ log, 12” top diameter = 72 bd. ft.

Net Scale: 10’ log, 12” top diameter = 60 bd. ft.

Crotch or Forked Top

The common practice, with this defect, is to reduce the length of the log by the length of the swollen portion (see Figure 30). Care should be exercised in the measurement of the top diameter and the scaler should check closely, to determine if there is any rot associated with the crotch.

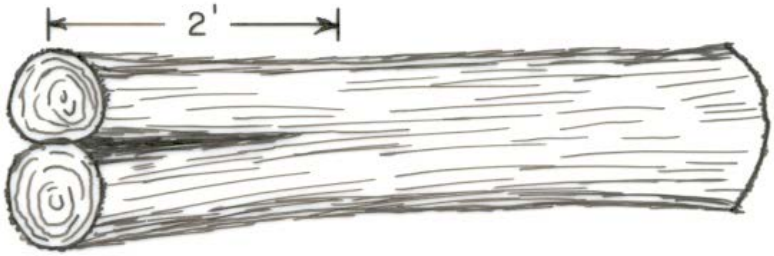


Figure 30. Crotch or forked top

7. Developing Volume Tables and Conversion Factors

7.1 General

The development of volume tables and conversion factors is an aspect of scaling that requires sound sampling procedures and methodology coupled with good judgment and expertise of the scaler. The data that is collected, compiled and formulated into tables and factors has a significant impact when applied on a large scale. Utmost care and attention must be applied by the scaler, to ensure a minimum of error. Any sampling associated with regulated scaling must be done by a licensed scaler.

This section of the manual will cover the current sampling methodology and practices acceptable to the Department. Any variation from these procedures must be approved by the Minister.

7.2 Smalians Formula

Note: where **V** appears in this section of the manual, it shall be with reference to volume (**V**), as determined by Smalians Formula.

Smalians Formula has been adopted as a CSA standard for the means to calculate the gross volume of logs and / or sections of stems. The length in metres (m) is measured, as well as the end diameters in metres² (m²), and the volume, in cubic metres, is computed directly. This formula is used extensively in the formation of volume tables and factors.

Cubic contents of logs or sections of stems, **V**, may be determined by applying Smalians formula, as follows:

$$\mathbf{V} = \frac{A_1 + A_2}{2} \times L$$

where: **V** = volume of log, m³
A = area of log ends (inside bark), m²
L = length of log, m

Where cylinder volumes are being determined (ex. half bolts) the following simplified version of the formula may be used, where an end diameter is measured in cm units.

$$\mathbf{V} = A \times L$$

$$\mathbf{V} = 0.00007854\ D^2 \times L$$

where **V** = volume of the piece in m³
D = diameter of the bolt (inside bark) or rot, in cm units
L = the length of the bolt or rot in m

Note : $\frac{L}{2}$ is used in place of L, when determining half bolt ***V***

0.00007854 D² is a constant, derived as follows:

Where A = a cross sectional area in m^2

$$A = \pi (D/2)^2$$

$$A = \frac{3.141\ 590\ D^2 / 4}{*10\ 000}$$

$$A = \frac{3.141\ 590\ D^2}{40\ 000}$$

$$A = 0.00007854\ D^2$$

π is a constant at 3.141 590

*10 000 is the divisor used to convert cm^2 to m^2, as scaled volumes are ultimately expressed in m^3

7.3 Stem Analysis

Stem analysis generally refers to the detailed measurement and volume determination of the gross merchantable portion of felled tree stems.

Volume results, determined through these procedures, may be used in treelength volume table construction, mass / volume relationships or other studies.

The procedures require outside bark measurements (o.b.), except for the small butt measurement. Compilation methodology accounts for bark thickness to generate solid wood content only.

The following procedures shall be followed for stem analysis data collection.

1. Sample stems must be placed on skids and adequate space must be left between sample stems to allow for accurate measuring.
2. Number each tree at the butt end.
3. Paint a spot on the top side of each treelength at the butt end. This identifies the position of the treelength when measured by the scaler.
4. On forked stems, one prong is considered as part of the main stem, and the other is marked to indicate a butt and is measured as an individual tree.
5. Measure total length, to nearest 0.1 m, from butt to the top or at a point where the tree is not less than 8.0 cm, outside bark.
6. If one end of the tree is broken leaving an irregular end surface, then the length is measured to the point where the first full diameter measurement is attainable by averaging the length of the broken section.

7. Measure the smallest butt diameter, or if tree is sectioned measure average diameter of large end inside bark in 2 cm classes.
8. Measure diameter outside bark at 0.5 m and 1.0 m. Diameter measurements are taken in 1.0 cm classes. These are caliper measurements taken consistently, parallel to ground level, unless out of round by 4 or more cm. In this case an average diameter is determined.
9. Diameters are adjusted for any missing bark, using a Department approved bark thickness table (Appendix S or T). The recorded diameter must reflect an outside bark measurement. Compilation of solid wood volume must account for bark thickness (ie. the net sample volume does not include bark).
10. Beyond 1.0 m diameter measurements are taken at 2.0 m increments to the last section and then at the top (ex. 3 m, 5 m, 7 m…..top). Caliper measurements are taken in same manner as step 8 and 9.
11. The diameter measurement at the top is taken at a point where the stem is not less than 8 cm (o.b.). The length of the last section is recorded to the nearest 0.1 m.
12. Volume is calculated by applying Smalians formula to each section of the stem (see Figure 31).

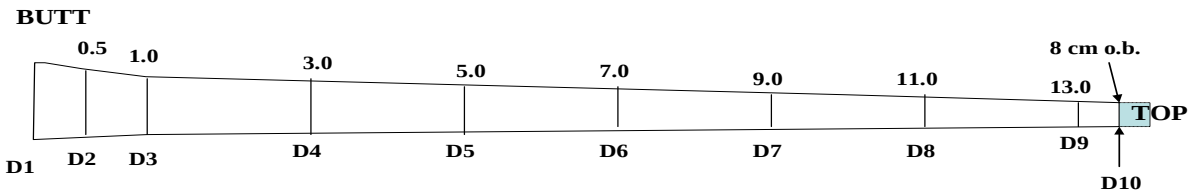


Figure 31. Stem analysis sections

7.4 Calculating Rot Deductions

There are two basic methods for calculating rot deductions.

For bolt type products, which are commonly stack measured, deductions are calculated based on a cylinder shape. The cylinder calculation is simply:

$$V(rot) = 0.00007854\ D^2 \times L \text{ (see Section 7.2)}$$

Stacked measure deduction tables incorporate rough wood factors which introduce associated bark and airspace volume with the deduction diameter (see Deductions m^3(st) section 3.3).

Where bolt type products are measured in samples, the deductions are also cylindrical, however rough wood factors are not applied, as the deductions are associated with solid content.

In the case of log deductions, a paraboloid cone shape is projected over the estimated length of the rot. A paraboloid cone shape can best be described as “bullet” shaped or a rounded cone. The calculation for this type of deduction is similar to above however a divisor of two (2) is applied as follows:

$$V(rot) = \frac{0.00007854\ D^2 \times L}{2}$$

Note: A perfect cone calculation uses a divisor of “3”

These calculations are incorporated in deduction tables and sampling procedures included in this manual.

7.5 Developing Cull Factors

Cull factors (or rot factors) are required for construction of treelength net volume tables and for development of treelength mass to volume conversions. A cull factor can be determined for a large population, such as a licence, or for a much smaller population, such as a block or load. The measurement procedure is the same, however the required intensity and volume per sample may vary, based on how the data will be applied and the confidence level required. Intensity and sample size shall be specified in scaling arrangements or contracts.

The procedure for measuring and compiling cull factor data is as follows:

1. Determine intensity of sample and sample size based on application.
2. Lay treelength samples out on skids in the sample yard with work space between each stem of 1.0 m.
3. Determine a gross scale of the sample, through the stem analysis procedure (see Section 7.3).
4. After a gross scale of the sample has been determined each stem is evaluated for rot.

5. If a stem has rot showing at the butt, sections are slashed each metre until the stem sounds. If rot is suspected further along the stem more isolated sectioning may be done to expose additional rot.
6. Rot volumes are calculated for each one metre section with rot. These rot volumes are calculated, based on the same formula applied to log defect deductions. Where rot is present on both ends of the one metre section, the rot length is one metre. In this case, a deduction is made for each end of the one metre piece. Where rot is showing on one end only, the rot is assumed to extend half the bolt length or 0.5 metres. If more than 50% of the sectioned piece volume is defective due to rot, a deduction is made for the entire section piece volume.
7. The volume of the rot expressed as a percentage of the gross scale of the sample is the cull factor. Where several samples are combined, all rot is combined and expressed as a percentage of the total gross scale.
8. Treelength pieces must be butted to eliminate cull material (only) prior to conducting the study.

7.6 Cube Scaling

The term “cube scaling” is used to define a technique whereby the solid cubic content of stacked primary forest products is determined and should not be confused with the term cubic metre scaling. Appendix A lists conversion factors, $m^3/m^3(st)$, for various products and length classes.

The solid cubic content, or m^3, of stacked products varies for a number of reasons, the most significant being:

1. Length of the primary forest product
2. Species
3. Average diameter of the bolts
4. Quality of preparation (knots)
5. Product type
6. Piling
7. Foreign material in piles

It is important that conversion factors are accurate. When primary forest products are sold or purchased in stacked form, there is an assumed m^3 content based on these factors.

The principles of “cubing” are the same for all stacked products, except for those products less than 2.44 m in length. In this case, measurements are only required on one side of the pile and length calculations are based on average bolt length, as opposed to half bolt lengths.

The steps to complete a cubing exercise are as follows:

Step 1: The solid content of every bolt in the pile is determined. This requires a diameter measurement of every bolt, on both sides of the pile. This will allow for gross solid content volume determination, based on projections of half-bolt volumes.

The diameter of each half-bolt is measured inside the bark by holding the scale stick in a consistent manner unless the bolt is out of round by 4 cm or more, in which case an average diameter is determined. The axis of the consistent scale stick measurements shall be recorded (ex. 45°). On butt ends with visible swell, the small butt diameter shall be recorded. In either case, the diameter is measured on a plane perpendicular to the longitudinal axis of the bolt in 2 cm units, the bolt is then marked to identify as tallied. If the diameter of a scaled piece coincides with the boundary between classes, that piece shall be measured and recorded as belonging to the lower class.

Once the diameter of every half bolt, on each side of the pile has been measured, they are totaled by diameter class, and multiplied by the volume per piece (1/2 bolt **V**) to determine total volume by diameter class. These volumes are totaled to determine the gross solid content of the pile. It is important to determine the average bolt length (and ½ bolt length) prior to compilation. Determine average bolt lengths (0.01 m) during taper adjustment, as follows.

A final adjustment shall be made to this gross solid content to account for taper, associated with butt pieces with visible swell. Without making this adjustment, solid volume may be overstated (or understated), as unadjusted calculations are based on perfectly even taper. This adjustment is referred to as a ***taper adjustment***.

The process to determine a taper adjustment is as follows:

Through a predetermined random selection process, identify a minimum of 25 pieces per sample for assessment (*NOTE: These pieces must be within a normal length range, as approved by the Regional Inspector*). These pieces, normally, situated on top of the pile, shall be individually measured for **V**. The individual piece volumes are totaled. Measure end diameters and lengths in 2 cm classes. End diameters shall be measured in the same manner applied to the sides of pile.

This process is repeated on the same pieces using the same dimension measurements, however on butt end pieces with visible swell, an additional measurement is taken at 1 m from the butt. This measurement, (1 cm class), shall be taken outside bark with a bark thickness factor applied (Appendix S or T) to ensure the volume calculation accounts for solid wood only. **V** is determined again for the pieces. Piece volumes, on which 1m taper measurements were taken, shall be calculated as two sections (see Figure 32).

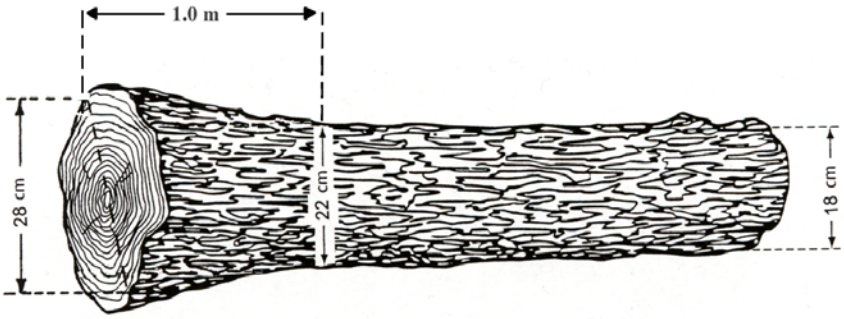


Figure 32. Taper measurement

The taper adjustment factor is determined as follows:

$$\text{Taper Adjustment Factor} = \frac{\text{V of Pieces (taper measurements taken)}}{\text{V of Pieces (no taper measurements taken)}}$$

Example: A full truckload of Softwood Studwood is "cubed"
Taper adjustment assessment done on 25 pieces
V of 25 pieces (no taper measurements taken) = 0.960 m^3
V of 25 pieces (taper measurements taken) = 0.944 m^3

$$\text{Taper Adjustment Factor} = \frac{0.944\ m^3}{0.960\ m^3}$$

Taper Adjustment Factor = 0.983

The taper adjustment factor shall be multiplied against the gross solid content of the pile to determine the ***taper adjusted solid content.***

Step 2: The gross pile content in m^3(st) is determined and calculated in exactly the same manner as described in Section 3.2. Deductions of voids are measured in exactly the same manner as described in Section 3.3.

For the purpose of "cube" scaling, no deductions are made for rot or cull bolts. All bolts, regardless of condition or presence of rot, occupy space.

Step 3: To determine the conversion factor, the following formula is applied:

$$\text{Conversion Factor} = \frac{\text{Taper Adjusted Solid Content of the Pile } m^3}{\text{Gross Pile Volume} - \text{Volume of Voids } m^3\text{(st)}}$$

Example: A pile of 2.50 m softwood pulpwood has been cube scaled.
Gross Pile Volume = 40.78 m^3(st)
Volume of Void Deductions = 0.142 m^3(st)
Taper Adjusted Solid Content of the Pile = 22.976 m^3

$$\text{Conversion Factor} = \frac{22.976\ m^3}{40.78 - 0.142\ m^3\text{(st)}}$$

$$= 0.5654\ m^3 / m^3\text{(st)}$$

Note: This factor is lower than the 2.50 m softwood pulpwood factor in Appendix A. The Appendix A factors are provincial averages.

7.7 Developing Mass to Volume Conversions

Where forest products are scaled in mass and converted to m^3, the procedures for conversion must be approved by the Department.

Mass may be converted to m^3 by:

1. Applying a Department approved provincial or zone conversion.
2. Applying a "rolling" conversion by operation based on sampling procedures approved by the Department.
3. Applying a fixed conversion(s) by operation based on historical sampling data, as approved by the Department.

The following **general procedures** shall apply to all sampling for mass conversions:

- Sampling procedures will be documented to the satisfaction of the Department in scaling arrangements.

- Samples are identified by a predetermined random or systematic selection process, at a frequency based on number of loads or tonnes, as per Table 1. Any variation from this frequency must be approved by the Department. Random selection systems, commonly computer applications, must be satisfactory to the Department.

- A designated section of the mill yard, approved by the Regional Inspector, shall be identified as the sample area.

- Skids are placed in sample area and all other timber including broken pieces must be removed before operation begins.

Table 1. Sample Frequencies

Anticipated Project Volume m^3	**Sample Frequency**	
	Loads	**tonnes**
≤ 5 000	5	150
5 000 - 20 000	10	300
20 000 +	25	750

- Loaded trucks are weighed and advised if a sample is to be removed. If a sample is to be taken, the truck then proceeds to sample area and unloads sample:

  a) The truck then returns to scales and is weighed again. The difference between this weight and the original weight is the mass of the sample, or;

  b) Another vehicle transports the sample to scales, is weighed and returns the sample. The empty vehicle is then re-weighed and the difference is the mass of the sample.

- Sample is placed on skids in a single tier with at least 1.0 m of clear space on all sides. Adequate room must be left between sample pieces to allow for accurate measuring.

- Each sample will contain a volume of not less than 5.0 m³. Larger sample volumes may be required by the Department depending on the application.

- All pieces of the weighed sample, exceeding 0.005 m3, must be measured and accounted for in the total volume calculation.

- In cases where an "off species" piece is present in the sample, there are two options that can be applied:

  a) Include mass and volume of piece(s) in sample, if small quantities of "off species" are representative of overall deliveries.

  b) Remove the piece(s) from both the mass and volume calculations. In this case the sample shall be reweighed after removing the "off species".

- Block Number (full), and Transportation Certificate number are marked on the first and last piece in each sample.

- Sample must remain intact for 48 hours after being scaled, except when scaled on Friday, Saturday or Sunday. These samples must remain intact for 72 hours.

- Mass conversions developed with blended sample data must be based on a "weighted average" of m³ volume and tonnes. In other words, the conversion factor is calculated as:

$$\frac{\text{total net m}^3\text{ of the samples}}{\text{total mass (tonnes) of the samples}}$$

- If sample results exceed a minimum or maximum range as per Table 2, then the sample must remain intact until released by a Department check scaler.

Table 2. Sample Ranges

Species	Summer		Winter	
	Min.	**Max.**	**Min.**	**Max.**
	net m³/ t	net m³/ t	net m³/ t	net m³/ t
Spruce, Fir, JP				
• Treelength	0.956	1.434	0.889	1.333
• Log	1.047	1.570	0.959	1.438
• Stud	0.988	1.482	0.893	1.339
• Pulp	0.937	1.405	0.807	1.210
Mixed Hardwood	0.795	1.193	0.710	1.066
Poplar	0.859	1.289	0.778	1.166

- Where operation based “rolling” conversions, are approved by the Department, one of the following compilation methods shall apply:

    a) apply sample data for previous four weeks to current pay period

    b) apply sample data for previous five samples to current pay period. If more than five samples are measured during pay period then all samples are used. Data greater than eight (8) weeks old shall not be used (dropped from the data set).

- All volume calculations must be compiled, in a manner consistent with this manual.

- Tally sheets, weight printouts, compilations and mass conversion summaries must be retained for future reference (5 years). Copies shall be forwarded to the local Department office and / or Regional Inspector, as requested.

The following methods are approved for determining m³ volume of samples as applied to mass conversions. The Minister may require variations from these methods, where abnormal wood conditions exist and volume determination may be adversely impacted without adjustment to procedures.

7.7.1 Method I – Stem Analysis

1. This method shall be used for volume determination of treelength products.
2. Apply Stem Analysis procedures (see Section 7.3).
3. A cull factor (see Section 7.5), if applicable, shall be applied against the gross volume to determine the net volume of the sample.

7.7.2 Method II – Log Analysis

1. This method may be used for volume determination of log products that are greater in length than 2.60 m.
2. Number each log at the large end.
3. Paint a spot on the top side of each log at the large end. This identifies the position of the log when measured by the scaler.
4. Measure total length of log, to nearest 0.1 m.
5. The length of a piece shall be the distance between two planes perpendicular to the longitudinal axis of the piece and situated at the geometric center of the end faces.
6. The average diameter of the large end of each log is measured, inside bark, in 2 cm class. On butt cut logs, the smallest butt diameter is measured.

7. Measure diameters, outside bark parallel to ground level, at 0.5 and 1.0 m from the large end and then for the remaining length of the log in 1.0 m increments. If the log is out of round by 4 cm or more, then an average diameter is recorded. These diameter measurements are recorded in 1 cm classes.
8. Measure diameter at the top end, outside bark, and record the length of the last section to the nearest 0.1 m.
9. Diameters are adjusted for any missing bark, using a Department approved bark thickness table (Appendix S or T). The recorded diameter must reflect an outside bark measurement. Compilation of solid wood volume must account for bark thickness (ie. the net sample volume does not include bark).
10. Solid wood volumes are calculated using Smalians formula for each section of log (see Figure 33), as measured (ie. butt section, mid sections and top section).
11. Rot deductions will be applied consistent with the cubic metre log scale deduction table (Appendix L). No deductions are made for log form.
12. The gross solid wood volume of the logs (the volume sum of the sections) minus rot deductions shall be the net volume of the sample.

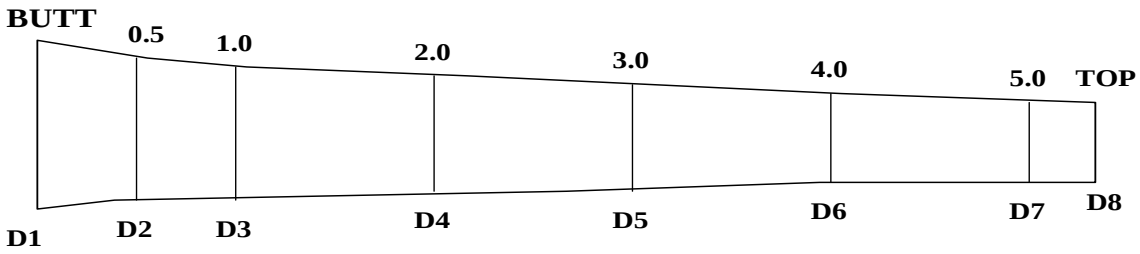


Figure 33. Log analysis sections

7.7.3 Method III – Log / Pulp Sample

1. This method may be used for volume determination of pulp, studwood, OSB, or log products, regardless of length.
2. Number each piece at one end or in cases where the sample exceeds 50 pieces number each 5th piece and ensure order is not disturbed prior to a check scale, if applicable.
3. Paint a spot on the top side of each piece at the numbered end. This identifies the position of the piece when measured by the scaler.

4. The length of each piece shall be measured by a 2 cm class.
5. The length of a piece shall be the distance between two planes perpendicular to the longitudinal axis of the piece and situated at the geometric center of the end faces.
6. If one end of the bolt is broken leaving an irregular end surface, the length is measured to the point where the first full diameter measurement is attainable, averaging the length of the broken section.
7. Diameters of both ends are measured on a plane perpendicular to the longitudinal axis of the piece by a 2 cm class.
8. Diameters are measured, inside bark, by holding the scale stick in a consistent manner (not vertical or horizontal) unless the log is out of round by 4 cm or more, in which case an average diameter is determined. However, on butt cut pieces with visible swell, the smallest butt diameter shall be measured. The axis of the consistent scale stick measurements shall be recorded (45° recommended).
9. An additional diameter will be measured at 1.0 m from butt, to incorporate a taper adjustment on butt cut pieces with visible swell. This caliper measurement will be taken parallel to ground level, unless the log is out of round by 4 cm or more, in which case, an average diameter is determined.
10. Taper diameters at 1.0 m will be measured in 1 cm classes.
11. Taper diameters at 1.0 m are taken outside bark and adjusted for any missing bark, using a Department approved bark thickness table (Appendix S or T). Compilation of solid wood volume must account for bark thickness (ie. the net sample volume does not include bark).
12. End diameters less than 8 cm class are measured and deducted as ½ bolt defects.
13. For samples of bolt type products (pulp, OSB, and studwood), rot deduction volumes shall be based on a cylindrical shape projected from the end rot diameter for the half bolt length. Rough wood factors are <u>not</u> applied. Reference Section 3.3, for defect measurement procedures.
14. For samples of all log products, rot deductions shall be made in a manner consistent with log deductions (see Appendix N). When rot exceeds 50% of gross volume, the log is culled and should not be included in volume compilations.
15. Deductions are not allowed for form defects.
16. Solid wood volumes are calculated for each piece based on Smalians formula using end diameters and length measurements. Where taper measurements are taken, the piece volume is based on two sections (butt to 1.0 m and 1.0 m to top end). Rot deductions are made on a piece basis to determine net piece volumes. The sum of the net piece volumes shall be the net volume of the sample.

7.7.4 Method IV – Piled Sample

1. This method may be used for piled bolt products such as pulp, OSB, or studwood. Generally, a full truckload is piled down for measurement; however partial loads exceeding 5 m^3 may also be measured by this method if approved by the Department.
2. Sample load intensity, may be adjusted outside the frequency as per Table 1, at the discretion of the Regional Inspector. This would be a particular consideration for full load samples.
3. Reference procedures for "*Cube Scaling, Section 7.6 – Step 1*" to determine the gross taper adjusted solid wood volume of the pile.
4. Rot and undersize deductions shall then be determined by measuring all rot defects and undersize on both sides of the pile. The rot and undersize deduction volumes shall be based on a cylindrical shape projected from the end diameter for the half bolt length. Rough wood factors are not applied. (note: reference Section 3.3 for defect measurement procedures).
5. The gross taper adjusted solid volume of the sample minus deduction volumes shall be the net taper adjusted volume. This shall be the net volume of the sample.

7.7.5 Method V - Water Displacement

1. This method may be used to measure any products however applications, to date, have been restricted to bolt type products.
2. Selected sample loads, held in a loader grapple, are immersed in a displacement tank equipped with an electronic level transmitter. The grapple is lowered into the water to a predetermined (marked) point on the grapple assembly.
3. The gross sample volume is equal to the measured displacement of water in m^3, minus m^3 displacement associated with grapple equipment (predetermined).
4. Following the displacement procedure, the sample is placed on skids to allow for measurement of rot (that displaces water) and undersize, as well as missing bark.
5. The gross sample volume is reduced by a bark percentage ratio, under procedures approved by the Department.
6. Deductions for rot and undersize are determined by measurement procedures, as defined in 7.7.3 Method III - Log / Pulp Sample.
7. The gross sample volume minus deductions for bark, rot, and undersize shall be the net sample volume.

Note: Consultation with the Department on site specific procedures is required.

7.7.6 Method VI – Woodchips

The mass of woodchips may be converted to m³ volume using Department approved sampling and conversion procedures including:

- sampling for *moisture content* (oven dry percentage)
- sampling for bark content
- use of conversions of oven dry wood to m³, applied on a species (or species group) basis

1. Moisture Content Sampling (oven dry percentage) - the mass of wood chips is reduced to *ovendry* mass after being sampled for moisture content. The sample shall be representative of the population and drawn in a random manner at an approved intensity. The minimum mass of the sample shall be 250 g. At all times the sample shall be stored and handled with precautions necessary to prevent changing its characteristics. In order to ensure that there is no loss or gain of moisture from the sample between the time of sampling and weighing, each sample shall be placed in an airtight container, such as a polyethylene bag, and tightly sealed. The sample must be kept sheltered and cool. The sample shall be transferred to a drying pan and placed in an oven at 103 +/- 2° C. The sample shall be dried until it reaches a constant mass. This normally takes 20 hours. The mass of the dried sample (g) divided by the mass of the sample (g) before drying gives the oven dry percentage. The delivered mass of wood chips, on a load basis, is multiplied by this percentage to express the oven dry mass of the load.
2. Bark Content – bark is an acceptable deduction in wood chips. The sample shall be representative of the population and drawn in a random manner at an approved intensity. The minimum mass of the sample shall be 800 g. The sample (g) shall be weighed prior to removal of bark and then placed on a clean dry table. Bark is removed from the sample. This includes loose bark, as well as bark removed from wood chips. The mass of the collected bark from the sample (g) divided by the gross sample weight (g) gives the bark percentage. A bark deduction can be made by reducing the mass of load(s) by the bark percentage. An alternative method involves incorporating the bark reduction in the conversion of oven dry mass to m³ (consult the Department).
3. Loads expressed in oven dry mass can be converted to m³ using conversions of m³ per oven dry tonne. The conversions currently approved by the Department are based on published forest research which specifies relative densities of the wood of native tree species. These conversions are subject to refinement as more data becomes available. Consult the Department regarding acceptable sampling procedures to determine relative densities.

APPENDIX / ANNEXE A

STACKED MEASURE CONVERSION FACTORS / FACTEURS DE CONVERSION POUR MEASURE APPARENT

PRODUCT/PRODUIT	LENGTH CLASS / CATÉGORIE DE LONGUEUR	m^3/m^3(st) m^3/m^3(app)	** m^3(st)/ m^3 m^3(app)/ m^3
SOFTWOOD PULPWOOD /	1.22 m (R/B)*	0.6641	1.5058
BOIS À PÂTE RÉSINEUX	2.50 m (R/B)	0.5836	1.7135
(except cedar / sauf le cèdre)			
CEDAR SAWLOGS /	1.26 m (R/B)	0.6250	1.6000
BILLES DE CÈDRE	1.92 m (R/B)	0.5938	1.6841
	2.54 m (R/B)	0.5625	1.7778
	3.14 m (R/B)	0.5500	1.8182
MIXED HARDWOOD PULPWOOD /	1.22 m (R/B)	0.5469	1.8285
BOIS À PÂTE FEUILLU MÉLANGÉ	2.50 m (R/B)	0.5078	1.9693
(except poplar / sauf le peuplier)			
POPLAR PULPWOOD /	1.22 m (R/B)	0.6641	1.5058
BOIS À PÂTE DE PEUPLIER	2.50 m (R/B)	0.6094	1.6410
STUDWOOD/LATHWOOD /	2.54 m (R/B)	0.6328	1.5803
BOIS DE COLOMBAGE / LATTE DE	2.84 m (R/B)	0.6203	1.6121
BOIS	3.14 m (R/B)	0.6099	1.6396
LATHWOOD / LATTE DE BOIS	1.26 m (R/B)	0.6641	1.5058
SPOOLWOOD / BOIS À FUSEAUX	1.26 m (R/B)	0.6641	1.5058
(white birch/bouleau blanc)	2.54 m (R/B)	0.5836	1.7135
VENEER / BOIS À PLAQUER			
Softwood/résineux	2.60 m (R/B)	0.6855	1.4588
Poplar/peuplier	2.60 m (R/B)	0.6944	1.4401

* R = rough B = brut

** Rough Wood Factor / Facteur de conversion du bois brut

Above conversion factors are provincial averages /
Les facteurs de conversion ci-dessus sont les facteurs moyens utilisés dans la province

APPENDIX / ANNEXE B

DEDUCTION TABLE / TABLE DE DÉDUCTION
2.50 m ROUGH SOFTWOOD PULPWOOD / BOIS À PÂTE RÉSINEUX À L'ÉTAT BRUT DE 2,50 m

Formula: $m^3(st) = A \times L \times$ Rough Wood Factor
$= (0.000\ 078\ 540)D^2 \times 1.25 \times 1.713\ 5$
Formule: $m^3(app) =$ A x L x Facteur de conversion du bois brut
$= (0{,}000\ 078\ 540)D^2 \times 1{,}25 \times 1{,}713\ 5$

TABLE SHOWING CONTENTS OF PULPWOOD BOLTS BY DIAMETER IN STACKED CUBIC METRES
(applicable to stacked 2.50 m Rough Softwood Pulpwood) /
TABLE MONTRANT LE CONTENU DES BILLOTS DE BOIS À PÂTE À L'ÉTAT BRUT
PAR DIAMÈTRE EN MÈTRES CUBES APPARENTS
(applicable au bois à pâte résineux empilé à l'état brut de 2,50 m)

Diameter of Defect or Void/Diamètre du défaut ou de l'espace vide (cm)	NUMBER OF PIECES / NOMBRE DE PIÈCES									
	1	2	3	4	5	6	7	8	9	10
	CONTENTS IN STACKED CUBIC METRES / CONTENU EN MÈTRES CUBES APPARENTS									
4	0.003	0.005	0.008	0.011	0.013	0.016	0.019	0.022	0.024	0.027
6	0.006	0.012	0.018	0.024	0.030	0.036	0.042	0.048	0.055	0.061
8	0.011	0.022	0.032	0.043	0.054	0.065	0.075	0.086	0.097	0.108
10	0.017	0.034	0.050	0.067	0.084	0.101	0.118	0.135	0.151	0.168
12	0.024	0.048	0.073	0.097	0.121	0.145	0.170	0.194	0.218	0.242
14	0.033	0.066	0.099	0.132	0.165	0.198	0.231	0.264	0.297	0.330
16	0.043	0.086	0.129	0.172	0.215	0.258	0.301	0.345	0.388	0.431
18	0.055	0.109	0.164	0.218	0.273	0.327	0.382	0.436	0.491	0.545
20	0.067	0.135	0.202	0.269	0.336	0.404	0.471	0.538	0.606	0.673
22	0.081	0.163	0.244	0.326	0.407	0.489	0.570	0.651	0.733	0.814
24	0.097	0.194	0.291	0.388	0.484	0.581	0.678	0.775	0.872	0.969
26	0.114	0.227	0.341	0.455	0.569	0.682	0.796	0.910	1.023	1.137
28	0.132	0.264	0.396	0.528	0.659	0.791	0.923	1.055	1.187	1.319
30	0.151	0.303	0.454	0.606	0.757	0.908	1.060	1.211	1.363	1.514
32	0.172	0.345	0.516	0.689	0.861	1.034	1.206	1.378	1.550	1.723
34	0.194	0.389	0.583	0.779	0.972	1.167	1.361	1.556	1.750	1.945
36	0.218	0.436	0.654	0.872	1.090	1.308	1.526	1.744	1.962	2.180
38	0.243	0.486	0.729	0.972	1.214	1.457	1.700	1.943	2.186	2.429
40	0.269	0.538	0.807	1.077	1.346	1.615	1.884	2.153	2.422	2.692
42	0.297	0.593	0.890	1.187	1.484	1.780	2.077	2.374	2.671	2.967
44	0.326	0.651	0.977	1.303	1.628	1.954	2.280	2.605	2.931	3.257
46	0.356	0.712	1.068	1.424	1.780	2.136	2.492	2.848	3.204	3.560
48	0.388	0.775	1.163	1.550	1.938	2.326	2.713	3.101	3.488	3.876
50	0.421	0.841	1.262	1.682	2.103	2.523	2.944	3.364	3.785	4.206
52	0.455	0.910	1.365	1.819	2.274	2.729	3.184	3.639	4.094	4.549
54	0.491	0.981	1.472	1.962	2.453	2.943	3.434	3.924	4.415	4.905
56	0.528	1.055	1.583	2.110	2.638	3.165	3.693	4.220	4.748	5.275
58	0.566	1.132	1.698	2.264	2.830	3.395	3.961	4.527	5.093	5.659
60	0.606	1.211	1.817	2.422	3.028	3.634	4.239	4.845	5.450	6.056

APPENDIX / ANNEXE C

DEDUCTION TABLE / TABLE DE DÉDUCTION
2.50 m ROUGH MIXED HARDWOOD PULPWOOD / BOIS À PÂTE FEUILLU MÉLANGÉ
À L'ÉTAT BRUT DE 2,50 m

Formula: m^3(st) = A x L x Rough Wood Factor
= (0.000 078 540)D^2 x 1.25 x 1.969 3
Formule: m^3(app) = A x L x Facteur de conversion du bois brut
= (0,000 078 540)D^2 x 1,25 x 1,969 3

TABLE SHOWING CONTENTS OF PULPWOOD BOLTS BY DIAMETER IN STACKED CUBIC METRES
(applicable to stacked 2.50 m Rough Mixed Hardwood Pulpwood) /
TABLE MONTRANT LE CONTENU DES BILLOTS DE BOIS PAR DIAMÈTRE
EN MÈTRES CUBES APPARENTS
(applicable au bois à pâte feuillu mélangé à l'état brut de 2,50 m)

Diameter of Defect or Void/Diamètre du défaut ou de l'espace vide (cm)	NUMBER OF PIECES / NOMBRE DE PIÈCES									
	1	2	3	4	5	6	7	8	9	10
	CONTENTS IN STACKED CUBIC METRES / CONTENU EN MÈTRES CUBES APPARENTS									
4	0.003	0.006	0.009	0.012	0.015	0.019	0.022	0.025	0.028	0.031
6	0.007	0.014	0.021	0.028	0.035	0.042	0.049	0.056	0.063	0.070
8	0.012	0.025	0.037	0.049	0.062	0.074	0.087	0.099	0.111	0.124
10	0.019	0.039	0.058	0.077	0.097	0.116	0.135	0.155	0.174	0.193
12	0.028	0.056	0.084	0.111	0.139	0.167	0.195	0.223	0.251	0.278
14	0.038	0.076	0.114	0.152	0.189	0.227	0.265	0.303	0.341	0.379
16	0.050	0.099	0.148	0.198	0.247	0.297	0.346	0.396	0.445	0.495
18	0.063	0.125	0.188	0.251	0.313	0.376	0.438	0.501	0.564	0.626
20	0.077	0.155	0.232	0.309	0.387	0.464	0.541	0.619	0.696	0.773
22	0.094	0.187	0.281	0.374	0.468	0.561	0.655	0.749	0.842	0.936
24	0.111	0.223	0.334	0.445	0.557	0.668	0.780	0.891	1.002	1.114
26	0.131	0.261	0.392	0.523	0.653	0.784	0.915	1.046	1.176	1.307
28	0.152	0.303	0.455	0.606	0.758	0.909	1.061	1.213	1.364	1.516
30	0.174	0.348	0.522	0.696	0.870	1.044	1.218	1.392	1.566	1.740
32	0.198	0.396	0.594	0.792	0.990	1.188	1.386	1.584	1.782	1.980
34	0.223	0.447	0.670	0.894	1.117	1.341	1.564	1.788	2.011	2.235
36	0.251	0.501	0.752	1.002	1.253	1.503	1.754	2.005	2.255	2.506
38	0.279	0.558	0.838	1.117	1.396	1.675	1.954	2.233	2.513	2.792
40	0.309	0.619	0.928	1.237	1.547	1.856	2.165	2.474	2.784	3.093
42	0.341	0.682	1.023	1.364	1.705	2.046	2.387	2.728	3.069	3.410
44	0.374	0.749	1.123	1.497	1.871	2.246	2.620	2.994	3.369	3.743
46	0.409	0.818	1.227	1.636	2.045	2.455	2.863	3.273	3.682	4.091
48	0.445	0.891	1.336	1.782	2.227	2.673	3.118	3.564	4.009	4.454
50	0.483	0.967	1.450	1.933	2.417	2.900	3.383	3.867	4.350	4.833
52	0.523	1.046	1.568	2.091	2.614	3.137	3.659	4.182	4.705	5.228
54	0.564	1.128	1.691	2.255	2.819	3.383	3.946	4.510	5.074	5.638
56	0.606	1.213	1.819	2.425	3.032	3.638	4.244	4.850	5.457	6.063
58	0.650	1.301	1.951	2.602	3.252	3.902	4.553	5.203	5.853	6.504
60	0.696	1.392	2.088	2.784	3.480	4.176	4.872	5.568	6.264	6.960

APPENDIX / ANNEXE D

DEDUCTION TABLE / TABLE DE DÉDUCTION
2.54 m ROUGH CEDAR STUDWOOD / BOIS DE COLOMBAGE DE CÈDRE À L'ÉTAT BRUT DE 2,54 m

Formula: m^3(st) = A x L x Rough Wood Factor
= (0.000 078 540)D^2 x 1.27 x 1.7778
Formule: m^3(app) = A x L x Facteur de conversion du bois brut
= (0,000 078 540)D^2 x 1,27 x 1,7778

TABLE SHOWING CONTENTS OF STUDWOOD BOLTS BY DIAMETER IN STACKED CUBIC METRES
(applicable to stacked 2.54 m Rough Cedar Studwood) /
TABLEAU MONTRANT LE CONTENU DE BOIS DE COLOMBAGE À L'ÉTAT BRUT
PAR DIAMÈTRE EN MÈTRES CUBES APPARENTS
(applicable au bois de colombage de cèdre empilé à l'état brut de 2,54 m)

Diameter of Defect or Void/Diamètre du défaut ou de l'espace vide (cm)	NUMBER OF PIECES / NOMBRE DE PIÈCES									
	1	2	3	4	5	6	7	8	9	10
	CONTENTS IN STACKED CUBIC METRES / CONTENU EN MÈTRES CUBES APPARENTS									
4	0.003	0.006	0.009	0.011	0.014	0.017	0.020	0.023	0.026	0.028
6	0.006	0.013	0.019	0.026	0.032	0.038	0.045	0.051	0.057	0.064
8	0.011	0.023	0.034	0.045	0.057	0.068	0.079	0.091	0.102	0.113
10	0.018	0.035	0.053	0.071	0.089	0.106	0.124	0.142	0.160	0.177
12	0.026	0.051	0.077	0.102	0.128	0.153	0.179	0.204	0.230	0.255
14	0.035	0.070	0.104	0.139	0.174	0.209	0.243	0.278	0.313	0.348
16	0.045	0.091	0.136	0.182	0.227	0.272	0.318	0.363	0.409	0.454
18	0.057	0.115	0.172	0.230	0.287	0.345	0.402	0.460	0.517	0.575
20	0.071	0.142	0.213	0.284	0.355	0.426	0.497	0.567	0.638	0.709
22	0.086	0.172	0.257	0.343	0.429	0.515	0.601	0.687	0.772	0.858
24	0.102	0.204	0.306	0.409	0.511	0.613	0.715	0.817	0.919	1.021
26	0.120	0.240	0.360	0.480	0.599	0.719	0.839	0.959	1.079	1.199
28	0.139	0.278	0.417	0.556	0.695	0.834	0.973	1.112	1.251	1.390
30	0.160	0.319	0.479	0.638	0.798	0.958	1.117	1.277	1.436	1.596
32	0.182	0.363	0.545	0.726	0.908	1.090	1.271	1.453	1.634	1.816
34	0.205	0.410	0.615	0.820	1.025	1.230	1.435	1.640	1.845	2.050
36	0.230	0.460	0.689	0.919	1.149	1.379	1.609	1.839	2.068	2.298
38	0.256	0.512	0.768	1.024	1.280	1.536	1.792	2.048	2.305	2.561
40	0.284	0.567	0.851	1.135	1.419	1.702	1.986	2.270	2.554	2.837
42	0.313	0.626	0.938	1.251	1.564	1.877	2.190	2.502	2.815	3.128
44	0.343	0.687	1.030	1.373	1.717	2.060	2.403	2.746	3.090	3.433
46	0.375	0.750	1.126	1.501	1.876	2.251	2.627	3.002	3.377	3.752
48	0.409	0.817	1.226	1.634	2.043	2.451	2.860	3.269	3.677	4.086
50	0.443	0.887	1.330	1.773	2.217	2.660	3.103	3.547	3.990	4.433
52	0.480	0.959	1.438	1.918	2.397	2.877	3.356	3.836	4.315	4.795
54	0.517	1.034	1.551	2.068	2.585	3.103	3.620	4.137	4.654	5.171
56	0.556	1.112	1.668	2.224	2.781	3.337	3.893	4.449	5.005	5.561
58	0.597	1.193	1.790	2.386	2.983	3.579	4.176	4.772	5.369	5.965
60	0.638	1.277	1.915	2.554	3.192	3.830	4.469	5.107	5.745	6.384

APPENDIX / ANNEXE E

DEDUCTION TABLE / TABLE DE DÉDUCTION
1.22 m ROUGH SOFTWOOD PULPWOOD / BOIS À PÂTE DE RÉSINEUX À L'ÉTAT BRUT DE 1,22 m

Formula: $m^3(st) = A \times L \times$ Rough Wood Factor
$= (0.000\ 078\ 540)D^2 \times 1.22 \times 1.505\ 8$
Formule: $m^3(app) =$ A x L x Facteur de conversion du bois brut
$= (0{,}000\ 078\ 540)D^2 \times 1{,}22 \times 1{,}505\ 8$

TABLE SHOWING CONTENTS OF PULPWOOD BOLTS BY DIAMETER IN STACKED CUBIC METRES
(applicable to stacked 1.22 m Rough Softwood Pulpwood) /
TABLEAU MONTRANT LE CONTENU DES BILLOTS DE BOIS À PÂTE À L'ÉTAT BRUT
PAR DIAMÈTRE EN MÈTRES CUBES APPARENTS
(applicable au bois à pâte résineux empilé à l'état brut de 1,22 m)

Diameter of Defect or Void/Diamètre du défaut ou de l'espace vide (cm)	NUMBER OF PIECES / NOMBRE DE PIÈCES									
	1	2	3	4	5	6	7	8	9	10
	CONTENTS IN STACKED CUBIC METRES / CONTENU EN MÈTRES CUBES APPARENTS									
4	0.002	0.005	0.007	0.009	0.012	0.014	0.016	0.018	0.021	0.023
6	0.005	0.010	0.016	0.021	0.026	0.031	0.036	0.042	0.047	0.052
8	0.009	0.018	0.028	0.037	0.046	0.055	0.064	0.074	0.083	0.092
10	0.014	0.029	0.043	0.058	0.072	0.086	0.101	0.115	0.130	0.144
12	0.021	0.042	0.062	0.083	0.104	0.125	0.146	0.166	0.187	0.208
14	0.028	0.057	0.085	0.113	0.142	0.170	0.198	0.226	0.255	0.283
16	0.037	0.074	0.111	0.148	0.184	0.221	0.258	0.295	0.332	0.369
18	0.047	0.093	0.140	0.187	0.234	0.280	0.327	0.374	0.420	0.467
20	0.058	0.115	0.173	0.231	0.288	0.346	0.404	0.462	0.519	0.577
22	0.070	0.140	0.209	0.279	0.349	0.419	0.489	0.558	0.628	0.698
24	0.083	0.166	0.249	0.332	0.416	0.499	0.582	0.665	0.748	0.831
26	0.098	0.195	0.292	0.390	0.488	0.585	0.682	0.780	0.878	0.975
28	0.113	0.226	0.339	0.452	0.566	0.679	0.792	0.905	1.018	1.131
30	0.130	0.260	0.390	0.520	0.650	0.779	0.909	1.039	1.169	1.299
32	0.148	0.295	0.443	0.591	0.738	0.886	1.034	1.182	1.329	1.477
34	0.167	0.334	0.500	0.667	0.834	1.001	1.168	1.334	1.501	1.668
36	0.187	0.374	0.561	0.748	0.935	1.122	1.309	1.496	1.683	1.870
38	0.208	0.417	0.625	0.833	1.042	1.250	1.458	1.666	1.875	2.083
40	0.231	0.462	0.693	0.924	1.154	1.385	1.616	1.847	2.078	2.309
42	0.254	0.509	0.764	1.018	1.272	1.527	1.782	2.036	2.290	2.545
44	0.279	0.559	0.838	1.117	1.396	1.676	1.955	2.234	2.514	2.793
46	0.305	0.611	0.916	1.221	1.526	1.832	2.137	2.442	2.748	3.053
48	0.332	0.665	0.997	1.330	1.662	1.994	2.327	2.659	2.992	3.324
50	0.361	0.721	1.082	1.443	1.804	2.164	2.525	2.886	3.246	3.607
52	0.390	0.780	1.170	1.560	1.950	2.341	2.731	3.121	3.511	3.901
54	0.421	0.841	1.262	1.683	2.104	2.524	2.945	3.366	3.786	4.207
56	0.452	0.905	1.358	1.810	2.262	2.715	3.168	3.620	4.072	4.525
58	0.485	0.971	1.456	1.942	2.427	2.912	3.398	3.883	4.369	4.854
60	0.519	1.039	1.558	2.078	2.597	3.116	3.636	4.155	4.675	5.194

APPENDIX / ANNEXE F

DEDUCTION TABLE / TABLE DE DÉDUCTION
2.50 m ROUGH POPLAR PULPWOOD / BOIS À PÂTE DE PEUPLIER À L'ÉTAT BRUT DE 2,50 m

Formula: $m^3(st)$ = A x L x Rough Wood Factor
= (0.000 078 540)D^2 x 1.25 x 1.6410
Formule: $m^3(app)$ = A x L x Facteur de conversion du bois brut
= (0,000 078 540)D^2 x 1,25 x 1,6410

TABLE SHOWING CONTENTS OF PULPWOOD BOLTS BY DIAMETER IN STACKED CUBIC METRES
(applicable to stacked 2.50 m Rough Poplar Pulpwood) /
TABLEAU MONTRANT LE CONTENU DES BILLOTS DE BOIS À PÂTE À L'ÉTAT BRUT
PAR DIAMÈTRE EN MÈTRES CUBES APPARENTS
(applicable au bois à pâte de peuplier empilé à l'état brut de 2,50 m)

Diameter of Defect or Void/Diamètre du défaut ou de l'espace vide (cm)	NUMBER OF PIECES / NOMBRE DE PIÈCES									
	1	2	3	4	5	6	7	8	9	10
	CONTENTS IN STACKED CUBIC METRES / CONTENU EN MÈTRES CUBES APPARENTS									
4	0.003	0.005	0.008	0.010	0.013	0.015	0.018	0.021	0.023	0.026
6	0.006	0.012	0.017	0.023	0.029	0.035	0.041	0.046	0.052	0.058
8	0.010	0.021	0.031	0.041	0.052	0.062	0.072	0.082	0.093	0.103
10	0.016	0.032	0.048	0.064	0.081	0.097	0.113	0.129	0.145	0.161
12	0.023	0.046	0.070	0.093	0.116	0.139	0.162	0.186	0.209	0.232
14	0.032	0.063	0.095	0.126	0.158	0.189	0.221	0.253	0.284	0.316
16	0.041	0.082	0.124	0.165	0.206	0.247	0.289	0.330	0.371	0.412
18	0.052	0.104	0.157	0.209	0.261	0.313	0.365	0.418	0.470	0.522
20	0.064	0.129	0.193	0.258	0.322	0.387	0.451	0.516	0.580	0.644
22	0.078	0.156	0.234	0.312	0.390	0.468	0.546	0.624	0.702	0.780
24	0.093	0.186	0.278	0.371	0.464	0.557	0.650	0.742	0.835	0.928
26	0.108	0.218	0.327	0.436	0.545	0.653	0.762	0.871	0.980	1.089
28	0.126	0.253	0.379	0.505	0.632	0.758	0.884	1.010	1.137	1.263
30	0.145	0.290	0.435	0.580	0.725	0.870	1.015	1.160	1.305	1.450
32	0.165	0.330	0.495	0.660	0.825	0.990	1.155	1.320	1.485	1.650
34	0.186	0.372	0.559	0.745	0.931	1.117	1.304	1.490	1.676	1.862
36	0.209	0.418	0.626	0.835	1.044	1.253	1.462	1.670	1.879	2.088
38	0.233	0.465	0.698	0.931	1.163	1.396	1.628	1.861	2.094	2.326
40	0.258	0.516	0.773	1.031	1.289	1.547	1.804	2.062	2.320	2.578
42	0.284	0.568	0.853	1.137	1.421	1.705	1.989	2.274	2.558	2.842
44	0.312	0.624	0.936	1.248	1.559	1.871	2.183	2.495	2.807	3.119
46	0.341	0.682	1.023	1.364	1.704	2.045	2.386	2.727	3.068	3.409
48	0.371	0.742	1.114	1.485	1.856	2.227	2.598	2.969	3.341	3.712
50	0.403	0.806	1.208	1.611	2.014	2.417	2.819	3.222	3.625	4.028
52	0.436	0.871	1.307	1.743	2.178	2.614	3.049	3.485	3.921	4.356
54	0.470	0.940	1.409	1.879	2.349	2.819	3.288	3.758	4.228	4.698
56	0.505	1.010	1.516	2.021	2.526	3.031	3.537	4.042	4.547	5.052
58	0.542	1.084	1.626	2.168	2.710	3.252	3.794	4.336	4.878	5.420
60	0.580	1.160	1.740	2.320	2.900	3.480	4.060	4.640	5.220	5.800

APPENDIX / ANNEXE G

DEDUCTION TABLE / TABLE DE DÉDUCTION
1.22 m ROUGH MIXED HARDWOOD PULPWOOD / BOIS À PÂTE FEUILLU MÉLANGÉ
À L'ÉTAT BRUT DE 1,22 m

Formula: m^3(st) = A x L x Rough Wood Factor
= (0.000 078 540)D^2 x 1.22 x 1.828 5
Formule: m^3(app) = A x L x Facteur de conversion du bois brut
= (0,000 078 540)D^2 x 1,22 x 1,828 5

TABLE SHOWING CONTENTS OF PULPWOOD BOLTS BY DIAMETER IN STACKED CUBIC METRES
(applicable to stacked 1.22 m Rough Mixed Hardwood Pulpwood) /
TABLE MONTRANT LE CONTENU DES BILLOTS DE BOIS PAR DIAMÈTRE
EN MÈTRES CUBES APPARENTS
(applicable au bois à pâte feuillu mélangé à l'état brut de 1,22 m)

Diameter of Defect or Void/Diamètre du défaut ou de l'espace vide (cm)	NUMBER OF PIECES / NOMBRE DE PIÈCES									
	1	2	3	4	5	6	7	8	9	10
	CONTENTS IN STACKED CUBIC METRES / CONTENU EN MÈTRES CUBES APPARENTS									
4	0.003	0.006	0.008	0.011	0.014	0.017	0.020	0.022	0.025	0.028
6	0.006	0.013	0.019	0.025	0.032	0.038	0.044	0.050	0.057	0.063
8	0.011	0.022	0.034	0.045	0.056	0.067	0.078	0.090	0.101	0.112
10	0.018	0.035	0.053	0.070	0.088	0.105	0.123	0.140	0.158	0.175
12	0.025	0.050	0.076	0.101	0.126	0.151	0.177	0.202	0.227	0.252
14	0.034	0.069	0.103	0.137	0.172	0.206	0.240	0.275	0.309	0.343
16	0.045	0.090	0.135	0.179	0.224	0.269	0.314	0.359	0.404	0.448
18	0.057	0.114	0.170	0.227	0.284	0.341	0.398	0.454	0.511	0.568
20	0.070	0.140	0.210	0.280	0.350	0.420	0.491	0.561	0.631	0.701
22	0.085	0.170	0.254	0.339	0.424	0.509	0.594	0.678	0.763	0.848
24	0.101	0.202	0.303	0.404	0.504	0.606	0.706	0.807	0.908	1.009
26	0.118	0.237	0.355	0.474	0.592	0.711	0.829	0.948	1.066	1.184
28	0.137	0.275	0.412	0.549	0.687	0.824	0.962	1.099	1.236	1.374
30	0.158	0.315	0.473	0.631	0.788	0.946	1.104	1.262	1.419	1.577
32	0.179	0.359	0.538	0.718	0.897	1.076	1.256	1.435	1.615	1.794
34	0.202	0.405	0.608	0.810	1.013	1.215	1.418	1.620	1.823	2.025
36	0.227	0.454	0.681	0.908	1.135	1.362	1.590	1.816	2.044	2.271
38	0.253	0.506	0.759	1.012	1.265	1.518	1.771	2.024	2.277	2.530
40	0.280	0.561	0.841	1.121	1.402	1.682	1.962	2.243	2.523	2.803
42	0.309	0.618	0.927	1.236	1.545	1.854	2.163	2.472	2.782	3.091
44	0.339	0.678	1.018	1.357	1.696	2.035	2.374	2.714	3.053	3.392
46	0.371	0.742	1.112	1.483	1.854	2.224	2.595	2.966	3.337	3.707
48	0.404	0.807	1.211	1.615	2.018	2.422	2.826	3.229	3.633	4.037
50	0.438	0.876	1.314	1.752	2.190	2.628	3.066	3.504	3.942	4.380
52	0.474	0.948	1.421	1.895	2.369	2.842	3.316	3.790	4.264	4.738
54	0.511	1.022	1.533	2.044	2.554	3.065	3.576	4.087	4.598	5.109
56	0.549	1.099	1.648	2.198	2.747	3.297	3.846	4.396	4.945	5.494
58	0.589	1.179	1.768	2.358	2.947	3.536	4.126	4.715	5.304	5.894
60	0.631	1.262	1.892	2.523	3.154	3.784	4.415	5.046	5.677	6.307

APPENDIX / ANNEXE H

DEDUCTION TABLE / TABLE DE DÉDUCTION
2.54 m ROUGH STUDWOOD, LATHWOOD / BOIS DE COLOMBAGE, LATTE DE BOIS À L'ÉTAT BRUT DE 2,54 m

Formula: $m^3(st) = A \times L \times$ Rough Wood Factor
$= (0.000\ 078\ 540)D^2 \times 1.27 \times 1.5803$
Formule: $m^3(app) = A \times L \times$ Facteur de conversion du bois brut
$= (0,000\ 078\ 540)D^2 \times 1,27 \times 1,5803$

TABLE SHOWING CONTENTS OF STUDWOOD AND LATHWOOD BOLTS
BY DIAMETER IN STACKED CUBIC METRES
(applicable to stacked 2.54 m Rough Studwood and Lathwood) /
TABLEAU MONTRANT LE CONTENU DES BILLOTS DE BOIS COLOMBAGE ET LATTE DE BOIS
PAR DIAMÈTRE EN MÈTRES CUBES APPARENTS
(applicable au bois de colombage et latte de bois empilé à l'état brut de 2,54 m)

Diameter of Defect or Void/Diamètre du défaut ou de l'espace vide (cm)	NUMBER OF PIECES / NOMBRE DE PIÈCES									
	1	2	3	4	5	6	7	8	9	10
	CONTENTS IN STACKED CUBIC METRES / CONTENU EN MÈTRES CUBES APPARENTS									
4	0.003	0.005	0.008	0.010	0.013	0.015	0.018	0.020	0.023	0.025
6	0.006	0.011	0.017	0.023	0.028	0.034	0.040	0.045	0.051	0.057
8	0.010	0.020	0.030	0.040	0.050	0.061	0.071	0.081	0.091	0.101
10	0.016	0.032	0.047	0.063	0.079	0.095	0.110	0.126	0.142	0.158
12	0.023	0.045	0.068	0.091	0.113	0.136	0.159	0.182	0.204	0.227
14	0.031	0.062	0.093	0.124	0.154	0.185	0.216	0.247	0.278	0.309
16	0.040	0.081	0.121	0.161	0.202	0.242	0.282	0.323	0.363	0.404
18	0.051	0.102	0.153	0.204	0.255	0.306	0.358	0.409	0.460	0.511
20	0.063	0.126	0.189	0.252	0.315	0.378	0.441	0.504	0.567	0.631
22	0.076	0.153	0.229	0.305	0.381	0.458	0.534	0.610	0.687	0.763
24	0.091	0.182	0.272	0.363	0.454	0.545	0.636	0.726	0.817	0.908
26	0.107	0.213	0.320	0.426	0.533	0.639	0.746	0.852	0.959	1.066
28	0.124	0.247	0.371	0.494	0.618	0.741	0.865	0.989	1.112	1.236
30	0.142	0.284	0.426	0.567	0.709	0.851	0.993	1.135	1.277	1.419
32	0.161	0.323	0.484	0.646	0.807	0.968	1.130	1.291	1.453	1.614
34	0.182	0.364	0.547	0.729	0.911	1.093	1.276	1.458	1.640	1.822
36	0.204	0.409	0.613	0.817	1.021	1.226	1.430	1.634	1.839	2.043
38	0.228	0.455	0.683	0.910	1.138	1.366	1.593	1.821	2.049	2.276
40	0.252	0.504	0.757	1.009	1.261	1.513	1.765	2.018	2.270	2.522
42	0.278	0.556	0.834	1.112	1.390	1.668	1.946	2.224	2.503	2.781
44	0.305	0.610	0.916	1.221	1.526	1.831	2.136	2.441	2.747	3.052
46	0.334	0.667	1.001	1.334	1.668	2.001	2.335	2.668	3.002	3.335
48	0.363	0.726	1.090	1.453	1.816	2.179	2.542	2.905	3.269	3.632
50	0.394	0.788	1.182	1.576	1.970	2.364	2.759	3.153	3.547	3.941
52	0.426	0.852	1.279	1.705	2.131	2.557	2.984	3.410	3.836	4.262
54	0.460	0.919	1.379	1.839	2.298	2.758	3.218	3.677	4.137	4.596
56	0.494	0.989	1.483	1.977	2.472	2.966	3.460	3.955	4.449	4.943
58	0.530	1.061	1.591	2.121	2.651	3.182	3.712	4.242	4.772	5.303
60	0.567	1.135	1.702	2.270	2.837	3.405	3.972	4.540	5.107	5.675

APPENDIX / ANNEXE I

DEDUCTION TABLE / TABLE DE DÉDUCTION
1.92 m ROUGH CEDAR STUDWOOD / BOIS DE COLOMBAGE DE CÈDRE À L'ÉTAT BRUT DE 1,92 m

Formula: $m^3(st)$ = A x L x Rough Wood Factor
= (0.000 078 540)D^2 x 1.92 x 1.6841
Formule: $m^3(app)$ = A x L x Facteur de conversion du bois brut
= (0,000 078 540)D^2 x 1.92 x 1,6841

TABLE SHOWING CONTENTS OF STUDWOOD BOLTS BY DIAMETER IN STACKED CUBIC METRES
(applicable to stacked 1.92 m Rough Cedar Studwood) /
TABLEAU MONTRANT LE CONTENU DE BOIS DE COLOMBAGE DE CÈDRE À L'ÉTAT BRUT
PAR DIAMÈTRE EN MÈTRES CUBES APPARENTS
(applicable au bois de colombage de cèdre empilé à l'état brut de 1,92 m)

Diameter of Defect or Void/Diamètre du défaut ou de l'espace vide (cm)	NUMBER OF PIECES / NOMBRE DE PIÈCES									
	1	2	3	4	5	6	7	8	9	10
	CONTENTS IN STACKED CUBIC METRES / CONTENU EN MÈTRES CUBES APPARENTS									
4	0.004	0.008	0.012	0.016	0.020	0.024	0.028	0.033	0.037	0.041
6	0.009	0.018	0.027	0.037	0.046	0.055	0.064	0.073	0.082	0.091
8	0.016	0.033	0.049	0.065	0.081	0.098	0.114	0.130	0.146	0.163
10	0.025	0.051	0.076	0.102	0.127	0.152	0.178	0.203	0.229	0.254
12	0.037	0.073	0.110	0.146	0.183	0.219	0.256	0.293	0.329	0.366
14	0.050	0.100	0.149	0.199	0.249	0.299	0.348	0.398	0.448	0.498
16	0.065	0.130	0.195	0.260	0.325	0.390	0.455	0.520	0.585	0.650
18	0.082	0.165	0.247	0.329	0.411	0.494	0.576	0.658	0.741	0.823
20	0.102	0.203	0.305	0.406	0.508	0.609	0.711	0.813	0.914	1.016
22	0.123	0.246	0.369	0.492	0.615	0.737	0.860	0.983	1.106	1.229
24	0.146	0.293	0.439	0.585	0.731	0.878	1.024	1.170	1.317	1.463
26	0.172	0.343	0.515	0.687	0.858	1.030	1.202	1.373	1.545	1.717
28	0.199	0.398	0.597	0.796	0996	1.195	1.394	1.593	1.792	1.991
30	0.229	0.457	0.686	0.914	1.143	1.371	1.600	1.828	2.057	2.286
32	0.260	0.520	0.780	1.040	1.300	1.560	1.820	2.080	2.340	2.601
34	0.294	0.587	0.881	1.174	1.468	1.761	2.055	2.349	2.642	2.936
36	0.329	0.658	0.987	1.317	1.646	1.975	2.304	2.633	2.962	3.291
38	0.367	0.733	1.100	1.467	1.834	2.200	2.567	2.934	3.300	3.667
40	0.406	0.813	1.219	1.625	2.032	2.438	2.844	3.251	3.657	4.063
42	0.448	0.896	1.344	1.792	2.240	2.688	3.136	3.584	4.032	4.480
44	0.492	0.983	1.475	1.967	2.458	2.950	3.442	3.933	4.425	4.917
46	0.537	1.075	1.612	2.149	2.687	3.224	3.762	4.299	4.836	5.374
48	0.585	1.170	1.755	2.340	2.926	3.511	4.096	4.681	5.267	5.851
50	0.635	1.270	1.905	2.540	3.174	3.809	4.444	5.079	5.714	6.349
52	0.687	1.373	2.060	2.747	3.433	4.120	4.807	5.494	6.180	6.867
54	0.741	1.481	2.222	2.962	3.703	4.443	5.184	5.924	6.665	7.405
56	0.796	1.593	2.389	3.186	3.982	4.778	5.575	6.371	7.168	7.964
58	0.854	1.709	2.563	3.417	4.272	5.126	5.980	6.834	7.689	8.543
60	0.914	1.828	2.743	3.657	4.571	5.485	6.400	7.314	8.228	9.142

APPENDIX / ANNEXE J

DEDUCTION TABLE / TABLE DE DÉDUCTION
2.60 m ROUGH SOFTWOOD VENEER / BOIS À PLAQUER RÉSINEUX À L'ÉTAT BRUT DE 2,60 m

Formula: m^3(st) = A x L x Rough Wood Factor
= (0.000 078 540)D^2 x 1.30 x 1.4588
Formule: m^3(app) = A x L x Facteur de conversion du bois brut
= (0,000 078 540)D^2 x 1,30 x 1,4588

TABLE SHOWING CONTENTS OF VENEER BOLTS BY DIAMETER IN STACKED CUBIC METRES
(applicable to stacked 2.60 m Rough Softwood Veneer) /
TABLEAU MONTRANT LE CONTENU DES BILLOTS DE BOIS À PLAQUER
PAR DIAMÈTRE EN MÈTRES CUBES APPARENTS
(applicable au bois à plaquer de résineux empilé à l'état brut de 2,60 m)

Diameter of Defect or Void/Diamètre du défaut ou de l'espace vide (cm)	NUMBER OF PIECES / NOMBRE DE PIÈCES									
	1	2	3	4	5	6	7	8	9	10
	CONTENTS IN STACKED CUBIC METRES / CONTENU EN MÈTRES CUBES APPARENTS									
4	0.002	0.005	0.007	0.010	0.012	0.014	0.017	0.019	0.021	0.024
6	0.005	0.011	0.016	0.021	0.027	0.032	0.038	0.043	0.048	0.054
8	0.010	0.019	0.029	0.038	0.048	0.057	0.067	0.076	0.086	0.095
10	0.015	0.030	0.045	0.060	0.074	0.089	0.104	0.119	0.134	0.149
12	0.021	0.043	0.064	0.086	0.107	0.129	0.150	0.172	0.193	0.214
14	0.029	0.058	0.088	0.117	0.146	0.175	0.204	0.234	0.263	0.292
16	0.038	0.076	0.114	0.153	0.191	0.229	0.267	0.305	0.343	0.381
18	0.048	0.097	0.145	0.193	0.241	0.290	0.338	0.386	0.434	0.483
20	0.060	0.119	0.179	0.238	0.298	0.357	0.417	0.477	0.536	0.596
22	0.072	0.144	0.216	0.288	0.360	0.433	0.505	0.577	0.649	0.721
24	0.086	0.172	0.257	0.343	0.429	0.515	0.601	0.686	0.772	0.858
26	0.101	0.201	0.302	0.403	0.503	0.604	0.705	0.806	0.906	1.007
28	0.117	0.234	0.350	0.467	0.584	0.701	0.817	0.934	1.051	1.168
30	0.134	0.268	0.402	0.536	0.670	0.804	0.938	1.072	1.206	1.341
32	0.153	0.305	0.458	0.610	0.763	0.915	1.068	1.220	1.373	1.525
34	0.172	0.344	0.517	0.689	0.861	1.033	1.205	1.377	1.550	1.722
36	0.193	0.386	0.579	0.772	0.965	1.158	1.351	1.544	1.737	1.930
38	0.215	0.430	0.645	0.860	1.075	1.290	1.506	1.721	1.936	2.151
40	0.238	0.477	0.715	0.953	1.192	1.430	1.668	1.907	2.145	2.383
42	0.263	0.525	0.788	1.051	1.314	1.576	1.839	2.102	2.365	2.627
44	0.288	0.577	0.865	1.153	1.442	1.730	2.019	2.307	2.595	2.884
46	0.315	0.630	0.946	1.261	1.576	1.891	2.206	2.521	2.837	3.152
48	0.343	0.686	1.030	1.373	1.716	2.059	2.402	2.745	3.089	3.432
50	0.372	0.745	1.117	1.489	1.862	2.234	2.607	2.979	3.351	3.724
52	0.403	0.806	1.208	1.611	2.014	2.417	2.819	3.222	3.625	4.028
54	0.434	0.869	1.303	1.737	2.172	2.606	3.040	3.475	3.909	4.343
56	0.467	0.934	1.401	1.868	2.335	2.803	3.270	3.737	4.204	4.671
58	0.501	1.002	1.503	2.004	2.505	3.006	3.507	4.008	4.510	5.011
60	0.536	1.072	1.609	2.145	2.681	3.217	3.753	4.290	4.826	5.362

APPENDIX / ANNEXE K

DEDUCTION TABLE / TABLE DE DÉDUCTION
2.60 m ROUGH POPLAR VENEER / BOIS À PLAQUER DE PEUPLIER À L'ÉTAT BRUT DE 2,60 m

Formula: $m^3(st)$ = A x L x Rough Wood Factor
= $(0.000\ 078\ 540)D^2$ x 1.30 x 1.4401
Formule: $m^3(app)$ = A x L x Facteur de conversion du bois brut
= $(0,000\ 078\ 540)D^2$ x 1,30 x 1,4401

TABLE SHOWING CONTENTS OF VENEER BOLTS BY DIAMETER IN STACKED CUBIC METRES
(applicable to stacked 2.60 m Rough Poplar Veneer) /
TABLEAU MONTRANT LE CONTENU DES BILLOTS DE BOIS À PLAQUER
PAR DIAMÈTRE EN MÈTRES CUBES APPARENTS
(applicable au bois à plaquer de peuplier empilé à l'état brut de 2,60 m)

Diameter of Defect or Void/Diamètre du défaut ou de l'espace vide (cm)	NUMBER OF PIECES / NOMBRE DE PIÈCES									
	1	2	3	4	5	6	7	8	9	10
	CONTENTS IN STACKED CUBIC METRES / CONTENU EN MÈTRES CUBES APPARENTS									
4	0.002	0.005	0.007	0.009	0.012	0.014	0.016	0.019	0.021	0.024
6	0.005	0.011	0.016	0.021	0.027	0.032	0.037	0.042	0.048	0.053
8	0.009	0.019	0.028	0.038	0.048	0.056	0.066	0.075	0.085	0.094
10	0.015	0.029	0.044	0.059	0.074	0.088	0.103	0.118	0.132	0.147
12	0.021	0.042	0.064	0.085	0.107	0.127	0.148	0.169	0.191	0.212
14	0.029	0.058	0.086	0.115	0.146	0.173	0.202	0.231	0.259	0.288
16	0.038	0.075	0.113	0.151	0.191	0.226	0.263	0.301	0.339	0.376
18	0.048	0.095	0.143	0.191	0.241	0.286	0.333	0.381	0.429	0.476
20	0.059	0.118	0.176	0.235	0.298	0.353	0.412	0.471	0.529	0.588
22	0.071	0.142	0.214	0.285	0.360	0.427	0.498	0.569	0.640	0.712
24	0.085	0.169	0.254	0.339	0.429	0.508	0.593	0.678	0.762	0.847
26	0.099	0.199	0.298	0.398	0.503	0.596	0.696	0.795	0.895	0.994
28	0.115	0.231	0.346	0.461	0.584	0.692	0.807	0.922	1.037	1.153
30	0.132	0.265	0.397	0.529	0.670	0.794	0.926	1.059	1.191	1.323
32	0.151	0.301	0.452	0.602	0.763	0.903	1.054	1.205	1.355	1.506
34	0.170	0.340	0.510	0.680	0.861	1.020	1.190	1.360	1.530	1.700
36	0.191	0.381	0.572	0.762	0.965	1.143	1.334	1.524	1.715	1.906
38	0.212	0.425	0.637	0.849	1.075	1.274	1.486	1.699	1.911	2.123
40	0.235	0.471	0.706	0.941	1.192	1.412	1.647	1.882	2.117	2.353
42	0.259	0.519	0.778	1.037	1.314	1.556	1.816	2.075	2.334	2.594
44	0.285	0.569	0.854	1.139	1.442	1.708	1.993	2.277	2.562	2.847
46	0.311	0.622	0.933	1.245	1.576	1.867	2.178	2.489	2.800	3.111
48	0.339	0.678	1.016	1.355	1.716	2.033	2.371	2.710	3.049	3.388
50	0.368	0.735	1.103	1.470	1.862	2.206	2.573	2.941	3.308	3.676
52	0.398	0.795	1.193	1.590	2.014	2.386	2.783	3.181	3.578	3.976
54	0.429	0.858	1.286	1.715	2.172	2.573	3.001	3.430	3.859	4.288
56	0.461	0.922	1.383	1.844	2.335	2.767	3.228	3.689	4.150	4.611
58	0.495	0.989	1.484	1.979	2.505	2.968	3.462	3.957	4.452	4.946
60	0.529	1.059	1.588	2.117	2.681	3.176	3.705	4.235	4.764	5.293

APPENDIX / ANNEXE L

NEW BRUNSWICK SOFTWOOD CUBIC METRE LOG SCALE /
MESURE EN MÈTRES CUBES DE BOIS RÉSINEUX DU NOUVEAU-BRUNSWICK

STD*/ PDPB	LOG LENGTH CLASS/ CLASS DE LONGUEUR DES BILLES 0.2 m units / unités de 0,2 m														
	>1.2 □1.4	>1.5 □1.7	>1.8 □2.0	>2.1 □2.3	>2.4 □2.6	>2.7 □2.9	>3.0 □3.2	>3.3 □3.5	>3.6 □3.8	>3.9 □4.1	>4.2 □4.4	>4.5 □4.7	>4.8 □5.0	>5.1 □5.3	>5.4 □5.6
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
8	0.007	0.009	0.011	0.014	0.018	0.022	0.026	0.030	0.035	0.038	0.042	0.045	0.048	0.051	0.054
10	0.012	0.015	0.019	0.024	0.028	0.034	0.038	0.044	0.049	0.054	0.058	0.062	0.067	0.071	0.074
12	0.016	0.020	0.025	0.030	0.036	0.044	0.051	0.058	0.066	0.072	0.078	0.084	0.090	0.095	0.100
14	0.022	0.028	0.034	0.041	0.048	0.057	0.066	0.076	0.085	0.092	0.100	0.108	0.116	0.123	0.130
16	0.029	0.036	0.043	0.052	0.062	0.074	0.085	0.096	0.108	0.118	0.127	0.136	0.146	0.155	0.164
18	0.035	0.045	0.056	0.067	0.079	0.092	0.106	0.120	0.133	0.145	0.157	0.169	0.181	0.192	0.202
20	0.042	0.055	0.069	0.083	0.097	0.113	0.129	0.145	0.161	0.176	0.190	0.204	0.219	0.232	0.246
22	0.051	0.067	0.084	0.101	0.118	0.136	0.155	0.174	0.192	0.209	0.226	0.244	0.261	0.277	0.293
24	0.060	0.080	0.100	0.120	0.141	0.162	0.184	0.205	0.226	0.246	0.266	0.286	0.307	0.326	0.345
26	0.071	0.094	0.118	0.142	0.166	0.190	0.214	0.238	0.263	0.286	0.310	0.333	0.356	0.379	0.402
28	0.083	0.109	0.136	0.164	0.192	0.220	0.248	0.276	0.303	0.330	0.356	0.383	0.410	0.436	0.463
30	0.097	0.128	0.159	0191	0.222	0.253	0.284	0.315	0.346	0.376	0.407	0.438	0.468	0.498	0.528
32	0.113	0.148	0.183	0.218	0.253	0.288	0.322	0.356	0.391	0.426	0.460	0.494	0.529	0.564	0.598
34	0.129	0.169	0.207	0.246	0.286	0.324	0.363	0.402	0.440	0.479	0.518	0.556	0.595	0.634	0.673
36	0.146	0.190	0.234	0.278	0.322	0.364	0.406	0.448	0.491	0.534	0.578	0.621	0.664	0.708	0.752
38	0.165	0.214	0.262	0.311	0.360	0.406	0.453	0.500	0.546	0.594	0.642	0.690	0.737	0.786	0.835
40	0.187	0.238	0.292	0.346	0.400	0.451	0.502	0.552	0.603	0.656	0.708	0.761	0.814	0.868	0.923
42	0.210	0.268	0.326	0.384	0.442	0.497	0.552	0.608	0.663	0.722	0.780	0.838	0.896	0.955	1.015
44	0.234	0.297	0.360	0.423	0.486	0.546	0.606	0.666	0.726	0.790	0.853	0.916	0.980	1.046	1.112
46	0.260	0.328	0.396	0.464	0.532	0.597	0.662	0.728	0.793	0.862	0.931	1.000	1.069	1.141	1.213
48	0.285	0.358	0.432	0.506	0.580	0.650	0.721	0.792	0.862	0.937	1.012	1.087	1.162	1.240	1.318
50	0.312	0.391	0.471	0.551	0.631	0.706	0.782	0.858	0.933	1.014	1.096	1.178	1.259	1.343	1.428
52	0.338	0.425	0.511	0.597	0.683	0.764	0.846	0.927	1.008	1.096	1.184	1.272	1.359	1.451	1.543
54	0.362	0.456	0.550	0.644	0.738	0.825	0.912	0.999	1.086	1.180	1.275	1.370	1.464	1.562	1.662
56	0.386	0.489	0.591	0.693	0.795	0.888	0.980	1.073	1.166	1.268	1.369	1.470	1.572	1.678	1.786
58	0.418	0.527	0.636	0.745	0.854	0.953	1.052	1.151	1.250	1.358	1.467	1.576	1.684	1.798	1.914
60	0.448	0.564	0.681	0.798	0.915	1.020	1.126	1.231	1.336	1.452	1.568	1.684	1.800	1.922	2.046
62	0.478	0.604	0.729	0.854	0.979	1.090	1.202	1.314	1.426	1.550	1.673	1.796	1.920	2.051	2.183
64	0.509	0.642	0.776	0.910	1.044	1.162	1.281	1.400	1.518	1.650	1.781	1.912	2.044	2.184	2.324
66	0.542	0.686	0.828	0.970	1.112	1.237	1.362	1.488	1.613	1.752	1.892	2.032	2.172	2.320	2.470
68	0.574	0.726	0.878	1.030	1.182	1.314	1.446	1.578	1.711	1.860	2.008	2.156	2.304	2.461	2.620
70	0.609	0.770	0.931	1.092	1.253	1.392	1.532	1.672	1.812	1.969	2.126	2.282	2.439	2.606	2.775
72	0.647	0.817	0.987	1.157	1.327	1.474	1.622	1.769	1.916	2.082	2.248	2.414	2.579	2.756	2.934
74	0.688	0.867	1.046	1.225	1.404	1.559	1.714	1.868	2.023	2.198	2.372	2.547	2.722	2.909	3.098
76	0.730	0.918	1.106	1.294	1.482	1.645	1.808	1.970	2.133	2.318	2.502	2.686	2.870	3.067	3.266
78	0.772	0.971	1.168	1.365	1.562	1.733	1.904	2.074	2.245	2.439	2.633	2.827	3.021	3.228	3.438
80	0.810	1.018	1.227	1.436	1.645	1.824	2.003	2.182	2.361	2.564	2.768	2.972	3.176	3.394	3.616

* STD - smallest top diameter / PDPB - plus petit diamètre au petit bout
> - means greater than / signifie supérieur à
□- means less than or equal to / signifie inférieur ou égal à
Note: Logs that are longer than a specified length class (ie. between classes) shall be scaled as belonging to the next larger length class
Note : Les billes d'une longueur supérieure à celle spécifiée pour une catégorie (c'est-à-dire que leur longueur se situe entre deux catégories) sont considérées comme appartenant à la catégorie supérieure la plus proche.

APPENDIX / ANNEXE M

NEW BRUNSWICK HARDWOOD CUBIC METRE LOG SCALE /
MESURE EN MÈTRES CUBES DE BOIS FEUILLU DU NOUVEAU-BRUNSWICK

STD*/ PDPB	LOG LENGTH CLASS/ CLASS DE LONGUEUR DES BILLES 0.2 m units / unités de 0,2 m														
	>1.2 □1.4	>1.5 □1.7	>1.8 □2.0	>2.1 □2.3	>2.4 □2.6	>2.7 □2.9	>3.0 □3.2	>3.3 □3.5	>3.6 □3.8	>3.9 □4.1	>4.2 □4.4	>4.5 □4.7	>4.8 □5.0	>5.1 □5.3	>5.4 □5.6
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
8	0.008	0.010	0.012	0.016	0.020	0.024	0.028	0.031	0.035	0.038	0.042	0.045	0.048	0.051	0.054
10	0.013	0.017	0.021	0.026	0.030	0.034	0.036	0.039	0.042	0.045	0.048	0.052	0.058	0.067	0.080
12	0.019	0.023	0.028	0.034	0.039	0.042	0.045	0.047	0.050	0.056	0.062	0.075	0.083	0.094	0.107
14	0.024	0.032	0.038	0.044	0.050	0.056	0.062	0.068	0.074	0.083	0.091	0.105	0.113	0.125	0.138
16	0.030	0.038	0.046	0.054	0.062	0.072	0.081	0.091	0.100	0.112	0.123	0.137	0.146	0.160	0.173
18	0.037	0.047	0.056	0.065	0.077	0.090	0.103	0.116	0.128	0.143	0.157	0.171	0.182	0.198	0.212
20	0.045	0.058	0.070	0.082	0.094	0.110	0.126	0.142	0.158	0.176	0.192	0.208	0.222	0.239	0.254
22	0.056	0.070	0.084	0.099	0.114	0.133	0.152	0.171	0.190	0.210	0.230	0.248	0.264	0.284	0.302
24	0.065	0.083	0.100	0.118	0.136	0.158	0.180	0.202	0.224	0.247	0.270	0.291	0.310	0.332	0.353
26	0.074	0.094	0.116	0.138	0.160	0.185	0.210	0.234	0.260	0.286	0.313	0.336	0.358	0.384	0.408
28	0.086	0.111	0.136	0.161	0.186	0.214	0.242	0.269	0.297	0.327	0.357	0.384	0.410	0.439	0.467
30	0.098	0.128	0.157	0.186	0.215	0.245	0.276	0.306	0.337	0.370	0.403	0.434	0.464	0.498	0.531
32	0.113	0.147	0.180	0.214	0.246	0.279	0.312	0.345	0.378	0.415	0.451	0.487	0.522	0.560	0.598
34	0.129	0.168	0.206	0.243	0.279	0.315	0.351	0.386	0.422	0.462	0.502	0.542	0.583	0.626	0.670
36	0.147	0.190	0.234	0.275	0.315	0.353	0.391	0.429	0.467	0.510	0.554	0.600	0.647	0.695	0.745
38	0.170	0.218	0.263	0.308	0.353	0.393	0.434	0.474	0.514	0.561	0.609	0.661	0.714	0.768	0.825
40	0.193	0.243	0.293	0.343	0.393	0.436	0.478	0.521	0.563	0.614	0.666	0.724	0.784	0.844	0.909
42	0.216	0.271	0.326	0.381	0.436	0.481	0.525	0.570	0.614	0.669	0.724	0.790	0.857	0.924	0.997
44	0.238	0.295	0.355	0.417	0.481	0.527	0.574	0.620	0.667	0.726	0.785	0.859	0.934	1.007	1.089
46	0.259	0.327	0.394	0.461	0.528	0.576	0.625	0.674	0.722	0.785	0.848	0.930	1.013	1.094	1.185
48	0.281	0.356	0.431	0.504	0.577	0.628	0.678	0.728	0.779	0.846	0.913	1.004	1.095	1.184	1.285
50	0.313	0.392	0.471	0.551	0.629	0.681	0.734	0.786	0.838	0.909	0.980	1.080	1.181	1.278	1.389
52	0.339	0.425	0.511	0.597	0.683	0.737	0.791	0.845	0.898	0.974	1.049	1.159	1.269	1.375	1.498
54	0.364	0.458	0.552	0.646	0.740	0.795	0.850	0.906	0.961	1.041	1.121	1.241	1.361	1.476	1.610
56	0.395	0.495	0.596	0.697	0.798	0.855	0.912	0.969	1.026	1.110	1.194	1.325	1.456	1.580	1.726
58	0.427	0.535	0.643	0.751	0.859	0.918	0.976	1.034	1.092	1.181	1.269	1.412	1.554	1.687	1.847
60	0.459	0.575	0.691	0.807	0.923	0.982	1.042	1.101	1.160	1.254	1.347	1.501	1.655	1.798	1.972
62	0.490	0.615	0.740	0.865	0.989	1.050	1.110	1.170	1.230	1.329	1.428	1.594	1.759		
64	0.526	0.658	0.791	0.924	1.057	1.118	1.180	1.241	1.302	1.407	1.512	1.689	1.866		
66	0.560	0.702	0.844	0.985	1.127	1.190	1.252	1.313	1.374	1.485	1.596	1.787	1.978		
68	0.598	0.749	0.899	1.049	1.199	1.262	1.325	1.386	1.448	1.562	1.676	1.886	2.096		
70	0.640	0.800	0.958	1.116	1.274	1.336	1.398	1.460	1.522	1.640	1.758	1.983	2.208		

* STD - smallest top diameter / PDPB - plus petit diamètre au petit bout
> - means greater than / signifie supérieur à
□- means less than or equal to / signifie inférieur ou égal à
Note: Logs that are longer than a specified length class (ie. between classes) shall be scaled as belonging to the next larger length class
Note : Les billes d'une longueur supérieure à celle spécifiée pour une catégorie (c'est-à-dire que leur longueur se situe entre deux catégories) sont considérées comme appartenant à la catégorie supérieure la plus proche.

APPENDIX / ANNEXE N

VOLUME OF DEDUCTIONS FOR A DEFECT FOR NEW BRUNSWICK CUBIC METRE LOG SCALE /
VOLUME DES DÉDUCTIONS D'UN DÉFAUT RELATIVES À LA MESURE DE BILLES EN MÈTRES CUBES DU NOUVEAU-BRUNSWICK

Formula: $m^3 = (0.000\ 078\ 540)D^2 \times L/2$ L - Length of defect /
Formule: $m^3 = (0.000\ 078\ 540)D^2 \times L/2$ L - Longueur du défaut

Average diameter/ diamètre moyen	LENGTH OF DEFECT IN METRES / LONGUEUR DU DÉFAUT EN MÈTRES											
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
cm	Volume in m^3 / volume en m^3											
2	—	—	—	—	—	—	0.001	0.001	0.001	0.001	0.001	0.001
4	—	0.001	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.004
6	0.001	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.008	0.008
8	0.001	0.003	0.004	0.005	0.006	0.008	0.009	0.010	0.011	0.013	0.014	0.015
10	0.002	0.004	0.006	0.008	0.010	0.012	0.014	0.016	0.018	0.020	0.022	0.024
12	0.003	0.006	0.008	0.011	0.014	0.017	0.020	0.023	0.025	0.028	0.031	0.034
14	0.004	0.008	0.012	0.015	0.019	0.023	0.027	0.031	0.035	0.038	0.042	0.046
16	0.005	0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.055	0.060
18	0.006	0.013	0.019	0.025	0.032	0.038	0.045	0.051	0.057	0.064	0.070	0.076
20	0.008	0.016	0.024	0.031	0.039	0.047	0.055	0.063	0.071	0.079	0.086	0.094
22	0.010	0.019	0.029	0.038	0.048	0.057	0.067	0.076	0.086	0.095	0.105	0.114
24	0.011	0.023	0.034	0.045	0.057	0.068	0.079	0.090	0.102	0.113	0.124	0.136
26	0.013	0.027	0.040	0.053	0.066	0.080	0.093	0.106	0.119	0.133	0.146	0.159
28	0.015	0.031	0.046	0.062	0.077	0.092	0.108	0.123	0.139	0.154	0.169	0.185
30	0.018	0.035	0.053	0.071	0.088	0.106	0.124	0.141	0.159	0.177	0.194	0.212
32	0.020	0.040	0.060	0.080	0.101	0.121	0.141	0.161	0.181	0.201	0.221	0.241
34	0.023	0.045	0.068	0.090	0.113	0.136	0.159	0.182	0.204	0.227	0.250	0.272
36	0.025	0.051	0.076	0.102	0.127	0.153	0.178	0.204	0.229	0.254	0.290	0.305
38	0.028	0.057	0.085	0.113	0.142	0.170	0.198	0.227	0.255	0.284	0.312	0.340
40	0.031	0.063	0.094	0.126	0.157	0.188	0.220	0.251	0.283	0.314	0.346	0.377
42	0.035	0.069	0.104	0.138	0.173	0.208	0.242	0.277	0.312	0.346	0.381	0.416
44	0.038	0.076	0.114	0.152	0.190	0.228	0.266	0.304	0.342	0.380	0.418	0.456
46	0.042	0.083	0.125	0.166	0.208	0.249	0.291	0.332	0.374	0.415	0.457	0.499
48	0.045	0.090	0.136	0.181	0.226	0.271	0.317	0.362	0.407	0.452	0.498	0.543
50	0.049	0.098	0.147	0.196	0.245	0.295	0.344	0.393	0.442	0.491	0.540	0.589

NOTE:

(a) When the defect does not extend the full length of the log, deductions shall be calculated as follows:

(1) determine the average diameter of the defect:
(2) length of defect shall be rounded to the nearest 0.5-m unit;
(3) refer to the table for the volume to be deducted from the gross volume of the log.

(b) When the defect extends the full length of the log, deductions shall be calculated as follows (length of defect shall be rounded to a 0.5-m unit; where the length of the defect is greater than the length of the log, the defect length shall be reduced by 0.5 m);

(1) determine the average diameter of the defect at the butt end of the log;
(2) refer to the table to determine the deduction to be made for the defect at the butt;
(3) determine the average diameter of the defect at the top end of the log;
(4) refer to the table to determine the deduction to be made for the defect at the top;
(5) the volume determined in steps 2 and 4 are added together. This value is the total deduction to be made for the defect.

NOTE:

a) Lorsque la défaut est limité à une partie de la bille, les déductions sont calculées comme suit :

(1) déterminer le diamètre moyen du défaut;
(2) arrondir la longueur du défaut à l'unité de 0,5 m près;
(3) se référer à la table pour avoir le volume à déduire du volume brut de la bille.

b) Lorsque le défaut s'étend à toute la longueur de la bille, les déductions sont calculées comme suit : (la longueur du défaut est arrondie à l'unité de 0,5 m; lorsque la longueur du défaut est supérieure à la longueur de la bille, la longueur du défaut est réduite de 0,5 m);

(1) déterminer le diamètre moyen du défaut au gros bout de la bille;
*(2) se référer à la table pour déterminer les déductions à faire pour le défaut au gros bou*t;
(3) déterminer le diamètre moyen du défaut au petit bout de la bille;
(4) se référer de la table pour déterminer la déduction à faire pour le défaut au petit bout;
(5) additionner les résultats déterminés aux phases 2 et 4 pour obtenir la déduction totale à faire pour le défaut.

APPENDIX / ANNEXE O

WEIR STAKES AND SPRUCE, TAMARACK, JACK PINE, RED PINE POLES,
POSTS AND PILING VOLUME TABLE /
TABLE DE VOLUME POUR LES PIEUX DE FASCINES ET LES POTEAUX,
PIQUETS ET PILOTS D'ÉPINETTE, DE MÉLÈZE, DE PIN GRIS ET DE PIN ROUGE

	Smallest Top Diameter / Plus petit diamètre au petit bout (cm)								
Length Class/ Class Longueur	10	12	14	16	18	20	22	24	26
m	Volume in m^3 / volume en m^3								
7.0	0.05	0.07	0.10	0.13	0.16	0.19	0.23	0.27	0.32
7.6	0.10	0.12	0.15	0.18	0.21	0.25	0.30	0.34	0.39
8.2	0.15	0.17	0.20	0.23	0.27	0.31	0.36	0.40	0.45
8.8	0.20	0.22	0.25	0.29	0.33	0.37	0.42	0.47	0.52
9.4	0.24	0.27	0.30	0.34	0.38	0.43	0.48	0.53	0.59
10.0	0.29	0.32	0.35	0.39	0.44	0.49	0.54	0.59	0.66
10.6	0.34	0.37	0.40	0.45	0.49	0.55	0.60	0.66	0.73
11.2	0.39	0.42	0.46	0.50	0.55	0.60	0.67	0.72	0.80
11.8	0.43	0.47	0.51	0.55	0.60	0.66	0.73	0.79	0.86
12.4	0.48	0.52	0.56	0.61	0.66	0.72	0.79	0.85	0.93
13.0	0.53	0.57	0.61	0.66	0.72	0.78	0.85	0.92	1.00
13.6	0.58	0.62	0.66	0.71	0.77	0.84	0.91	0.98	1.07
14.2	0.63	0.67	0.71	0.77	0.83	0.90	0.97	1.05	1.14
14.8	0.67	0.71	0.76	0.82	0.88	0.96	1.04	1.11	1.21
15.4	0.72	0.76	0.81	0.87	0.94	1.01	1.10	1.18	1.27
16.0	0.77	0.81	0.87	0.93	1.00	1.07	1.16	1.24	1.34
16.6	0.82	0.86	0.92	0.98	1.05	1.13	1.22	1.31	1.41
17.2	0.86	0.91	0.97	1.03	1.11	1.19	1.28	1.37	1.48
17.8	0.91	0.96	1.02	1.09	1.16	1.25	1.34	1.44	1.55
18.4	0.96	1.10	1.07	1.14	1.22	1.31	1.41	1.50	1.62
19.0	1.01	1.06	1.12	1.19	1.28	1.37	1.47	1.56	1.68

Note: see Section 2.3 for clarification of length classes / Consulter l'article 2.3 pour obtenir des précisions sur les catégories de longueur.

APPENDIX / ANNEXE P

CEDAR POLES AND POSTS VOLUME TABLE /
TABLE DE VOLUME POUR LES POTEAUX ET PIQUETS DE CÈDRE

	Smallest Top Diameter / Plus petit diamètre au petit bout (cm)								
Length Class/ Class Longueur	10	12	14	16	18	20	22	24	26
m	Volume in m^3 / volume en m^3								
7.0	0.21	0.22	0.22	0.23	0.25	0.26	0.27	0.29	0.30
7.6	0.25	0.27	0.29	0.32	0.35	0.38	0.42	0.46	0.50
8.2	0.29	0.32	0.36	0.40	0.45	0.51	0.57	0.63	0.70
8.8	0.33	0.38	0.43	0.49	0.56	0.63	0.71	0.79	0.89
9.4	0.38	0.43	0.50	0.57	0.66	0.75	0.86	0.96	1.09
10.0	0.42	0.49	0.57	0.66	0.76	0.88	1.01	1.13	1.28
10.6	0.46	0.54	0.63	0.74	0.87	1.00	1.15	1.30	1.48
11.2	0.50	0.59	0.70	0.83	0.97	1.13	1.30	1.47	1.67
11.8	0.55	0.65	0.77	0.91	1.07	1.25	1.45	1.64	1.87
12.4	0.59	0.70	0.84	1.00	1.17	1.37	1.59	1.81	2.07
13.0	0.63	0.76	0.91	1.08	1.28	1.50	1.74	1.97	2.26
13.6	0.67	0.81	0.98	1.17	1.38	1.62	1.89	2.14	2.46
14.2	0.72	0.87	1.04	1.25	1.48	1.75	2.04	2.31	2.65
14.8	0.76	0.92	1.11	1.33	1.59	1.87	2.18	2.48	2.85
15.4	0.80	0.97	1.18	1.42	1.69	1.99	2.33	2.65	3.04
16.0	0.84	1.03	1.25	1.50	1.79	2.12	2.48	2.82	3.24
16.6	0.89	1.08	1.32	1.59	1.90	2.24	2.62	2.99	3.44
17.2	0.93	1.14	1.39	1.67	2.00	2.36	2.77	3.15	3.63
17.8	0.97	1.19	1.45	1.76	2.10	2.49	2.92	3.32	3.83
18.4	1.01	1.25	1.52	1.84	2.21	2.61	3.06	3.49	4.02
19.0	1.06	1.30	1.59	1.93	2.31	2.74	3.21	3.66	4.22

Note: see Section 2.3 for clarification of length classes / Consulter l'article 2.3 pour obtenir des précisions sur les catégories de longueur.

APPENDIX / ANNEXE Q

NEW BRUNSWICK LOG SCALE - FBM / MESURE DE BOIS DU NOUVEAU-BRUNSWICK - PMP

DIAMETER IN INCHES INSIDE BARK AT TOP END OF LOG / DIAMÈTRE EN POUCES À L'INTÉRIEUR DE L'ÉCORCE AU PETIT BOUT DE LA BILLE

	LENGTH IN FEET / LONGUEUR EN PIEDS																
	8	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
3	3	3	3	3	4	4	5	5	6							
4	4	5	5	6	7	7	8	9	9							
5	6	7	8	9	10	11	12	13	14	15	16					
6	10	11	12	14	15	17	18	19	20	22	23					
7	15	17	19	21	23	25	27	29	31	33	35					
8	20	23	25	28	30	33	35	38	40	43	45	48	50	53	55	58
9	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69
10	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92
11	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115
12	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138
13	56	63	70	77	84	91	98	105	112	119	126	133	140	147	154	161
14	65	74	82	90	98	106	114	122	130	139	147	155	163	171	179	188
15	75	84	93	102	112	121	131	140	150	159	168	177	187	196	205	214
16	85	96	107	117	128	138	149	159	170	181	192	202	213	223	234	245
17	99	111	124	136	149	161	174	186	198	210	223	235	248	261	275	286
18	115	129	143	158	172	186	200	215	229	244	258	272	286	301	315	330
19	131	147	163	180	196	212	228	245	261	278	294	310	326	343	359	376
20	150	168	187	206	225	243	262	281	300	318	337	356	375	393	412	431
21	164	185	206	227	247	268	288	308	327	349	370	391	411	432	453	474
22	181	204	227	250	272	295	317	340	362	385	408	431	453	476	498	521
23	188	223	248	272	297	317	336	356	376	411	445	470	495	519	544	569
24	216	243	270	297	324	352	380	406	432	459	486	513	540	569	594	621
25	238	268	298	328	358	388	419	448	477	507	537	566	596	620	656	685
26	253	285	317	348	380	411	444	475	507	538	570	602	634	665	697	729
27	273	307	341	375	410	444	478	512	546	580	615	649	683	717	751	785
28	307	345	384	422	460	498	537	575	614	652	690	728	767	805	844	882
29	329	370	410	452	495	535	575	616	657	698	739	780	820	862	903	944
30	353	397	441	485	530	574	618	662	706	750	795	839	883	927	971	1015

CONTENTS IN BOARD FEET / CONTENU EN PIED-PLANCHES

APPENDIX / ANNEXE R

Limits of error for scaling instruments / Tolérances des instruments de mesurage

Measurement, m Mesurage en mètres	Limits of error, mm / Tolérances en millimètres	
	Tapes / Chaînes d'arpenteur	Scale sticks, Calipers / Règles de mesurage, Compas forestier
0 to / à 1.5	0.5	1.0
>1.5 to / à 3	1.0	2.0
>3 to / à 5	2	4.0
>5 to / à 7	2.5	5.0
>7 to / à 10	3	—
>10 to / à 15	3.5	—
>15 to / à 20	4	—
>20 to / à 30	5.5	—

Note: *This Table is based on the Government of Canada's* Weights and Measures Regulations */*
La présente table est fondée sur le Règlement sur les poids et mesures *du gouvernement du Canada.*

APPENDIX / ANNEXE S

SOFTWOOD BARK THICKNESS TABLE
TABLE D'ÉPAISSEUR DE L'ÉCORCE DES RÉSINEUX

Diameter Diamètre cm	Bark Thickness (cm) Épaisseur de l'écorce (cm)	
	Single / simple	Double / double
8	.2	.4
9	.2	.5
10	.3	.6
11	.3	.6
12	.3	.7
13	.3	.7
14	.4	.8
15	.4	.8
16	.4	.9
17	.5	.9
18	.5	1.0
19	.5	1.0
20	.5	1.1
21	.6	1.1
22	.6	1.2
23	.6	1.2
24	.6	1.3
25	.7	1.4
26	.7	1.4
27	.7	1.5
28	.8	1.5
29	.8	1.6
30	.8	1.6
31	.8	1.7
32	.9	1.7
33	.9	1.8
34	.9	1.8
35	.9	1.9
36	1.0	1.9
37	1.0	2.0
38	1.0	2.0
39	1.0	2.1
40	1.1	2.1
41	1.1	2.2
42	1.1	2.2
43	1.1	2.3
44	1.2	2.3
45	1.2	2.4
46	1.2	2.4
47	1.2	2.5
48	1.3	2.5
49	1.3	2.5
50	1.3	2.6
51	1.3	2.7
52	1.4	2.7
53	1.4	2.8
54	1.4	2.8
55	1.4	2.8
56	1.4	2.9
57	1.5	2.9
58	1.5	3.0
59	1.5	3.0
60	1.5	3.1

APPENDIX / ANNEXE T

HARDWOOD AND POPLAR BARK THICKNESS TABLE
TABLE D'ÉPAISSEUR DE L'ÉCORCE DES FEUILLUS ET DU PEUPLIER

Diameter Diamètre cm	Bark Thickness (cm) Épaisseur de l'écorce (cm)	
	Single / simple	Double / double
8	.2	.5
9	.3	.6
10	.3	.6
11	.3	.7
12	.4	.7
13	.4	.8
14	.4	.9
15	.5	.9
16	.5	1.0
17	.5	1.1
18	.6	1.1
19	.6	1.2
20	.6	1.2
21	.7	1.3
22	.7	1.4
23	.7	1.4
24	.7	1.5
25	.8	1.5
26	.8	1.6
27	.8	1.7
28	.9	1.7
29	.9	1.8
30	.9	1.9
31	1.0	1.9
32	1.0	2.0
33	1.0	2.0
34	1.1	2.1
35	1.1	2.2
36	1.1	2.2
37	1.1	2.3
38	1.2	2.4
39	1.2	2.4
40	1.2	2.5
41	1.3	2.5
42	1.3	2.6
43	1.3	2.7
44	1.4	2.7
45	1.4	2.8
46	1.4	2.8
47	1.5	2.9
48	1.5	3.0
49	1.5	3.0
50	1.5	3.1
51	1.6	3.2
52	1.6	3.2
53	1.6	3.3
54	1.7	3.3
55	1.7	3.4
56	1.7	3.5
57	1.8	3.5
58	1.8	3.6
59	1.8	3.7
60	1.9	3.7

APPENDIX / ANNEXE U

RULE OF THUMB FOR DETERMINING THE BOARD FOOT CONTENT OF LOGS	RÈGLE PRATIQUE POUR DÉTERMINER LE CONTENU EN PIEDS-PLANCHE DES BILLES

N.B. Log Scale / Mesure de bois du Nouveau-Brunswick

Diameter Small End (inside bark) / Diamètre au petit bout (sans écorce)	F.B.M. pp
5”	L – 2
6”	1¼ L
7”	2L – 1
8”	2½ L
9”	3L
10”	4L
11”	5L
12”	6L
13”	7L
14” 8’ 9’ to/à 17’ 18’ +	8L + 1 8L + 2 8L + 3