Scaling Roundwood: A Metric Scaling Standard for Canada¹

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Abstract

The current status of scaling in Canada is summarized. The work of the Committee on Scaling of Primary Forest Products is discussed and the scope of the Committee is indicated. Important features of the National Standard of Canada — Scaling Roundwood, are described as they apply to measurement units and the scaling of roundwood in individual pieces, piles and stacks.

Résumé

L'auteur résume la situation actuelle du cubage au Canada. Il disserte sur le travail du Comité sur le cubage des produits forestiers primaires et indique l'étendue des travaux du Comité. D'importantes caractéristiques de la Norme sont décrites telles qu'appliquées aux unités de mesure ainsi qu'au cubage du bois rond en grumes individuelles, en piles et en staques.

Introduction

A roundwood scale forms the basis for commercial transactions and the payment of dues and royalties to the Crown. In pioneering times, when transactions were limited to local areas, the measurement methods used to determine wood quantities were settled between buyer and seller. As trade expanded to include foreign markets, timber dealers and colonial governments recognized the need to regulate measurement procedures and to produce wood products to agreed specification and quality.

The early statutes of the provinces set out the official regulations and procedures and specified the merchantable standards for timber products. These statutes were, in effect, the first standards to govern the measurement, sale and export of wood from Canada.

What is a Standard?

A standard is defined as a document recording approved rules for an orderly approach to a specific activity (1). An equally applicable definition would be: a standard is that which is accepted for current use by authority, custom, or general consent (2).

By applying the latter definition, the scaling manuals and regulations developed for each province can be interpreted as being standards. They are accepted for current use through the provincial regulatory authority. However, for many private sales, obsolete units and methods are often used because of custom or general consent.

Current Status in Scaling

The status of scaling in Canada, as of May 1974, was reported by Bowen (3), and is briefly summarized here.

Cubic Foot

Five different formulas are used for determining cubic foot scale in Canada. The volume of a cylinder is used in six provinces, but constants and formula expressions differ. Smalian's formula is used in two provinces; two other provinces use regression estimators based on Smalian's formula. Nova Scotia, the Yukon Territory and the Northwest Territory do not use cubic measure.

In scaling practice, differences occur in the application of rounding rules to measures of diameter and length. Trim allowances and methods of deduction for cull or rejection of a product also differ among the provinces.

Board Foot

Six different board foot rules are used to determine the official scale of some 25 kinds of primary wood products. The only province that does not recognize the board foot for official scaling purposes is British Columbia.

Trim allowances show much variation among the provinces, and qualifications regarding lengths of logs to be measured by the board foot also differ. Diameters are measured inside bark at the small end, but rules for rounding diameters have little uniformity.

Cord

The cord is used in all provinces and territories. Rounding rules for the measurement of stacks vary, as do those for the measurement of pieces. Trimming allowances on lengths of pieces also differ.

Piece

All provinces and territories measure by the piece — the counting of individual pieces. Some 35 kinds of primary wood products are measured in this manner.

Other Measures

For scale purposes, other measures include pounds and tons for weight scaling, linear foot,

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fathom, and 52-inch cords for measuring shingle bolts in British Columbia.

The current situation in scaling is best described as a confused state of diversified unity. Unity because the units of measure, inches, foot, cubic foot, board foot, cord, pound, ton and count are accepted; diversity in that the methods used to measure and combine these units vary considerably.

Committee on Scaling Primary Forest Products

This confused state of affairs would have continued had it not been for a Federal Government decision, taken in 1970, to convert to the metric system. This decision resulted in the establishment of metric forestry committees and in the formation of the CSA Committee on Scaling of Primary Forest Products (4).

Some of the background on the Committee was reported earlier (5), but a brief summary is warranted.

The CSA Committee on Scaling of Primary Forest Products was formed in September 1975. It consists of 26 members: 12 producers representing the provinces, territories and private wood lot owners; 10 users representing industry, and four general interest representatives of the universities and the Canadian Forestry Service.

A secretariat is provided by the Canadian Forestry Service and liaison is maintained with the CSA and the U.S. Forest Service.

The scope of the Committee is to develop and maintain National Standards of Canada for scaling, and to promote the use of the Standards by the forest industries and government, commercial, educational and private interests throughout the Nation. New developments in scaling are to be monitored and evaluated. The Committee will also

recommend research necessary for the continuous improvement of the Standards.

Meetings are held on an annual basis but may be more frequent, if necessary. The Committee operates in a democratic manner; there is a full discussion of technical matters, contentious issues are submitted to a vote, and work is performed through technical sub-committees. This is the process of standardization.

Scaling Roundwood, — CAN3-0302.1 — M77

Scaling Roundwood (6), is a National Standard of Canada approved by the Standards Council of Canada and the Canadian Standards Association. It describes the minimum criteria to be used in scaling the quantity of wood obtained from trees after they are felled. It is intended as a source document on scaling for producers and users of primary wood products in Canada.

Scaling Roundwood is composed of 12 clauses and 11 appendices. Specific sections deal with scope, definitions, approaches to scaling, determining the solid volume of individual logs, logs in piles, tree lengths, stacked volume, fuelwood, sample scaling, mass scaling, and piece and linear scaling. The minimum specifications for scaling instruments, including scale sticks, calipers and tapes, are also provided.

The Standard specifies the use of Canadian metric units and a summary is presented in Table 1.

Log Measurement

In measuring individual logs, three tolerance levels are recognized to provide a volume estimate acceptable for the purpose of the scale. Precision measures of diameter and length differ for each level.

Table 1. Units Summary for Scaling Roundwood

Description	Unit	Precision	Interval
Diameter			
Tolerance Level 1.....	cm	0.1 cm	NS*
Tolerance Level 2.....	cm	1.0 cm	0.0 < D ₁ ≤ 1.0
Tolerance Level 3.....	cm	2.0 cm	1.0 < D ₂ ≤ 3.0
Length			
Tolerance Level 1.....	m	0.01 m	NS
Tolerance Level 2.....	m	0.1 m	NS
Tolerance Level 3.....	m	0.2 m	9.9 < L ₁₀ ≤ 10.1
Stack Length.....	m	0.02 m	9.99 < L ₁₀ ≤ 10.01
Stack Width (≤ 2.6 m).....	m	0.02 m	1.99 < W ₂ ≤ 2.01
Stack Height.....	m	0.02 m	6.99 < H ₇ ≤ 7.01
Area, Log Ends.....	m ²	NS	
Volume, Logs			
Tolerance Level 1.....	m ³	3 significant digits	
Tolerance Level 2.....	m ³	0.001 m ³	
Tolerance Level 3.....	m ³	0.001 m ³	
Volume, Log Defect.....	m ³	0.001 m ³	
Volume, Piles.....	m ³	0.01 m ³	
Volume, Stacked.....	m ³ (stacked)	0.001 m ³	
Volume, Stacked Peeled.....	m ³ (stacked) peeled	0.001 m ³	
Volume, Disks.....	cm ³	NS	
Mass, Logs, Piles, Vehicles, etc.....	t or kg	0.01 t or 10 kg	
Mass, Disks.....	gm	NS	

* not specified

Centimetres (cm) are used for measuring roundwood diameter and the diameter of defect. For scaling large quantities of logs, diameters are measured in 2 cm classes, with the boundary between size classes on the odd centimetre. Merchantable diameter limits are not established.

Metres (m) are used to measure roundwood lengths. Lengths will generally be measured in size classes of 0.2 m, with the boundary between size classes on the odd 0.1 m. No provision is made for broomage or trim allowance. Merchantable log lengths are not established.

Gross volume is computed using Smalian's formula and is expressed in cubic metres (m^3). The only defects that are recognized, for which volume deductions shall be made, are advanced decay (rot), charred wood and missing wood.

Provision is also made for measuring logs in piles, with measurements taken on one or both sides of the pile. When measurements are confined to one side of the pile, the gross pile volume in cubic metres is determined as the sum of volumes of cylinders. Defect is assumed to extend the full length of the log and defect volume is calculated as the sum of the volumes of defective cylinders.

When measures are taken on both sides of the pile, the gross pile volume is calculated as one-half the sum of the volumes of cylinders. Defect is assumed to extend one-half the length of the log and defect volume is calculated as one-half the sum of cylinders.

H. D. Rolston measuring diameter of log.

Stacked Wood Measurement

Stacked wood is measured for length, width and height in 2 cm classes and recorded in metres. The boundary between size classes occurs on the odd centimetre. Length and height measurements may be obtained from one or both sides of the stack.

Stacked measure applies only to an orderly arrangement of logs or bolts less than or equal to 2.6 m in length. Fuelwood is also measured in stacked form, but there is no deduction for defect.

A stacked cubic metre (symbol m^3 (stacked)) means the total amount of wood, bark and airspace contained in a stack of roundwood, as determined by its external dimensions, equal to one cubic metre ($1 m^3$). Peeled wood may also be measured in stacked form, but the volume unit is expressed as a stacked cubic metre peeled (symbol m^3 (stacked) peeled).

Tree Length Measurement

A method of measuring tree lengths using butt diameters to estimate the solid wood volume of aggregates is described. Volume determination uses local volume tables or the average tree length volume approach.

Mass Measurement

Minimum procedures are set down for the determination of the mass of quantities of roundwood, including tree lengths loaded on transports, trucks and other vehicles, and logs loaded on pallets and in bundles. The mass of roundwood is expressed in tonnes (t) or kilograms (kg), and provision is made for conversion of mass to solid volume through sample scaling procedures.

Piece and Linear Scaling

Criteria descriptions and procedures description are set down for scaling by a piece count or a summation of lengths.

Instruments

The minimum requirements for scaling instruments, and the criteria of construction, materials, marking and limits of error are established. The specific design of scale sticks is not included.

Appendices

The appendices include symbols for the commercial tree species in Canada, approximate factors for converting stacked and piece measures to solid volume measures and vice versa, examples of volume tables and procedures for estimating volumes of tree lengths in piles, rough and peeled wood factors and volumetric scaling of stacked wood on vehicles. In addition, procedures for determining the ratio of mass to solid volume are described.

What is Required?

July 1, 1979 is the scheduled date for the im-

plementation of metric scaling systems in Canada. The Standard has been printed for distribution and the provinces are encouraged to use it and to prepare regulations citing the Standard as the minimum criteria for scaling roundwood within their jurisdiction. Provincial limits governing merchantability for diameter, log length and reject logs must be established. Scalers must also be trained before implementation of metric scaling can take place.

Implications for Wood Measurement Procedures

Standards, as developed within the framework of the Canadian Standards Association, are consensus standards. They are prepared by individuals who represent a reasonable balance of interests relevant to the scaling process. Their development and application is a voluntary process. The stan-

dards approach to scaling is a rational and cooperative way for dealing with wood measurement problems. It assures technical excellence and continuity of effort.

- (1) **Standards Council of Canada. 1977.** Criteria and Procedures for the Preparation and Approval of National Standards of Canada. CAN-P-2B. 350 Sparks Street, Ottawa, Ontario.
- (2) **Leggett, R. F. 1971.** Standards in Canada. Information Canada, Ottawa, Ontario.
- (3) **Bowen, M. G. 1975.** The Measurement of Primary Wood Products in Canada: Current Status. Forest Management Institute Information Report FMR-X-68. Canadian Forestry Service, Ottawa, Ontario.
- (4) **Keen, R. E. 1975.** Metric Forestry: A Measure of Progress. Forestry Chronicle, V51(2), p. 47-50.
- (5) **Honer, T. G. 1977.** Metric Scaling Standards in Canada. Paper prepared for the 58th annual meeting woodlands section Canadian Pulp and Paper Association in press).
- (6) **CSA Standard CAN3-0302.1 — M77, Scaling Roundwood,** Canadian Standards Association, Rexdale, Ontario.

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