



*SDC's instructions for timber measurement*

# **MEASUREMENT OF ROUNDWOOD STACKS**

1 December 2014

The instructions may be applied from 1 January 2014 in accordance with a decision of the SDC Board. The date of introduction is decided by each measuring company.

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# 1 Introduction

## 1.1 SDC's instructions for timber measurement – timber measurement legislation

SDC's instructions for timber measurement have been produced in collaboration with the Swedish Timber Measurement Associations. They are approved by parties on the timber market through decisions by the SDC Board. Regulations and instructions regarding control and follow-up, in addition to what is described in these instructions, are presented in separate documents. Current versions of measurement instructions and control documents may be retrieved from [www.sdc.se/virkesmätning](http://www.sdc.se/virkesmätning) under the tab 'Virkesmätning'.

Timber measurement in Sweden is regulated by special legislation, the Swedish Timber Measurement Act (SFS 2014:1015). This Act and the regulations of the Swedish Forest Agency (SKSFS 2014:11) on timber measurement form a fundamental regulatory framework for timber measurement and timber reporting in Sweden.

One of the regulations concerns requirements for accuracy when measuring stacks, involving gross volume.

- Systematic errors: only insignificant systematic errors are allowed in measurement.
- Batchwise deviation: for timber batches greater than 10 m<sup>3</sup> the maximum permitted deviation is stated as a function of the batch size. As the batch size increases, the permitted deviation decreases.

*A batch of timber is defined as follows: A clearly defined quantity of timber agreed by the seller and buyer that is measured in the same way. Specifications regarding timber properties are identical for the entire quantity. The timber is usually delivered on a single occasion or during a defined period of time.*

The legislation is described in more detail in the document *General information concerning SDC's instructions for timber measurement*.

## 1.2 Scope and application of this document

Stack measurement is used for roundwood, and gives a volume in cubic metres solid under bark (m<sup>3</sup>sub). The measurement is of form-adjusted solid volume, i.e. deduction is made for any bulging. This volume should correspond to the volume obtained in top-butt measurement of logs (see SDC instructions, *Measurement of log volume under bark*).

These instructions are suitable for measurement of roundwood as the basis of pricing, regardless of species, assortment or intended use. The timber may be in fixed lengths or in decreasing lengths between 2.5 and 6.5 m. The instructions apply to measurement of timber loaded on vehicles and to measurement of stacks at a storage site. Quality provisions are described in assortment specific instructions.

## 1.3 Basic requirements for stack measurement

The timber must be measured carefully and according to the provisions applicable to the measurement. If local conditions do not allow the measurement to be carried out in this way, the timber must not be measured. The timber must be measured as seen.

Before measurement, the delivery/stack is examined by the measuring official to check that the timber properties, and conditions for measurement, e.g. confirmed identity, comply with applicable instructions and agreements. If this is not the case, measurement is refused.

When the timber is to be measured on a vehicle, the work environment may also lead to a refusal, such as the way the timber is loaded or the presence of contaminants, such as stones.

If measurement is refused, both seller and buyer of the timber concerned are to be informed immediately, and notified of the reason for the refusal.

## 2 Stack dimensions and wood volume percentage

The wood volume of the stack under bark is calculated through its dimensions and wood volume percentage. The stack dimensions (Figure 1 and

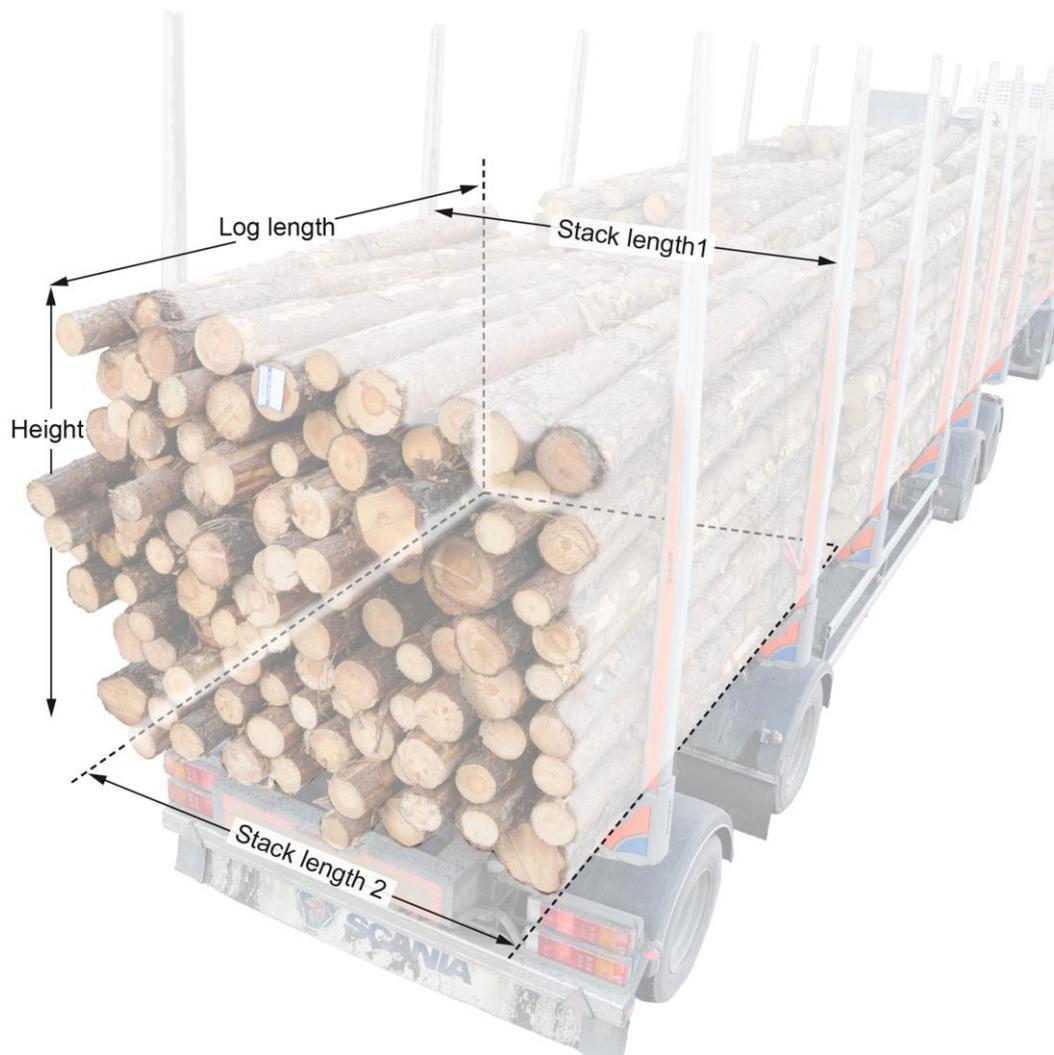


Figure 2), i.e. *stack length*, *log length* and *height*, are measured as if the timber were placed in an imaginary tightly fitting rectangular box. On the log-end side of the stack, the imaginary box side is placed so that the volume of the cavity caused by the logs not reaching the end is compensated by protruding logs. The distance between opposite sides in the imaginary box is measured at right-angles to the sides. The dimensions are given in cm with rounding off according to Swedish Standard. The wood volume percentage is the proportion of wood in the

volume of the imaginary box. The timber volume is the product of the stack dimensions and the wood volume percentage. The timber volume is given in cubic metres (m<sup>3</sup>sub) to at least two decimal places.

**Height:** The height of the stack is the distance between a horizontal bottom surface and an average of the highest points of the top layer of logs.

**Stack length:** The length of a stack is the distance between end support/banks (or imaginary support/banks).

**Log length:** For timber in decreasing lengths, the log length of the stack is the basal area-weighted average length that would be obtained through log measurement. For timber of fixed lengths, the basic rule is that the agreed log length applies as the dimension. When necessary, this is checked by measuring the length of individual logs in accessible parts of the stack. If this measurement gives an average log length that deviates more than 3 cm from the agreed stock length, the measured length applies.

**Wood volume percentage:** The wood volume percentage of the stack is determined and expressed as a whole-figure percentage. The wood volume percentage mainly depends on the following properties (*a table to help in visual assessment is provided in Appendix 1*):

Stack properties	Log properties
- Stacking	- Mean diameter
- Logging waste, and snow and ice	- Crookedness
- Position of the logs in the stack	- Delimiting (incl. buttress)
- Height of the stack	- Length of the logs
- Percentage of butt logs	- Stem shape / tapering
- Species mix	- Bark volume

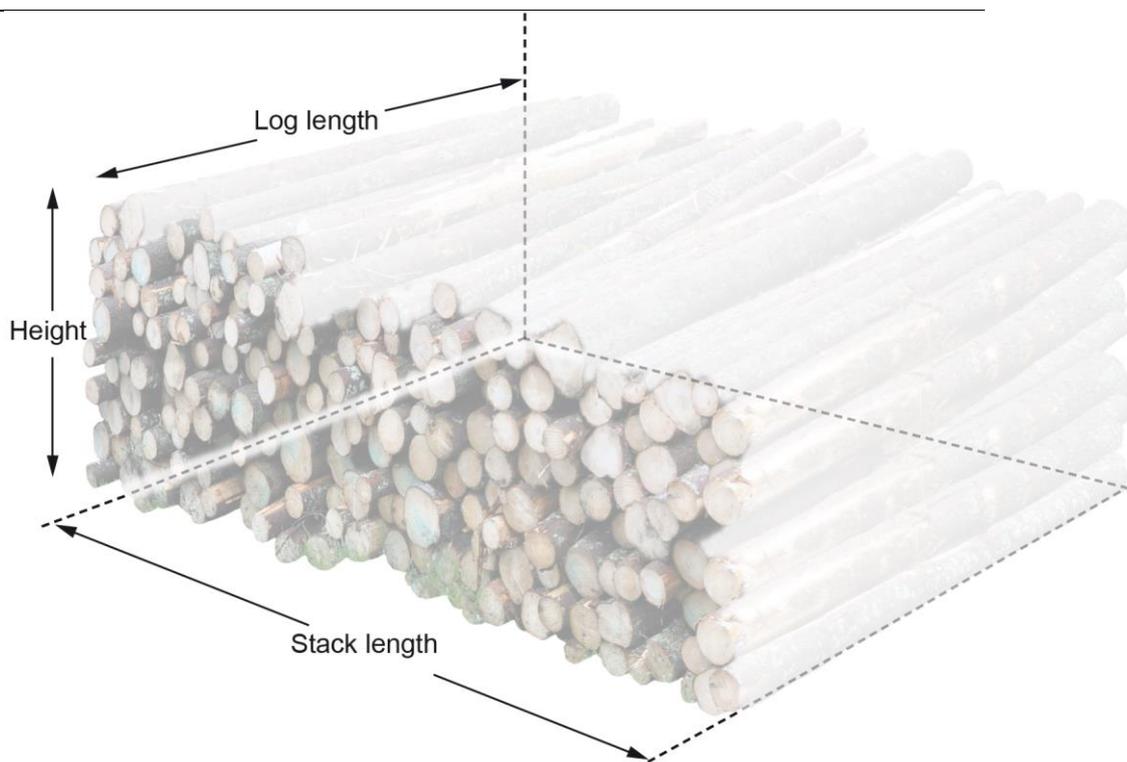


Figure 1. Stack dimensions: stack length, log length and height.

### 3 Stack measurement on a vehicle

#### 3.1 Measurement on a vehicle

When a stack is measured on a vehicle, dimensions are measured according to

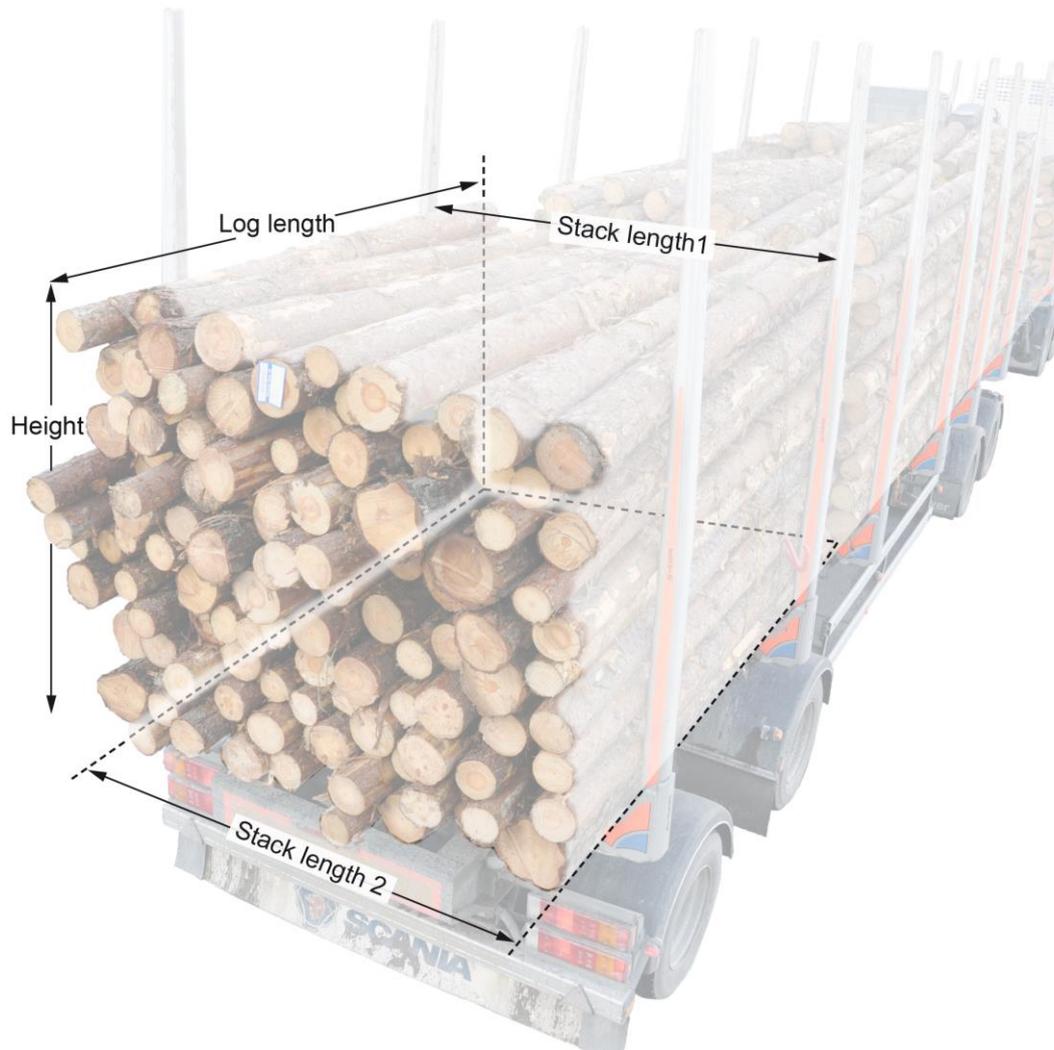


Figure 2. If a measurement platform is available that allows measurement and examination of the top of the stack, dimension measurements are limited to those taken from the platform. This procedure is called one-sided measurement. If no measurement platform is available, the measurement is carried out as a two-sided measurement. Timber stacked on railway trucks and part-stacks are exempt from the requirement for two-sided measurement.

**Stack length:** The stack length is measured between the stakes on the vehicle, known as the bank width. The stack length is calculated as the average of the upper and lower bank width.

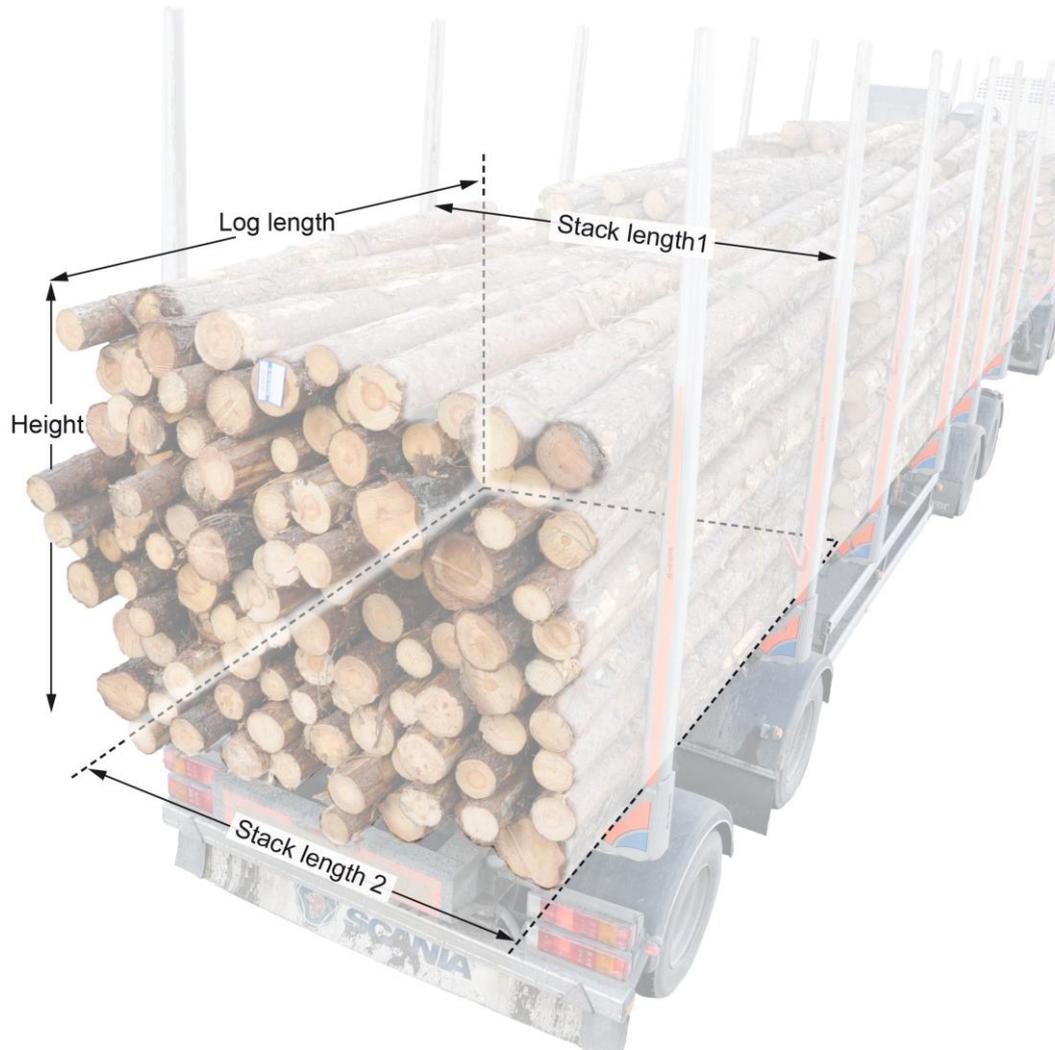


Figure 2 shows that the lower stack length is difficult to measure when the vehicle is loaded. This dimension must therefore be stated and displayed on the vehicle, or must be made available in some other way to the measuring official.

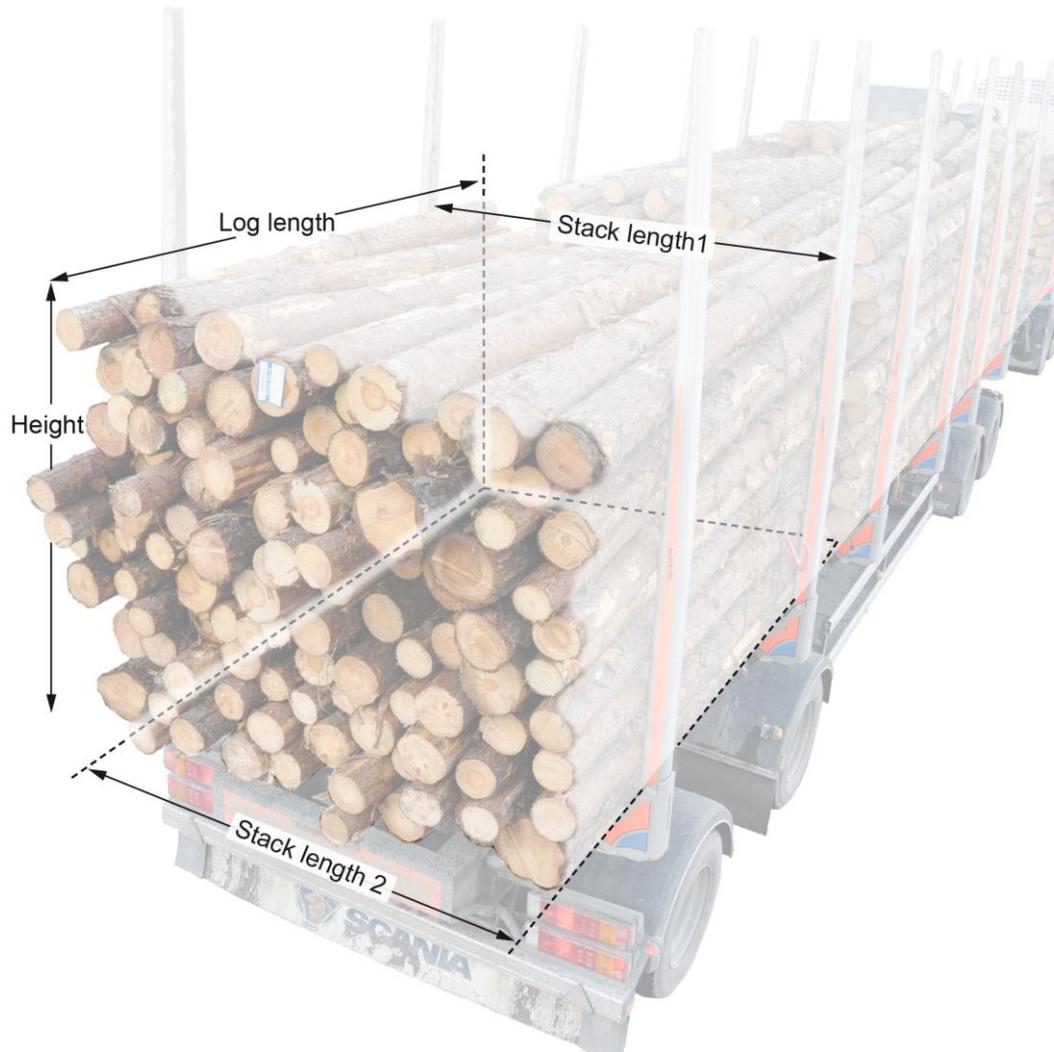


Figure 2. Measurement of a stack on a vehicle.

### 3.2 Split stack on a vehicle

A stack on a vehicle may be divided into several deliveries on condition that:

- There is a maximum of three deliveries in the same stack (deviating regional regulations may be applied).
- An individual part of a stack is at least 20 cm high.
- At least one end surface side of the stack is available for inspection (e.g. the stack closest to the cab and the middle stack on the trailer may not be divided on a rig with five stacks of standard lengths).
- The boundary between part-stacks is clearly marked, e.g. the upper layer in the underlying part-stack is marked with marking dye. Labelling must be done during loading.

## 4 Stack measurement at a storage site

A storage site may be a road, harbour, terminal, etc.

### 4.1 Requirements regarding how the timber is stacked

For stack measurement at a storage site, the following conditions are required:

- The stack must be at least 1 m high and no more than 3 m high.
- The top of the stack must be levelled.
- Where stacks contain timber of standard length, the ends must be evened. No end surface of an individual log may deviate more than 20 cm from the average end surface of the stack.
- Stacks containing timber of varying lengths must be arranged so that one of the stack ends is evened so that no log end deviates more than 40 cm from the average end surface of the stack.
- Stacks with timber of varying lengths may not exceed 6 m in length.
- Space must be available on both sides of the stack to allow examination of its content. On one of the stack sides (the most even side where the stack contains varying lengths) there must be sufficient room for measurement to take place (at least 5 m).
- Before measurement, the top of the stack must be cleared of snow, ice and logging waste as much as necessary to allow measurement of the timber. Only a limited amount of logging waste may be found inside the stack.

### 4.2 Section measurement of a stack

If the stack exceeds 3 m in length, section measurement must be used for log length and height. The stack is then divided into a number of equal-length sections of no longer than 3 m. When measuring log length, one measurement is taken for each section. When measuring the stack height, one measurement is taken at each log-end side of each section, and the average is given as the height of the stack.

Stacks without end supports normally have sloping sides. In order to obtain a suitable stack length measurement, an 'imaginary' volume transfer of the outer part is made. This measure, known as 'folding up', is permitted up to 1 m at each end of the stack.

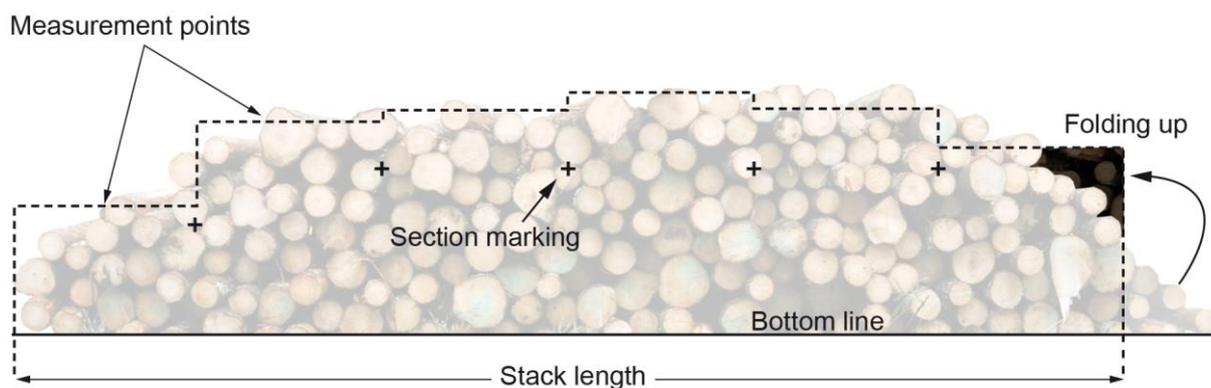


Figure 3. Section measurement and the principle of folding up.

SL = stack length  
LL = log length  
H = stack height

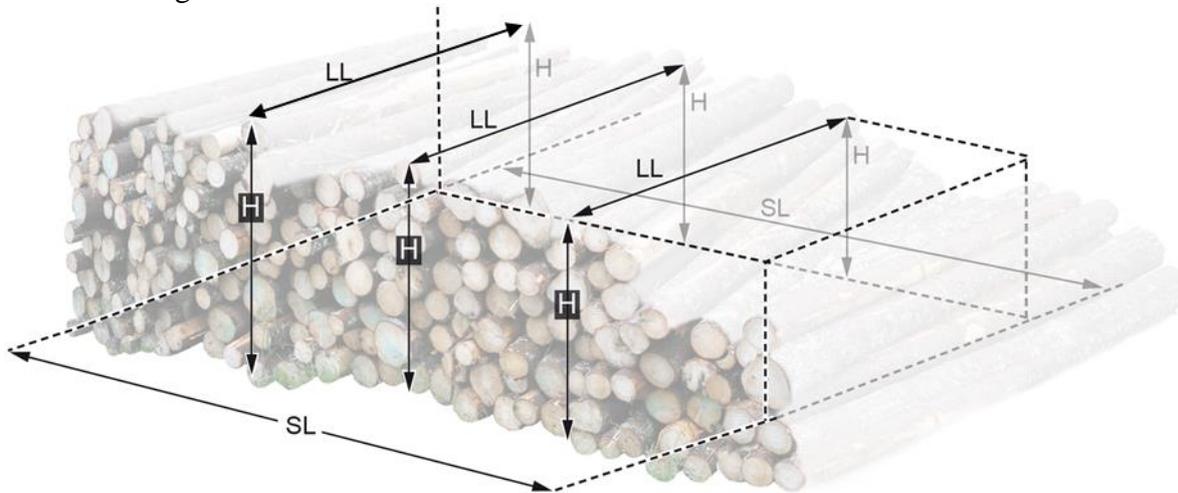


Figure 4. Section measuring of a stack with standard-length timber

## 5 Equipment for measuring stacks

### 5.1 Instruments for manual measurement of stack dimensions

Instruments for measuring stack length, log length and height must be approved according to the measuring company's regulatory framework.

### 5.2 Stack measurement using photos

Stacks on a vehicle may be measured using photos. The photos must enable equivalent measurement and equivalent control opportunities to that of manual measurement on the vehicle. For the vehicle in question, the bank width must be registered and be available for the measuring official.

The following apply when photos are used to measure a stack:

- A photo must be taken perpendicular to the stack for measurement of height and log length.
- Function for calibration, e.g. clearly visible calibration object in the photo where the measurement is taken.
- At least one photo per stack at such an angle that a maximum part of the stack's end area can be assessed.
- The possibility to zoom in so that the supplier's labelling can be read and the quality assessed.

### 5.3 Equipment for automatic stack measurement on a vehicle

A stack on a vehicle may be measured using equipment for automatic measurement if this is approved by VMK. Apart from volume under bark, automatic measurement must also

generate the same results as manual measurement, i.e. stack length, log length, height, and wood volume percentage.

## 6 Control of measurements

Measurements must be checked on randomly selected stacks. Control of stack measurement on a vehicle must be carried out as log measurement (manual top-butt measurement). Control measurements may be carried out later if it can be guaranteed that the timber is kept separate. Control of stack measurement on a roadside may be carried out as stack measurement, but preferably as log measurement (manual top-butt measurement). When the control measurement is carried out as stack measurement, it must be carried out as two-sided measurement with 1-m stack sections.

The control unit is the stack, and the result from the control measurement must be expressed as the difference in stack volume between first measurement and control, and reported as mean values and distributions at the desired aggregation level (measurement site, time period, batch, etc).

## 7 Revision history

1 December 2014	The instructions may be applied in accordance with the decision of the SDC Board. The instructions are applied after decisions made by each measuring company. The instructions replace the section <i>Volume measurement of stacks</i> in Measurement Instructions VMR 1-99.
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## 8 Appendices

### Appendix 1 Table for assessing wood volume percentage in a stack

#### Base figures for tree species.

Tree species	Base figure	Comments
Spruce	70%	1. If the stack contains more than one tree species, the base figure is calculated by weighting the species' base figures with the estimated volume proportion (= weighted mean) 2. For assortments intended for sawing, the base figures are increased by 2% for deciduous trees and 1% for coniferous trees. For aspen intended for matchstick manufacture, the base figure is increased by 2%. 3. When a stack is measured on a vehicle, the base figure is reduced by 1% if the timber is well stacked up to the end support, otherwise by 2%.
Pine	68%	
Aspen	66%	
Alder, Oak	65%	
Birch, Beech, Ash	64%	

#### Correction for the mean diameter of the timber (arithmetic mean diameter on bark)

cm	%	cm	%	cm	%	cm	%
4	-13	9	-6	15	0	23-26	+5
5	-11	10	-5	16	+1	27-39	+6
6	-9	11	-4	17	+2	40-69	+7
7	-8	12	-3	18-19	+3	70+	+8
8	-7	13	-2	20-22	+4		

#### Deduction for bark and stacking

Bark		Stacking	
Extremely thin bark	-4	Dense, well-stacked	0
Thin bark (high proportion of shiny bark)	-5	Well-stacked	-1
Normal bark	-6 to -8	Rather sparsely stacked	-2
Thick bark (high proportion of crusty bark)	-9	Sparsely stacked, lopsided stacking (normal mechanical stacking)	-3 to -5
Extremely thick bark	-10 to -12	Very sparsely stacked, very lopsided stacking	-6 to -7
		Extremely sparsely stacked, extremely lopsided stacking	-8 to -9

### Deduction for crookedness and delimiting

<b>Crookedness</b>		<b>Delimiting (incl. buttress)</b>	
Straight	0	Individual short delimiting stumps on a few logs, otherwise delimited to the mantle surface. Negligible knot bulges and individual buttresses	0
Almost straight	-1	Many short delimiting stumps, marked branch whorls, a small number of buttresses	-1
Somewhat crooked	-2	Significant number of branch stumps and buttresses, noticeable branch whorls with branch swellings	-2 to -3
Crooked	-3 to -4	Large number of branch stumps, large branch whorls and several large buttresses. Partly coarsely branched	-4 to -5
Noticeably crooked	-5	Thick branches and/or very poor preparation	-6 to -8
Very crooked	-6		
Extremely crooked (branch wood)	-7		

For stacks of timber with a mean diameter of 7 cm and less, the deduction is doubled. For diameters of 8-9 cm the deduction is cancelled out.

### Correction for stem form/tapering

<b>Logs with very good stem form (negligible tapering, and even and smooth mantle surface)</b>		<b>Logs with very poor stem shape (large tapering and knobby mantle surface)</b>	
Volume proportion 31-50%	+ 1%	Volume proportion 31-50%	- 1%
Volume proportion 51-70%	+ 2%	Volume proportion 51-70%	- 2 %
Volume proportion 71% and more	+ 3%	Volume proportion 71% and more	- 3 %

### Deduction for snow and ice, and logging waste

<b>Soft snow, solid snow, ice in the stack</b>		<b>Logging waste in the stack</b>	
Small amount	-2	Negligible amount or none	0
Sizeable amount	-4	Limited amount	-1
Large amount	-8	Large amount	-2
Very large amount	-12	Very large amount	-3 to -4

Logging waste includes stemwood shorter than 50 cm, chips from wood splitting, etc, bark, branches and brushwood.

**Correction for timber length and stack height**

Timber length (only standard length)			Stack height	
	Coniferous	Deciduous		
4.0 m	- 2	- 3	Stack exceeding 2 metres on 2/3 of the length of the bottom layer	+ 1
3.0 m	0	0		
2.5 m	+ 1	+ 2	Stack exceeding 3 metres on 2/3 of the length of the bottom layer	+ 2
2.0 m	+ 3	+ 4		

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