



SDC's instructions for timber measurement

Grading of sawlogs of pine and spruce

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This is a translation from Swedish, which is the language that will apply in the event of any translation disputes.

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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 Timber Measurement Associations. They are approved by parties on the timber market through decisions by the board of SDC. Rules and regulations concerning control of timber measurement, in addition to what is described in this document, are presented in separate documents. Current versions of measurement instructions and control documents can be found at www.sdc.se under the tab "Virkesmätning".

Timber measurement in Sweden is regulated by the Timber Measurement Act (SFS 2014:1015) and the regulations of the Swedish Forest Agency (SKSFS 2014:11). The legislation is described more in detail in the document 'General information concerning SDC's instructions for timber measurement'.

1.2. Applicability of these instructions

These instructions apply when measuring sawlogs of Scots Pine (*Pinus silvestris*) or Norway Spruce (*Picea abies*). The instructions may be used both when measuring log-by-log and when measuring stacks. The instructions only specify grading rules. Rules concerning volume measurement of logs or stacks, and more detailed instructions on how to measure specific properties, are described in other instructions.

1.3. Basic requirements for measuring a consignment of sawlogs

If agreed, the consignment is to be inspected before measurement if measurement is to comprise stack measurement, or before off-loading if measurement is to comprise log-by-log measurement. Measurement will be refused if properties such as freshness, or conditions for measurement such as identification of the consignment, do not fulfil contracted specifications. This includes inspection of blue stain, where limits can be set in accordance with Chapter 6.

Unless otherwise agreed, measurement of the consignment will be refused:

- If coal, soot, plastics, stones (> 20 mm) or metal is found.
- If more than 10% of the total volume consists of reject logs (see Chapter 2).

If measurement is refused because agreed conditions have not been fulfilled, both seller and buyer are to be informed immediately, and notified of the reason for the refusal.

2. Basic quality requirements for sawlogs of pine and spruce

A sawlog must:

- Have been cut from a living stem section and crosscut with a saw.
- Be free from insect damage and storage decay (applies to the wood).
- Be free from coal, soot, gravel, stones, metal and plastics (applies to wood and bark). Gravel and stones are defined as particles > 2 mm.
- Not have buttresses higher than 15 cm.
- Not contain more than 5% forest rot on the end surface (buttresses not included). Forest rot caused by *Phellinus pini* is not allowed.
- Fulfil contracted length and diameter requirements.
- Be satisfactorily straight (a maximum of 120 cm loss of saw yield where the straight part fulfils the length requirement). For sawlogs of standard length (≤ 3.3 m) maximum 30 cm loss of saw yield.
- Not have open scars, indents caused by feed rolls, splits from felling or cross-cutting or other stem damage (except for flutes) that affect more than 20% of the diameter of the scaling cylinder.
- Not have shakes or splits originating from the growing tree. Heart shakes are allowed.
- Not have spike knots larger than 120 mm.
- Be satisfactorily delimbed or delimbed according to contract.

Logs that do not fulfil these requirements are rejected.

3. Grading when measuring log-by-log

3.1. General information concerning grading

A consignment of sawlogs that is to be graded into more than one grade must be measured log-by-log. Sampling methods are allowed.

A log's grade is based on its properties on the entire log surface, including both end surfaces. If the log's position on the ground or on the conveyor can be regarded as random, it is sufficient to examine only the exposed part when grading. If agreed between the parties (buyer and seller), grades may be merged or excluded. If all grades are merged the grade is set to 0.

3.2. Grades for pine and spruce

There are four grades for pine sawlogs and two grades for spruce sawlogs.

	Pine grades			
	1	2	3	4
Log type	Butt log	Not butt log	All log types	All log types
Knots, whole mantle surface	Max 20 mm, all knot types. Max 5 knots	Sound knots max 120 mm. Other knots max 60 mm.	Sound knots max 120 mm. Other knots max 60 mm	Spike knot max 120 mm. Other knots unlimited.
Knot within 150 cm of butt end		A minimum of two distinct whorls or one sound knot		
Knot swelling	Max 5			
Growth rings 2-8 cm from pith	Minimum 20		Minimum 12	
Straightness	Max. 20 cm loss of saw yield			Max. 120 cm loss of saw yield
Indication of top rupture	Not allowed			Allowed
Forest rot	Not allowed			Max 5% of end surface

Diameter reduction (pine)

If a log has scars or flutes that affect the scaling cylinder, its diameter is to be reduced by 1 cm unless these defects are within 20 cm of a log end (tolerance).

	Spruce grades	
	1	2
Knots, whole mantle surface	Max 60 mm regardless of knot type	Spike knot max 120 cm. Other knots unlimited.
Growth rings	Min 12	
Straightness	Max 20 cm loss of saw yield	Max 120 cm loss of saw yield
Indication of top rupture	Not allowed	Allowed
Open scar	Scar which affects the scaling cylinder is not allowed	Depth of scar max 20% of scaling cylinder diameter.
Bark-encased scar	Length max 2 x top end diameter	Allowed
Forest rot	Not allowed	Max 5% of log end surface

Tolerance:

- Knots, buttress-related cavities and scars within 20 cm of log end (applies also to causes for reject).
- Open scars, including holes left after branch removal, shorter than 7 cm.

Definitions:

- For pine grade 1, sound knots are included if their diameter > 15 mm, other knots if they are > 9 mm.
- For pine grade 2, sound knots are included regardless of their diameter.
- A distinct whorl (pine grade 2) comprises at least two knots > 15 mm.
- Growth rings are counted 2-8 cm from the pith on the large-end cross section, except for butt log of spruce where rings are counted on the small-end cross section. Counting is done in the radial direction that gives the smallest number of rings.
- Scaling cylinder: a straight cylinder based on cross-callipered top-end diameter minus 15 mm. If the measurement unit is cm, the scaling cylinder is based on the top-end diameter minus 1 cm.
- Loss of saw yield: length of the scaling cylinder that does not fit into the actual log due to crook.
- Indents caused by feed rolls, splits from felling or cross-cutting and scars from pulled-out branches are regarded as open scars.



Figure 1. Determining loss of saw yield.

4. Instructions for stack measurement

When measuring sawlogs in stacks, e.g. loaded on trucks, the proportion of reject logs is determined. The proportion of reject logs may be estimated from the visible sides of the stack. The exposed logs are to be regarded as a sample from which the proportion of reject logs is estimated. When the share of reject logs is difficult to determine, or if the proportion is close to the permitted level, the stack must be spread out for closer examination.

5. Assessment of logging damage class

Logging damage includes splits in log ends originating from felling or cross-cutting, and spike holes caused by the feed rolls of the harvester. Extent of logging damage, expressed in frequency classes, is estimated when agreed by the parties. Classes may be merged or excluded by agreement. Logging damage is classified per consignment and may be carried out for both stack measurement and log-by-log measurement. Consignment means the number of logs delivered and measured on a specific occasion, often a truck load.

5.1. Splits in log ends originating from felling or cross-cutting

To be regarded as a split, as observed in the end surface, the split must be 1) tangential 2) affect the scaling cylinder, and 3) reach the mantle surface.

The frequency of splits is classified as follows:

- No logs with splits
- Moderate frequency of logs with splits, 1-5% of the logs
- High frequency of logs with splits, > 5% of the logs

5.2. Spike holes

A log is considered to be damaged if spike holes caused by the feed rolls have penetrated deeper than 7 mm into the wood. The depth is measured from the mantle surface under bark and the damage includes broken or torn fibres. The consignment is classified as damaged if more than 5% of the logs have spike holes.

5.3. Frequency classes for logging damage

Frequency classes for logging damage		
	Spike holes	
	No ($\leq 5\%$)	Yes ($> 5\%$)
Not assessed	Not assessed	
No logs with splits	1	2
Moderate frequency of splits, 1-5 %	3	4
High frequency of splits, > 5 %	5	6

6. Estimating the proportion of logs with blue stain

The proportion of logs with blue stain, expressed as frequency classes, is estimated when agreed by the parties. Classes may be merged or excluded by agreement. The assessment is carried out per consignment and can be done for both stack measurement and log-by-log measurement. The assessment applies to surface blue stain or deep blue stain. Deep blue stain means more than 5 mm from the log surface or > 50 mm from the log end. The frequency of

deep blue stain can only be assessed by cutting into the wood. Blue stain can develop rapidly, so cannot be followed up as described in Chapter 7.

6.1. Frequency classes for blue stain

Grading alternative	Name	Frequency of logs with blue stain	Blue stain class
No inspection for blue stain			
		-	Not assessed
Assessment of surface blue stain			
	Surface blue stain $\leq 5\%$	0-5%	1
	Surface blue stain 6-25 %	6-2 %	2
	Surface blue- stain $> 25\%$	$> 25\%$	3
Assessment of deep blue stain (limit for measurement refusal by agreement)			
	No deep blue stain	0%	4
	Deep blue stain 1-10%	1-10%	5
	Deep blue stain 11-25%	11-25%	6
	Deep blue stain 26-50%	26-50%	7
	Deep blue stain $> 50\%$	$> 50\%$	8

7. Control measurement

Control measurement should be performed as manual measurement of randomly selected logs. For control measurement, the entire surface of the log must be visible for inspection, such as by placing the logs on a surface where they can be rolled. If possible, control measurement should be performed within two weeks, and must be performed no later than six weeks after the first measurement.

Results may be presented per measurement station, time period, etc. as:

- Percentage correctly graded logs.
- Grading value quotient. Total value from first measurement divided by total value from control measurement. Differences in volume determination are not included when calculating grading value quotient.
- Total value quotient. Includes both grading and volume differences.

Estimations of value quotients should be based on average prices from a sample of relevant price lists.

Exceptions

A small number of randomly selected control logs may not be sufficient for control measurement of consignment-based estimates of the proportion of logs with logging damage or blue stain. Furthermore, blue stain can develop rapidly, so control measurement performed weeks after the first measurement may be misleading.

Control of logging damage requires cutting in the wood, so the control measurement cannot be performed before the regular measurement (unlike grading, where control measurements can be performed in advance).

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