



*Swedish Instructions for Timber Measurement*

## **VMK APPLICATION GUIDE**

### **Measurement Instructions for Determining the Quality of Pulpwood**

1 August 2018



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## 1. Introduction

### 1.1. VMK application guides for timber measurement

This application guide serves as support for interpretation of the corresponding measurement instructions (*Instruction*) set by the SDC Board. The application guides have been prepared by the Control Commission, with representatives from VMK (*Timber Measurement Control*), VMF Nord, VMF Qbera and VMF Syd. Current instructions and application guides are available on [www.sdc.se](http://www.sdc.se) under the tab ‘Virkesmätning’.

### 1.2. Scope and implementation of this application guide

*Instruction:*

*These instructions apply when pulpwood is to be measured to form the basis for payment. Pulpwood is roundwood intended for the production of pulp.*

According to the definition in the measurement instructions, it is the intended use of the timber as agreed between the parties that determines which rules apply for the measurement. However, after measurement, there is nothing to prevent pulpwood being used for some other purpose if this is appropriate.

In the nomenclature for timber accounting, pulpwood is described with a four-digit code. The third digit, the T code, indicates the tree species or species group. A pulpwood assortment is always traded with the T code specified. The following codes by assortment can be applied:

Assortment	T code	Tree species
Spruce pulpwood	2	Spruce ( <i>Picea abies</i> ) and Sitka spruce
Softwood pulpwood	0	All softwoods, unless agreed otherwise
Birch pulpwood	4	Birch
Aspen pulpwood	5	Aspen and poplar
Beech pulpwood	6	Beech ( <i>Fagus silvatica</i> ), maple, mountain ash and Swedish whitebeam
Alder pulpwood	7	Alder and occasional logs of other hardwoods, except oak and elm
Hardwood pulpwood	3	All hardwoods, except oak and elm, unless agreed otherwise
Mixed pulpwood	9	Species according to contract

In addition to the assortments named above, most commonly-traded tree species may be traded under their respective species name (T codes). Examples are larch, Lodgepole pine and eucalyptus.

Pulpwood is divided into assortments by tree species or species group. Where more than one tree species is permitted, the agreement between the parties must state which species may be included. Logs of prohibited species are rejected.

Spruce pulpwood may include both ordinary spruce (*Picea abies*) and Sitka spruce. The latter, which is a species imported to Sweden, is found in some planted stands in southern and southwest Sweden. Sitka spruce may also occur in imported pulpwood.

The reason for the strict species requirement for spruce pulpwood is that this assortment is primarily used for manufacture of mechanical pulps (ground pulp, thermomechanical pulps (TMP) and chemi-thermomechanical pulps (CTMP). These manufacturing processes are affected negatively by the resin found in most other softwood species, particularly pine and fir species.

Softwood pulpwood is used in the manufacture of sulphate pulp, and may contain other softwood species by agreement. Pine normally dominates, but spruce is also common. Other softwood species that may occur include larch, various fir species (e.g. silver fir), Lodgepole pine and Douglas fir. Deliverable species may be restricted, in which case the agreement or contract applying to the recipient point in question specifies the restrictions.

Birch pulpwood may only contain birch. Only two species occur in Sweden, the *downy birch* and the *silver birch*.

Aspen pulpwood may only contain the species aspen and poplar. There are various species of poplar (such as the Eastern Balsam poplar and the white poplar), but common to all of them is that they are closely related to aspen and similar to aspen in terms of wood properties.

### 1.3. Basic requirements for measurement

Provisions regarding preparation are based on industrial requirements for processability. Another aim is to limit difficulties in measurement and other handling of crooked logs. Timber preparation errors are considered down to and including the smallest deliverable diameter, and all preparation errors are grounds for rejection (preparation rejection).

## 2. Quality requirements regarding deliverable stacks

### 2.1. Freshness

*Instruction:*

*Spruce pulpwood must be fresh. The main requirement regarding freshness is that the bark is easily removed and/or that the wood has a specified moisture content. If the freshness is in doubt, the wood must be examined. However, pulpwood delivered within three weeks of felling is always regarded as fresh.*

*Other pulpwood assortments should be satisfactorily fresh. The requirements for this are agreed between the trading parties.*

*Freshness is assessed at stack level, and at least 90% of the stack volume must be deemed fresh (spruce pulpwood) or satisfactorily fresh (other pulpwood).*

Freshness is not just a sign that the wood has recently been felled, but also reflects properties such as *lightness* and *binding strength between bark and wood*.

There is no direct measurement of freshness. Instead, there are regulations for the longest permitted time from felling to measurement, and for binding strength between bark and wood. Bark must be easily removable from fresh spruce pulpwood. This is assessed using an axe or a knife on an undamaged part of the bark, where the inner bark must be white and moist.

## 2.2. Reject logs

Measurement of roundwood volume in stacks normally means that any reject logs must be identified and their volume determined while they are in the stack. A more thorough inspection can only be carried out if the logs in the stack are placed on a surface for log-by-log inspection and measurement, which is a procedure carried out when earlier measurements are being checked for quality and when sample stacks are measured.

Reject logs in the stack are often hidden by other logs, and one or both log-end sides of the stack may also be hidden by adjacent stacks. Consequently, the occurrence of rejects is calculated on the basis of what can be observed on the external sides of the stack (log sides and log ends) in accordance with section 2.4.

## 2.3. Reject cause codes

Table 1 shows the codes to be applied for reject logs. In stack measurement, the entire reject volume must be recorded, and the most common reject cause is to be stated. If a log has more than one reject cause, the cause recorded is the one with the lowest code number according to Table 1.

Table 1. Reject cause codes.

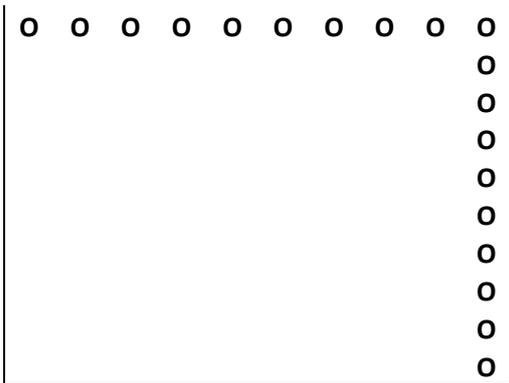
Code	Reject cause	Notes
0	Reject volume adjusted, based on control group	
1	Incorrect species/assortment	Includes dry trees
2	Crooked	Width of crook
3	Forest rot	Spruce pulpwood >10%, other pulpwood >67%
4	Log diameter	Diameter too small or too big
5	Log length	Length too short or too long
6		
7	Preparation	Branches, forks, buttress, etc.
8	Contamination	Coal, soot, plastic, stones, metal, etc.
9	Storage decay	Spruce pulpwood >0%, other pulpwood >10%

## 2.4. Calculating reject logs in stacks

### Log sides

Calculate the reject proportion from the visible part of the log sides (Y), applying the reject cause codes (1) wrong species/assortment/dry trees, (2) crooked, (5) length, and (7) branches/forks (7).

**Two sides visible**



**Factor 5 \* Y**

**One side visible**

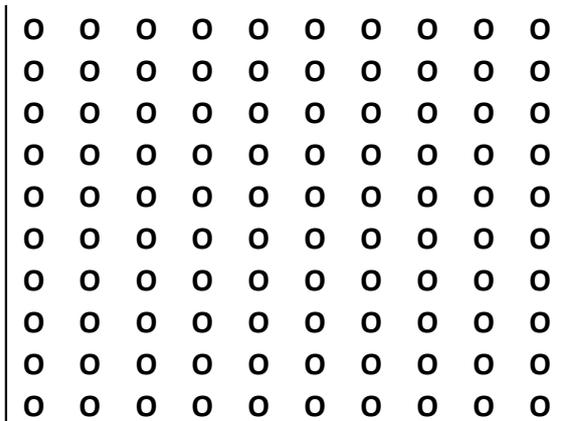


**Factor 7 \* Y**

If the number of visible stack sides is between one and two, the applicable factor is interpolated between 5 and 7. If, for example, 1½ stack surfaces are visible, the factor is 6, but if less than 1½ log-side surfaces are visible, the factor should be closer to 7.

Log ends

**One side visible**



**Tree species, dry wood (1) and diameter (4)**

**Factor 1,5 \* Y**

**Forest rot (3) and storage decay (9)**

**Factor 2 \* Y**

The described principle for adjusting the factor must be checked to see whether the result is reasonable. If the reject logs are thinner than the mean diameter of the logs in the stack, the proportion (volume) of rejected logs must be reduced, and if the reject logs are thicker, then then the proportion (volume) must be increased.

The principle assumes that non-deliverable logs have not been deliberately hidden in the stack. If this is suspected for a stack on a measuring platform, or if the stack is difficult to assess for some reason, the logs should be removed and placed on a surface for examination. This

procedure is suitable for stacks where the proportion of reject logs is close to the limit for refusal of measurement.

### 3. Quality requirements concerning deliverable logs

#### 3.1. Dimensions

*Instruction:*

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*Logs must fulfil certain minimum and maximum size requirements:*

*Minimum diameter: 5 cm under bark at minimum length.*

*Maximum diameter: 70 cm under bark (largest individual diameter measurement)*

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When measuring logs on a measuring bench, hoist or ground, the calliper measurements should be carried out systematically. Cross-calliper measurements should preferably be taken horizontally and vertically from the ground, and single calliper measurements taken 45 degrees from the ground. The only exception to this method is for clearly oval logs, where cross-callipering measures the largest and smallest diameter.

The largest diameter of the log is the physically greatest diameter across the log. This measurement can comprise, for example, the diameter measured inclusive thick buttresses, forks or other irregularities, but not branches.

*Instruction:*

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<i>Minimum length</i>	<i>Logs cut to standard length:</i>	<i>standard length – 30 cm</i>
	<i>Logs cut to varying lengths:</i>	<i>290 cm (270 cm for VMF Nord)</i>
<i>Maximum length</i>	<i>Logs cut to standard length:</i>	<i>standard length + 30 cm</i>
	<i>Logs cut to varying lengths:</i>	<i>580 cm</i>

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‘Agreed standard length’ means a certain agreed, desirable log length with little variation in length. Length may not deviate more than  $\pm 30$  cm from the agreed length.

Varying lengths means that the deliverable length must be within a certain minimum and maximum length interval.

Logs down to a diameter of 3 cm are measured.

#### 3.2. Living stem section

*Instruction:*

*A pulpwood log should be cut from a living stem section. A stem section is regarded as living if nutrients are transported in more than 50% of the circumference of the cross-section.*

A stem section is regard as living if, on felling, nutrients are being transported in most of the inner bark of the stem section (phloem). In this context ‘most’ means more than 50% of the circumference of both log ends.

### 3.3. Delimiting

*Instruction:*

*The log must be satisfactorily delimited, i.e. the branches should be cut off close to the stem surface. Remaining branch stubs must not exceed the following dimensions:*

<b>Branch diameter under bark</b>	<b>Branch height</b>
- 15 mm	Unlimited
≥ 16 mm	< 12 cm spruce pulpwood < 16 cm other pulpwood

*Branch height is defined as the perpendicular distance from the log surface under bark to the tip of the branch. A broken remaining branch is not included in the length of the branch stub. A branch is regarded as broken off if its resistance when bending is less than that of a branch with a diameter less than 15 mm under bark.*

‘Branch height’ refers to the distance measured perpendicular to the log’s longitudinal axis from the log surface under bark to the outermost solid part of the branch.

The provisions for a satisfactorily delimited log mean that remaining thin branch stubs, with diameter up to and including 15 mm under bark, are permitted regardless of height. This means in practice that even whole branches with this thin diameter are permitted. However, a requirement is that the log has passed through a delimiting unit, so that the remaining branches on such a log are so few that they should not cause any problems in handling.

There are no restrictions for the total number of branch stubs thinner than 15 mm, but the stubs must be less than 12 cm for spruce pulpwood and 16 cm for other pulpwood. However, this rule must not be applied in such a way that delimiting of the log deliberately and systematically exploits the length tolerance for branch stubs, which could be possible in motor-manual processing. The main rule is that the delimiting tool is to have been in contact with the surface of the log over its entire length. Consequently, the branch stubs remaining after this process are the result of incomplete delimiting – particularly during the sap period – or because they were simply overlooked, which can be the case in motor-manual delimiting.

If the branch extends beyond the length of the log, branch height is measured as the greatest height within the extent of the log.

### 3.4. Forks

*Instruction:*

*Open forks are allowed if the height is less than 12 cm for spruce pulpwood or less than 16 cm for other pulpwood.*

A fork means a stem section with a divided pith. Ingrown bark often occurs between the stem sections that have merged.

When a log has a divided pith, this is regarded as a fork if the fork limb’s diameter (d) under bark is at least one-third of the main stem’s diameter (D) under bark (see Figure 1). If these conditions are not fulfilled, the thinner stem section is regarded as a branch.

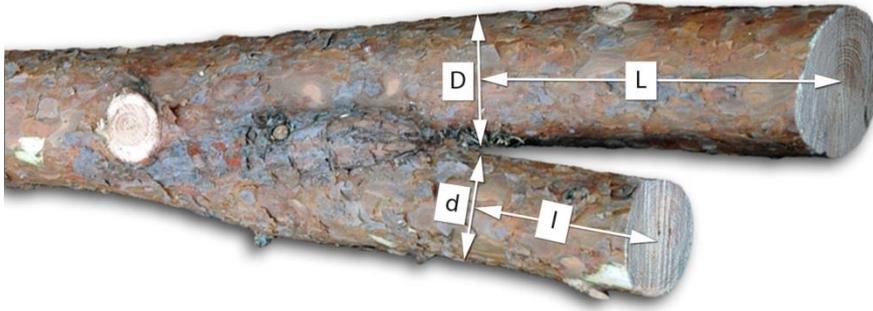


Figure 1. Diameter measurements of main stem and fork limb.

A fork is called an open fork if the main stem and the fork limb are completely separated and there is air between them. In other cases, the fork is a closed fork. The requirement for air between the main stem and fork limb means that forks where bark adjoins bark are regarded as closed forks. The difference between the two types is shown in Figures 3 and 4. Closed forks are permitted in pulpwood.



Figure 2. Open fork – air between fork limb and the main stem.



Figure 3. Closed fork – no air between fork limb and the main stem.

According to the instruction, the height of an open fork must be less than 12 cm under bark for spruce pulpwood and less than 16 cm under bark for other pulpwood assortments. If the fork limb extends beyond the length of the main stem, the height is measured as the greatest height within the extent of the main stem. The log diameter measured across the log, including the fork limb, must be less than 70 cm under bark (ub).

### 3.5. Forest rot and storage decay

#### 3.5.1. Requirements for deliverable logs

Instruction:

Assortment	Max. forest rot in log end (under bark)	Max. storage decay in a cross section (under bark) 15 cm from log end
Spruce pulpwood	10 %	0 %
Other pulpwood	67 %	10 %

Logs where rot or decay exceeds the limits stipulated in the above table are rejected. For pulpwood assortments other than spruce pulpwood, logs with 10 to 33% storage decay at the cross section may, on agreement, be traded as 'storage decayed' and reported using a special assortment code.

Rot comprises wood that has been broken down by fungi or other microorganisms. Rot is divided into storage decay and forest rot depending on how it occurred.

Storage decay occurs in wood during storage and in standing dry trees. At an early stage, storage decay looks like dispersed small marks or streaks in sapwood.

Forest rot develops in growing trees, and is divided by colour into light forest rot and dark forest rot.

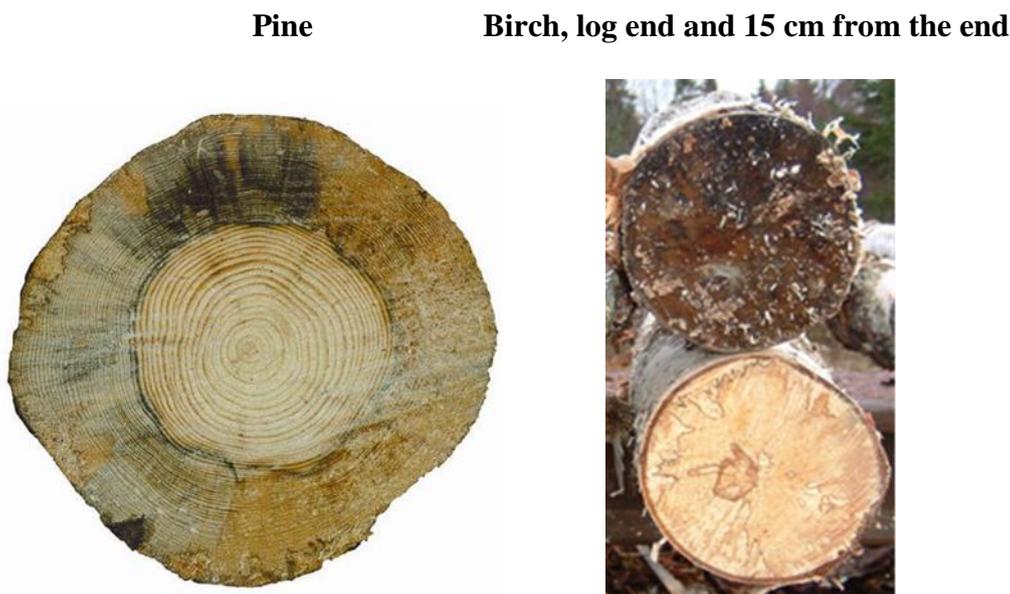


Figure 4. Examples of storage decay in pine and birch.

For forest rot, only the occurrence of dark rot, loose rot and rot holes is to be assessed. Light solid rot and aniline wood, which is a first stage of forest rot, are permitted, and so are not assessed. Forest rot is assessed at the log end.

Storage decay is assessed in a cross-section 15 cm in from the log ends. For a correct assessment of storage decay the log must be cut across this section. The distance of 15 cm from the end of the log is specified because the storage decay in this area is usually at its greatest extent, and also because cutting across this section minimises wood waste. When cutting with a motor saw,

applicable safety regulations must be followed; for example, the timber must not be cut with the pulpwood placed on a vehicle. However, simpler examination from a measuring platform may be made using an axe.

Wood colour and consistency form the basis for assessment when determining the line between rot-damaged and healthy wood. Correct assessment of the colour of the rot requires good light conditions, so examination and assessment of rot during hours of darkness is unsuitable, unless the lighting at the measurement site is very good.

A more thorough investigation of storage decay in pulpwood requires that the wood be placed either beside a road or on a surface at the mill. In order to limit the amount of work involved, the investigation may be based on a random sample, which may comprise either randomly selected sample surfaces in the log ends of the stack or randomly selected log ends.

For all wood imported to Sweden between 1 August and 30 November, it is recommended that the proportion of storage decay is determined via sampling, where the wood is cut at the ends of all logs in the sample.

A more thorough investigation of decay should only be necessary in exceptional cases, for example where wood has been stored for too long. In principle, the quality of this type of wood should be determined on the roadside, so that the measurement on the vehicle at the mill can be limited to measurement of total (gross) volume.

Storage decay in deliverable logs is not recorded separately. The tolerance limit is less than one-tenth of the cross-section, with the exception of spruce pulpwood. If the proportion is between one-tenth and one-third of the area, the log can be transferred to the assortment *storage decayed wood*, if so agreed.

### ***3.5.2. Volume deduction for forest rot in deliverable logs***

*Instruction:*

*In log-by-log measurement, the proportion of rot in the log-end surface is estimated. In stack measurement, the proportion of rot in the end surface of the stack is estimated. On agreement, this surface proportion can be converted to a rot volume.*

Rot diameter is expressed in mm, before the proportion of rot is calculated automatically in the computer calliper.

Only deliverable logs are to be included in the assessment of the proportion of forest rot. If both log-end surfaces of the stack are visible, an average of these is calculated and recorded.

Rot area is converted to volume via VIOL automatically, based on experience-related relationships. See SDC VIOL-codes in the section 'Conversion from rot area to rot volume'.

## 4. Revision history

19 October 2009	Dimension reject (recorded reject volume). Freshness.
24 May 2011	Supplement on significant quantity of stones and contamination
11 November 2014	Application guide replaces previous text on quality aspects Compendium of Timber Measurement Part V Pulpwood according to VMR 1-06. Guide adopted by Control Commission Reject cause codes and proportion of reject logs Easily debarked spruce pulpwood. Diameter, convenient diameter Measurement of branch height Rot diameter, rounding off to the nearest whole cm, but not down to 0 cm. Deduction for forest rot in deliverable logs
16 March 2015	New smaller logo. Living stem section (3.2).
1 April 2016	Section 2.4. Addition of 'not': "... not been deliberately hidden in the stack" 'Must' replaced by 'should' for placing logs from a stack on a surface for examination. Addition: "In stack measurement, the entire rejection volume must be recorded" Addition: "If the log has more than one cause of rejection, the cause recorded is the one with the lowest code number according to Table 1." Table 1: Removal of insects and blue stain from Code 1 and Code 6 Quality errors.
1 August 2016	SDC instructions changed to <i>Swedish</i> instructions. New front page. Table 1. Four > symbols inserted to clarify reject limits due to rot. Section 3.1. Instruction changed, minimum length in VMF Nord 270 cm. Section 3.3. <i>Thicker</i> changed to <i>thinner</i> . "There are no restrictions for the total number of branch stumps thinner than 15 mm."
1 January 2017	Section 2.3. Rejection code 1 includes dry trees. Section 2.4. Calculating reject logs in stacks. For a stack on a measuring platform (but not remote measurement), the logs should be removed and placed on a surface for examination. This procedure is suitable for stacks where the proportion of reject logs is close to the limit for refusal of measurement.
1 April 2017	Section 1.2. Tree species for softwood pulpwood changed/clarified. Section 3.5.2. Addition: See SDC VIOL-codes in the section 'Conversion from rot area to rot volume'.
1 August 2017	Section 2.4. Reject <i>volume</i> changed to reject <i>proportion</i> . "... more than 1½ of the log-side surfaces..." changed to "... less than...".
1 January 2018	Section 1.3. Text adjustment. Timber preparation errors are considered <i>down to and including the smallest deliverable diameter</i> instead of the previous <i>down to and including a diameter of 5 cm under bark</i> .
1 August 2018	Section 3.5.2. The <i>instruction</i> is changed a little. Rot diameter is expressed in <i>mm</i> .