Timber buyer association of Latvia

Timber seller association of Latvia

The Joint Advisory Council

"Management of Latvian timber measurement and accounting" SIA

The procedure of the measured roundwood volume accuracy control

(using automated measuring device)

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The procedure of the measured roundwood volume accuracy control (using automated measuring device)
PROCEDURE No. VKP1/2018

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1 General information

Abbreviations:

AUI	automated measuring device
KpDC	"Timber Flow Data Centre" SIA
LKUUV	"Management of Latvian timber measurement and accounting" SIA
LVS	national standard of Latvia for Measurement of Round Timber (currently in force LVS 82:2003)
VKP	timber buyers and sellers' Joint Advisory Council
VMF LATVIA	"VMF LATVIA" SIA

Explanations:

Term	An explanation within the procedure
Control results	Check measurements by check scaler of VMF LATVIA
Matrix	Common measurement task by timber buyers and sellers
Scaler (check scaler)	Expert of VMF LATVIA
Check	A part of the whole set under investigation (check population) that is observed and studied (performing check measurements and determining the volume of roundwood) to judge all the properties of the check population in the check
Accuracy	Characterizing the volume differences between first measurement and check measurement (with AUI and measurement method)
Measurement	Testing reports, which are obtained from calculations using timber measurement (AUI) and evaluation data (scaler), have been prepared within the framework of accuracy control. Here, in narrow sense, only volume determination
Measurement method	According to national standard LVS 82:2003, if using the log by log roundwood volume determination is permitted by the following methods: - Mid-point measurement; - Top diameter measurement plus taper ratio; - Section type measurement.
Sawmill	Considering the high proportion of primary processing of roundwood longitudinal cutting, all processing sites here are designated like that (including peeling, slicing, turning, etc.)
Measurement ticket	The document of result of measurement issued by VMF LATVIA

The purpose of the procedure:

- to ensure timely and transparent log by log volume determination (using AUI) and preparation of check control data, processing;

- the calculation of statistical indicators;

- communication independently from measurement method to ensure the results are consistent with the goals set by the VKP;

- to support timber flow processes, including risk management in transactions with roundwood and correct action in the operation of measuring devices, scalers, data flow and calculations.

This procedure describes process of "bird's-eye view" shown below (see *Figure 1*) and has two appendices:

- Detailed description for obtaining check measurement data, *Appendix 1*;

- Accuracy report (form), *Appendix 2*.
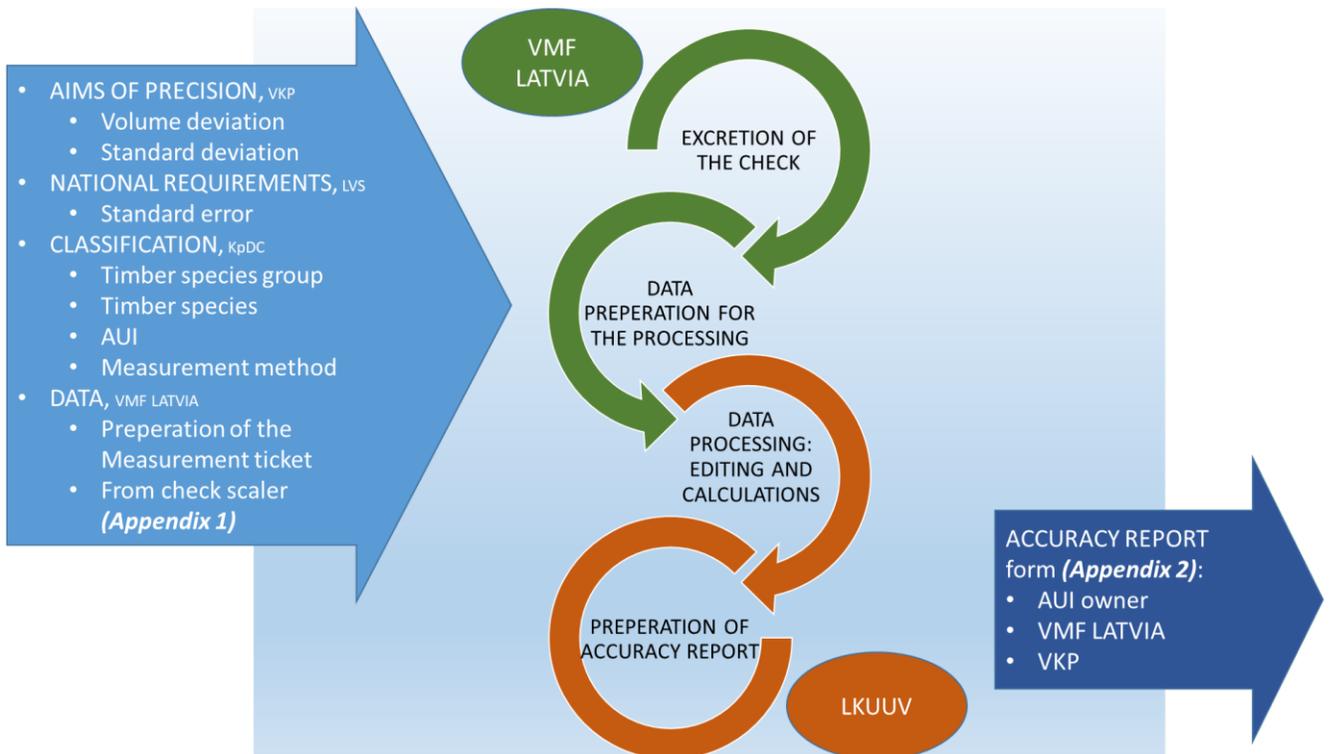
Figure 1. The "bird's-eye view" process described in the procedure

It is planned to upgrade this procedure by developing the industry-specific timber flow through the database supporting the papiNet data standard communication, and the creation of its operator – KpDC, as the testing report is one of the first four electronic papiNet documents in the project. It is planned to minimize the manual work involved in this procedure by developing KpDC's database functionality.

This procedure is referred to VMF LATVIA, until the change in the establishment of KpDC.

2 Number calculation and numbering of control logs

The check population is a collection of objects for which you want to know the statistical information. The check population is the number of roundwood logs for each sawmill (processing site) for each measurement method

and timber species, which is multiplied by the planned number of scalers, so that the accuracy report for the management of its operation could also be used by VMF LATVIA (see *Figure 2*).
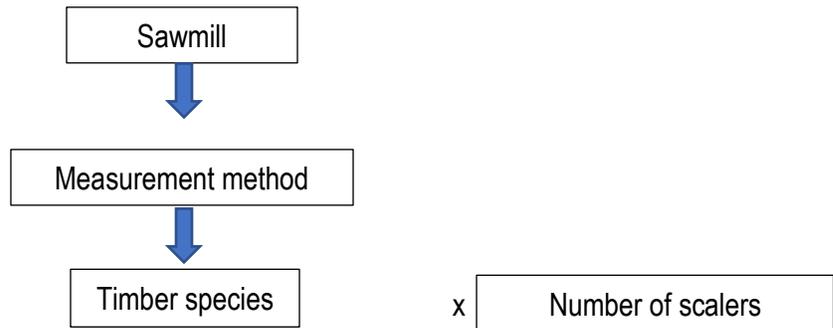

Figure 2. Determination of check population

VMF LATVIA receives information from the sawmills on the number of AUIs and projected volume to be measured for the next year, used volume determination methods and timber species. The summary (projected volume to be measured for the next year, used volume determination methods and timber species), together with the required calculation of the number of control logs (*note- calculating steps below*), is sent to the executive director of the LKUUV.

Considering that the number of control logs is calculated using a projected volume to be measured for the next year sent by the sawmill, at least 80% of the calculated is considered enough for statistical analysis.

Check is based on the standard deviation and standard error ratio.

$$Number\ of\ CL\ [1](pieces) = \frac{St^2}{St_{error}^2}, \text{ where:}$$

Number of CL, pieces – number of control logs;
St – standard deviation, %;
St_{error} – standard error, %.

Standard error describes the inaccuracy or error that occurs when generalizing the average ratio of a check to a check population. It depends on the amount sent as a forecast (see *Table 1*).

Table 1

Standard error depending on forecasted amount [2]

Volume, m^3	Standard error, %
1500	3.5
2500	3.0
3500	2.5
5000	2.0
10000	1.5
20000	1

[1] If several VMF LATVIA scalers operate on the AUI, then the number of control logs is multiplied by the number of VMF LATVIA scalers
[2] The standard error is determined according to LVS 82:2003

Standard deviation is a measure of the spread of a data set, which describes the dispersion around the average ratio. It is determined on the measurement method and the timber species (see Table 2).

Table 2

Standard deviation depending on the measurement method and timber species, %

Timber species / Measurement method	Pine	Spruce	Birch	Aspen
	Standard deviation [3], %			
Section type measurement	5.7	6.1	5.9	-
Mid-point measurement	6.4	7.4	-	-
Top diameter measurement, plus taper ratio	8.3	10.5	9.7	8.7

N.B! **The number of control logs depends on the measuring accuracy of AUI in the sawmill – if the measurement is more accurate, the number of control logs is smaller!**

The **frequency** of control logs is determined by VMF LATVIA – dividing the check population with check. Control logs are selected by randomness principle. Frequency calculation formula:

$Frequency = \frac{\sum N}{N_{KS}}$, where:

Frequency – measurement regularity of control logs;

$\sum N$ –total number of logs, pieces;

N_{KS} – needed number of logs, pieces.

Recommendation: In the middle of the reporting year make sure that the predicted volume matches the fact and, if necessary, perform a recalculation.

Numbering of control logs – measuring with AUI, numbering is from 1 to 9999, which is repeated within a single sawmill (see *Figure 3*).
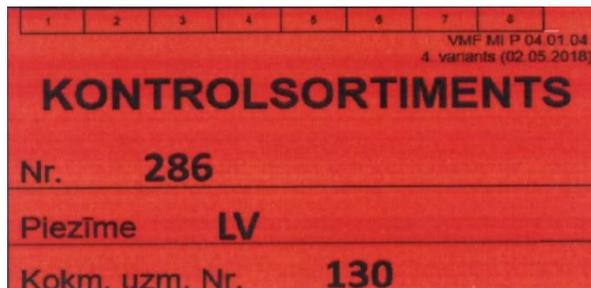

Figure 3. Completed labelled sheet sample for control logs for AUI

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[3] The standard deviation calculated in the previous half-year is used to calculate the number of control logs. The standard deviations in the table are obtained for the research purpose for the initiation of accuracy testing processes

3 Preparing and transferring the data file

Until the establishment of KpDC once every 6 (six) months VMF LATVIA complies data on control logs in the .xls file (see *Table 3*) and sends it to the executive director of the LKUUV.

When the roundwood is measured by the section type measurement method, until the data flow from AUI will be arranged (planned to be completed with the VMF LATVIA project in 2018 and the project supported by the Forest Sector Competence Centre of Latvia in 2019), the volume is calculated by sawmill itself, for mid-point and top diameter plus taper ratio measurement volume calculated by VMF LATVIA. If the volume is determined based on top diameter measurement, plus taper ratio or mid-point measurement method then the volume is calculated by VMF LATVIA according to the task (matrix) of the buyers and sellers and the data received from the sawmill.

Table 3

Control log data

Column	CONTENT		CONTENT CREATION TERMS		
	Name of the cell	Source	Unit of measurement	Structure	
A	Client	Matrix (work task for measuring)		VMF LATVIA code, 4 characters	
B	Measurement method	VMF LATVIA		VMF LATVIA code, 1 character	
C	Timber species	VMF LATVIA scaler		KpDC code, 2 characters	
D	Timber species	VMF LATVIA check scaler		KpDC code, 2 characters	
E	First assortment *	VMF LATVIA check scaler		VMF LATVIA code, 1 character	
F	Length	AUI	cm	0 decimal places	
G	Length	VMF LATVIA check scaler	cm	0 decimal places	
H	Butt diameter under bark	AUI	mm	0 decimal places	
I	Butt diameter under bark	VMF LATVIA check scaler	mm	0 decimal places	
J	1m under bark	VMF LATVIA check scaler	mm	0 decimal places	
K	2m under bark	VMF LATVIA check scaler	mm	0 decimal places	
L	3m under bark	VMF LATVIA check scaler	mm	0 decimal places	
M	4m under bark	VMF LATVIA check scaler	mm	0 decimal places	
N	5m under bark	VMF LATVIA check scaler	mm	0 decimal places	
O	6m under bark	VMF LATVIA check scaler	mm	0 decimal places	
P	Top diameter over bark*	VMF LATVIA check scaler	mm	0 decimal places	
Q	Top diameter under bark	VMF LATVIA check scaler	mm	0 decimal places	
R	Top diameter over bark *	AUI	mm	0 decimal places	
S	Top diameter under bark	AUI	mm	0 decimal places	
T	Mid-point over bark*	AUI	mm	0 decimal places	
U	Mid-point under bark	AUI	mm	0 decimal places	
V	Mid-point over bark *	VMF LATVIA check scaler	mm	0 decimal places	
W	Mid-point under bark	VMF LATVIA check scaler	mm	0 decimal places	
X	Volume under bark	AUI	m^3 **	3 decimal places	
Y	Volume under bark	VMF LATVIA check scaler	m^3	3 decimal places	
Z	Assessment of the bark thickness*	VMF LATVIA scaler		VMF LATVIA code, 1 character	

Continuation of the Table 3:

AA	Assessment of the bark thickness *	VMF LATVIA scaler		VMF LATVIA code, 1 character
AB	Quality *	VMF LATVIA scaler		VMF LATVIA code, 1 character
AC	Quality *	VMF LATVIA check scaler		VMF LATVIA code, 1 character
AD	Taper *	VMF LATVIA	cm/m	2 decimal places
AE	Period when the control log is measured *	VMF LATVIA		Year, (I or II) half

* The data in the table displayed in *italics are collected for in-depth analysis*.

** At sawmills "Stora Enso Latvija" AS and "Kurekss" SIA the volume is calculated using a length expressed in whole decimetres (for the measurement method – section type).

Transcript of sawmill code:

Sawmill	code VMF LATVIA
"4Plus" SIA	6334
"AKZ" SIA	6317
"Aļņi AS" SIA	6413
"BSW Latvia" SIA	6338
"DIANA" (Stāķi) SIA	6322
"Gaujas Koks" (Jēkabpils) SIA	6320
"Jēkabpils kokapstrāde" SIA	6463
"Kubikmetrs" SIA	6434
"Kurekss" SIA	6326
"Latvāņi" SIA	6467
"Latvijas Finieris" (Bolderāja) AS	6316
"Verems" RSEZ SIA	6319
"Ošukalns" SIA	6331
"PATA" SIA	6324
"Piebalgas" SIA	6335
"Priedaine N" SIA	6428
"Rettenmeier Baltic Timber" SIA	6325
"Silviko" SIA	6500
"Smiltene Impex" SIA	6321
"Stiga RM" SIA	6450
"Stora Enso Latvija"AS	6307
"Timberex Group" SIA	6375
"Vārpas 1" SIA	6372
"Vika Wood" SIA	6302
"Vudlande" SIA	6323

Transcript of measurement method code:

Measurement method	code VMF LATVIA
Top diameter measurement, plus taper ratio	1
Mid-point measurement	2
Section type measurement	4

Transcript of timber species code:

Timber species	code KpDC
Pine	11
Spruce	12
Deciduous tree	20
Birch	24
Aspen	21
Black alder	23

4   Data processing

4.1   Data editing

First of all, it must be checked that the received data file contains enough information to be used in analysis, namely to ensure that number of measured control logs are consistent with forecast by VMF LATVIA. If there is at least 80% of the required number of control logs, then data can be used for further analysis.

Received data from VMF LATVIA (.xls file) needs to be edited - move the erroneous data to another file's worksheet (SUMMARY OF ERRORS). This SUMMARY OF ERRORS is to be returned to VMF LATVIA for improving its work. In the calculations are used data without erroneous queues.

Erroneous data may be:

1. Measurement method – verify that the correct measurement methods are indicated, or the measurement method corresponds to the information provided by VMF LATVIA about the measurement method used in the sawmill;

2. Timber species – check whether the correct timber species are indicated, or timber species corresponds to the information provided by VMF LATVIA about the appropriate timber species in the sawmill;

3. Length difference between the length of the assortment according to AUI data and the length of the assortment according to the check scaler's data (outside the boundary +/- 30 cm (not including));

4. The difference between every section's top and butt diameters is greater than - 3 cm (not including));

5. Top diameter under bark and mid-point diameter under bark:

    a. Move to SUMMARY OF ERRORS those assortment data in which the difference between the top diameter under bark according to check scaler data and AUI data are outside the boundaries of +/- 3 cm (not including);

    b. Move to SUMMARY OF ERRORS those assortment data in which the difference between the mid-point diameter under bark according to check scaler data and AUI data are outside the boundaries of +/- 3 cm (not including);

6. Top diameter and mid-point diameter over and under bark:

    a. Move to SUMMARY OF ERRORS those assortment data in which the top diameter over bark is smaller than the top diameter under bark (compare both – data from AUI and data from check scaler);

    b. Move to SUMMARY OF ERRORS those assortment data in which mid-point diameter over bark is smaller than the mid-point diameter under bark (compare both – data from AUI and data from check scaler);

7. Others.

The accuracy report recipients are informed of:

A. if the erroneous data (the number of control log rows) in each single check exceeds 0,1% of the total.

In this case, all – including erroneous data – are used to prepare the accuracy report.

B. "other" reasons.

4.2 Calculations

It is necessary to analyse the volume difference between check scaler data and AUI data. The standard deviation and volume deviation must be determined for this indicator.

The formula for calculating the **volume deviation**:

$$vol.\,dev. = \left(\frac{\sum V_M - \sum V_{KM}}{\sum V_{KM}}\right) \times 100, \text{ where:}$$

$vol.\,dev.$ – volume deviation, %;

$\sum V_M$ – total volume by VMF LATVIA scaler data;

$\sum V_{KM}$ – total volume by VMF LATVIA check scaler data.

The result is expressed by 1 decimal place, indicating positive or negative values (+/-).

The formula for calculating **standard deviation**: $s = \frac{\sqrt{\sum(x - \bar{x})^2}}{n}$, where:

s – standard deviation, %;

x – deviation for one assortment, %;

$\bar{x}$ – arithmetic mean value of check, %;

n – number of, pieces.

To calculate the standard deviation, it is first necessary to calculate the deviation of one assortment and the arithmetic mean value of check.

Formula for calculating the deviation of one assortment:

$$x = \left(\frac{V_M - V_{KM}}{V_{KM}}\right) \times 100, \text{ where:}$$

x – deviation for one assortment, %;

V_M – total volume by VMF LATVIA scaler data;

V_{KM} – total volume by VMF LATVIA check scaler data.

Formula for calculating the arithmetic mean value of check:

$$\bar{x} = \frac{\sum x}{n}, \text{ where:}$$

$\bar{x}$ – arithmetic mean value of check;

$\sum x$ – total assortment deviations;

n – number of, pieces.

The result is expressed by 1 decimal place.

5   Accuracy report

The accuracy report recipients are sawmill, VKP and VMF LATVIA and it is sent by e-mail.

The accuracy report is prepared in accordance with check population structure determined by VKP, i.e. for each AUI about last 6 (six) months period (half a year):

- About each timber species;

- About each measurement method.

In the Accuracy report form (Appendix 2), the historical statistical indicators of the last 5 (five) semesters and the value of accuracy specified by the VKP are also displayed.

6   Deadlines and responsibilities

Until the procedure is upgraded, the deadlines for this procedure and the responsible ones are:

STEPS	RESPONSIBILITY	Performer	Deadline
VMF LATVIA needs to submit its scope of action forecast for frequency calculation, used volume determination methods and timber species	Sawmill	Director	1st of November (actualisation 1st of June)
Inform the sawmills and LKUUV about the distributed checks and planned frequencies; inform LKUUV about used volume determination methods and timber species at sawmills	VMF LATVIA	Technical manager	30th of November (If the forecasts differ by more than 20%, it is advisable to actualise by 1st of August)
Preparation and transfer of the data file to be processed to LKUUV	VMF LATVIA	Quality manager	1 (one) month after the end of the half-year (1st of August; 1st of February)
Data editing and transfer of list to VMF LATVIA of assortments not included in the calculations	LKUUV	Executive director	1 (one) week from receiving data from VMF LATVIA
Calculation and preparation of accuracy report	LKUUV	Project manager	2 (two) weeks from receiving data from VMF LATVIA
Sending the accuracy report to sawmill, VMF LATVIA and VKP (for members of the VKP)	LKUUV	Project manager	20th of August; 20th of February