LITHUANIAN RULES FOR MEASUREMENT OF ROUND TIMBER, STANDING TREES AND VOLUME ESTIMATION

1. COMMON REGULATIONS

1.1. These regulations are designed to determine the principles which are to be used in the derivation of round timber measurement and volume calculation rules.

1.2. All forest owners, administrators, impartial timber scalers, sellers and buyers when paying for purchased or sold timber, bartering, timber producers, organizations partaking in the trade of forestry products when paying for logging are bound to follow these rules. These rules should also be applied in all cases when state tax calculations directly depend on purchased or sold timber amount.

1.3. These rules were based on the Round timber scaling, classification and marking rules endorsed by Environmental ministry of Lithuanian Republic 05 June, 2001 and comply with 23 January, 1968 directives 68/89EEC of European Council of round timber measurement and classification

1.4. The component part of the rules is Timber Volume Tables (Annex 2), which represent the norms for 8 main tree species (pine, spruce, birch, aspen, black alder, grey alder, oak and ash. To determine the volume of maple and lime the same rules of volume calculation as for black alder; hornbeam, wych-elm, elm – oak; willow, goat-willow – white alder are used.

1.5. In case the rules allow for using several round timber measurement methods, the method to be used has to be indicated in selling – buying agreement.

2. TERMS AND DEFINITIONS

2.1. Round timber – a felled, trimmed, topless tree which either can or can not be crosscut.

2.2. Random error – is a component of measurement error, that fluctuates randomly (changes the sign and the value) when repeated measures of the same physical body are taken.

2.3. Height class – an index indicating the height of a tree growing on a cutting area according to which the height and volume of different diameter trees is determined.

2.4. Topless stem – stem without top, that has been cut during trimming of a tree on the cutting area or after the stem is loaded on the truck.

2.5. Under bark – used together with measurement term and means that bark is excluded from the measurement.

2.6. Cutting area – area assigned for main or intermediate cuttings, marked by natural or artificial cleared lines.

2.7. Stacked cubic meter – volume of $1m^3$ of the stacked round wood including empty spaces.

2.8. Veneer log – a high-quality log of a desirable species suitable for conversion to veneer.

2.9. Long round wood – round wood 3m and more in length, volume is calculated in solid cubic meters

2.10. Length allowance – nominal length tolerance limits, estimating losses when cross cutting wood.

2.11. Length – the shortest distance between the butt end and the top end of the log.

2.12. Long-log - round wood that was not cross cut.

2.13. Commercial round wood - industrial roundwood sawn from stems or branches.

2.14. Butt log – a log cut from the thick end of the stem.

2.15. Butt-end – the thick end of the stem.

2.16. Bole – the main trunk of a tree, according to which the standing tree is assessed.

2.17. Barling – assortment of up to 14 cm over bark diameter at 1 meter distance from the thick end and 3 cm and more underbark diameter at the thin end of long roundwood.

2.18. Repeated length roundwood assortment. Round wood designed for producing appropriate number of roundwood assortments of the same length. Allowances of the repeated length roundwood assortment should not be lower than the sum of allowances of all produced roundwood assortments.

2.19. Stump – part of a tree, remaining under and over the ground after felling.

2.20. Overground part of the stump – a part of a cut tree remaining over the ground

2.21. Solid cubic meter – 1 m^3 of timber excluding empty spaces.

2.22. Hardwood – wood of oak, ash, maple, hornbeam, elm trees.

2.23. Firewood - wood used for fuel. Measured over bark.

2.24. Sleeper block – roundwood designed for producing sleepers or switch balks.

2.25. Industrial roundwood – roundwood designed for industrial processing. Measured over bark with exception of particle board wood.

2.26. Sawlog - a log that is large enough to be sawed into lumber.

2.27. Particle board wood - round wood used for manufacturing particle boards. Measured under bark.

2.28. Top diameter – diameter of the smallest end of the log.

2.29. Small-end cross-section area - plane of the log cross cut at the thin end of the log.

2.30. Pulpwood - roundwood designed for manufacturing pulp.

2.31. Log - cross-section of the roundwood.

2.32. Stack volume - stack volume with air spaces is measured by surface dimensions (length, width and height)

2.33. Diameter - distance between two parallel tangents of a stem or roundwood.

2.34. Place of the cross cut - imaginary cross cut place on the long log or log.

2.35. Cross-section area - plane of the log cross cut.

2.36. Assortment – round wood of a fixed use.

2.37. Stem – overground part of the tree without branches.

2.38. Large-end cross-section area - plane of the log cross cut at the thick end of the log.

2.39. Pole log - round wood used for manufacturing poles.

2.40. Over bark – used together with measurement term and means that measurement of a tree diameter includes bark thickness.

2.41. Rounded dimension – measurement result expressed in whole numbers.

2.42. Weight - measurement unit of the roundwood quantity based on its mass.

2.43. Root collar - transition zone between stem and root at or over the ground line of a tree or seedling.

2.44. Theoretical point of the cross cut - visually set imaginary cross cut point on the long log or log supposed to be used for the sorting purposes.

3.45. Short length roundwood – roundwood up to 3m in length, volume of witch is usually evaluated by stacked cubic meters.

2.46. Volume – quantity of round wood based on its dimensions.

2.47. Nominal length – length of round wood excluding length allowance.

2.48. Middle log – a log cut of from the middle part of the long log between the but and top logs.

2.49. Mid-diameter – is measured at the middle of the length of the log.

2.50. Top log – a log cut of from the top end of the long log.

2.51. Brushwood – cut small trees and brushes up to 6 cm in diameter.

2.52. Commercial branches – branches of oak, birch, pine and ash, suitable for producing industrial wood or firewood of standard dimensions.

2.53. Cutting residuals – over-ground part of the stump, sawdust of the crosscuts, length allowances of the industrial round wood, top of the stem, branches with exception of the commercial branches, small stems with diameter under 5cm at 1.3m height, stems of undergrowth and brushes..

2.54. Impartial timber scaler – a person who is certified in accordance with the order set by Minister of Environment, and who obtained the impartial timber scaling competency certificate and has no working relationships with the buyers and sellers of wood.

3. ACCURACY OF THE ROUND WOOD MEASURING AND ALLOWED DEVIATIONS

3.1. Round wood diameter and length are measured with 1cm accuracy. Random measurement error (hereinafter - measurement error) of 95% of all measurements should not exceed more than ±1 cm, of 5% of all measurements - more than ±1,5 cm. Measurement errors are determined during re-measurement and control measurements. If during the re-measurement the parties do not come to an agreement a control measurement is taken.

If the measurement is taken by automatic measurement lines or other wood volume measurement devices, accuracy of the length and diameter measurement is defined in accordance with technical parameters of automatic measurement apparatus which are recorded at the State metrology service.

3.2. If round timber is measured in stacks, the height of a stack is measured with accuracy of 3cm,

length – 10cm, and width - 1cm. Measurement error when measuring stack height of 95% of all measurements should not exceed more than ±3 cm, of 5% of all measurements - more than ±4.5 cm. Measurement error when measuring stack length of 95% of all measurements should not exceed more than ±10 cm, of 5% of all measurements - more than ±15 cm. Measurement error when measuring stack width of 95% of all measurements should not exceed more than ±1 cm, of 5% of all measurements - more than ±1.5 cm. Stacking coefficient is determined with ± 0.02 accuracy.

3.3. If round wood is measured employing piece by piece method, volume estimation error should not exceed ± 5%, when the amount of the measured timber does not exceed 10 solid cubic meters , ± 3% - when the amount of the measured timber is 10 through 50 solid cubic meters, and ± 2% - when the amount of measured timber exceeds 50 solid cubic meters.

If round wood is measured in stacks, volume estimation error should not exceed ± 7%, when the amount of the measured timber does not exceed 10 solid cubic meters, ± 5% - when the amount of the measured timber is 10 through 50 solid cubic meters, and ± 3% - when the amount of measured timber exceeds 50 solid cubic meters.

3.4. If measurement is taken by automatic measurement lines or other wood volume measurement devices, volume estimation error should not exceed ± 3%, when the amount of the measured timber does not exceed 10 solid cubic meters, ± 2% - when the amount of the measured timber is 10 through 50 solid cubic meters, and ± 1% - when the amount of the measured timber exceeds 50 solid cubic meters.

3.5. Stem volume of the trees growing on the cutting area is determined employing tree by tree measurement method with the error not higher than ± 10%. When a few cutting areas are measured the allowed error is reduced to 3% inversely in proportion to the square root from the number of measured cutting areas.

3.6. The difference between stem volume of the trees that grew on the cutting area and determined employing tree by tree method and volume of the produced assortments determined employing measurement in stacks, piece by piece or both methods should not exceed ± 10%. Estimating this difference on several cutting areas the allowed measurement error is reduced to 3% inversely in proportion to the square root from the number of measured cutting areas.

3.7. Shrinkage of the round timber can be estimated using sawn timber radial shrinkage tables. Radial shrinkage is found in tables according to round timber radius at the diameter measurement point and measured moisture content. Radial shrinkage is expressed in percent from the round timber diameter at the point of its measurement. Round timber volume shrinkage in percent is obtained when the result is multiplied by two.

4. ROUND TIMBER MEASUREMENT PLACE AND METHOD

4.1. Round wood measurement has to be taken out on receiving, selling, control measurement places (road side, on vehicles or on conveyor) according to the special instructions and agreements existing between the parties. A buyer, seller, or commissioned person and impartial wood scalers who in accordance to the fixed order have obtained the impartial timber scaling competency certificate have a right to measure round wood.

4.2. Timber should be stacked so that the dimensions, needed to estimate volume, of all the assortments or stacks can be measured. A borderline between timber from different owners in the same stack should be marked clearly.

4.3. Round wood can be measured employing piece by piece method when length and diameter of every log is measured, or measurement in stacks method when every stack, bundle or load is measured:

4.3.1. piece by piece method is employed to estimate volume of stems, pole logs, sleeper logs, veneer logs, medium size (mid-diameter under bark 23 – 34 cm) as well as big sawlogs (mid-diameter under bark ≥35 cm);

4.3.2. measurement in stacks method is employed to measure volume of pulpwood, particle board timber, small sawlogs and firewood:

4.3.3. both methods can be employed to measure volume of small sawlogs (mid-diameter under bark 10-22cm), barlings, short length hardwood logs

4.4. Mid-diameter of the log can be determined according to top diameter and average taper coefficient – 1cm/m.

4.5. The seller and the buyer can change measurement in stacks method to piece by piece measurement method at any time under agreement.

5.MEASURING APPARATUS

5.1. Measuring devices used for measuring according to the rules of the state trials of measurement devices should correspond to the metrology endorsed type of the measurement devices and listed in the register of the measuring devices. Their initial and routine controls should be carried out.

5.2. To measure the length of individual assortment and the length of a stack, steel measuring tapes, steel measuring lines or stiff measuring rods of a resistant material should be used. Devices for measuring the assortment should have the length that allows measuring by single hold, for measuring the length of the stack - minimal length of the devices should be not shorter than 15m. The length measurement devices have to be graded at least in 1 cm.

5.3. To measure diameters of individual assortments or diameters of standing trees measuring sticks or stiff measuring rods, manual or electronic calipers should be used. Diameter measuring devices should be graded at least in 1 cm.

5.4. To measure height of the standing trees clinometers should be used. The clinometer's scale should be graded with at least 50cm accuracy.

5.5. Automatic measurement lines or other wood volume measurement devices could be used to measure round wood employing piece by piece method. Measurement could be taken by impartial wood scalers, buyers, sellers, or commissioned persons. Log measurement line or other wood volume measurement devices must be registered at the State metrology service, their measurement error should not exceed those indicated in item 3.4.

5.6. It is recommended that diameter and length measurement devices be indicated in selling-buying agreement. In case they are not indicated in the agreement, the measuring devices indicated in 5.2 and 5.3 are used.

6. PIECE BY PIECE ROUND TIMBER VOLUME MEASUREMENT

6.1. To determine the precise log volume its length and diameter are measured.

6.2. Round wood length measurement and measurement precision:

6.2.1. to measure the length of the straight round wood (Annex 1, Figures A, B, C) and round wood with simple sweep the shortest distance between log cross-section areas is taken (Annex 1, Figure D);

6.2.2. to measure the length of the round wood with a multiple sweep the assortment is divided into theoretical cross-sections of the simple sweep, then the length of every part is measured separately and these separate measurements are added.

6.2.3. the length of the round wood with undercut is measured from the middle of the undercut (Annex 1, Figure 3).

6.2.4. assortment length is measured with an accuracy of at least 1cm and expressed in meters rounded down to two places of decimal. If nominal length is required the measured length after length allowances indicated in the specifications and standards are deducted is rounded down to the nearest nominal length.

6.3. Round wood diameter measurement place and accuracy:

6.3.1. log diameter under bark is measured either in the middle or top end of the log;

6.3.2. for the pulpwood control measurement employing piece by piece method diameters under bark are measured at the top end (10cm in from the cross section) and at the butt end (10cm in from the cross section for the mid and top end logs and 45cm in if they are butt logs with buttress) (Annex 1, figure 4);

6.3.3. the diameter of the sawn tree stem or topless stem over bark is measured 1.2m in from the butt;

6.3.4. the diameter of barling is measured under bark at the top end or over bark 1m in from the butt end;.

6.3.5. the diameter of the standing tree is measured at 1.3 m height from the root collar. In case a forked stalk is lower than 1.3m the diameter of both stems is measured. Of the trees growing on the slope the 1.3m height is determined from the higher slope side. The diameter of the tree with roots above soil surface 1.3m height is measured where roots divaricate. In case of a burr at 1.3m height the diameter is measured above the burr;

6.3.6. if the selling- buying agreement states that logs are to be measured over bark their measures under bark would be obtained according to one of the following alternatives:

6.3.6.1. deducting the double bark thickness measured at the place of diameter measurement of each assortment;

6.3.6.2. deducting the double bark thickness measured at the place of diameter measurement, defined in accordance with the bark of not less than 5% randomly or systematically chosen control assortments.

6.3.6.3. using the agreed diameter reduction due to bark;

6.3.6.4. using bark thickness tables;

6.3.7. the diameter is measured perpendicular to the longitudinal axis of the log between two parallel tangents;

6.3.8. in case of a burr at the point of diameter measurement when measure is to be taken at the top end the measurement point is moved towards the butt end , when measure in the middle of the assortment is to be taken the measurement point is equally moved from the burr towards both ends and the mean of the measurements is calculated, when measures at the both ends are to be taken the measurement points are equally moved from the butt end and top end towards the centre of the log;

6.3.9. logs up to 20cm in diameter (under bark at the measurement point) are measured once. Of the thicker than 20cm and all oval crosscut logs the smallest and largest diameters are measured and their arithmetic mean is calculated;

6.3.10. log diameter is measured with an accuracy of 1cm rounding down decimals. If the diameter is measured twice, the result of their arithmetic mean is rounded to the even number. The diameter of the barlings is rounded according to the rule of the arithmetic rounding;

6.3.11. tree stem or topless stem diameter smaller than 20cm is measured with accuracy of 2cm, thicker – 4cm accuracy, rounding according to the arithmetic rounding rule;

6.3.12. height of the standing tree is measured with accuracy of 0.5m rounding according to the arithmetic rounding rule.

6.4. Volume of the separate round wood assortment is determined from length and diameter measurements employing formulae or obtained from log volume tables, with accuracy not smaller than 0.01 m³. The volume of the round wood assortment stacks is expressed with 0.01 m³ accuracy:

6.4.1. when the diameter of the thin end and length of the assortment are measured its volume under bark is determined according to appropriated log volume tables (butt log and mid-log volume tables, top log volume tables, logs whose top diameter is larger than 70cm under bark volume tables, logs shorter than 1m volume tables, logs of 10 – 13.5m length volume tables, barling volume tables);

6.4.2. when diameter in the middle of the log (d_V) and length (l) is measured, volume under bark is determined according to 1m length cylinder volume tables or calculated employing the formula:

$$V_v = \frac{3.1416 \cdot d_v^2 \cdot l}{40000}; \qquad (1)$$

where:

l – log length, m;

d_V – log mid-diameter under bark, increased by 0.5 centimeter, cm (with respect to diameter rounding peculiarities, as described in 6.3.10);

6.4.3. to calculate the volume of the assortment according to the measurement of diameter at the top end (d_l), butt end (d_d) and length (l) the following formula is employed:

$$V_{ps} = \frac{3.1416 \cdot l \cdot (d_p^2 + d_p \cdot d_s + d_s^2)}{40000 \cdot 3}; \qquad (2)$$

where:

l – assortment length, m;

d_p – the diameter of the assortment thin end under bark, increased by 0.5 centimeter, cm (with respect to diameter rounding peculiarities, as described in 6.3.10)

d_S – diameter of the assortment butt end under bark, increased by 0.5 centimeter, cm (with respect to diameter rounding peculiarities, as described in 6.3.10).

6.4.4. If the measurement is taken by automatic measurement lines or other wood volume measurement devices underbark volume of the logs is defined in accordance with scanned data of the length and diameter.

6.5. Stem volume of the standing trees is obtained employing tree by tree method for separate trees or height class method for their groups (cutting areas):

6.5.1. to obtain stem volume of the standing trees employing tree by tree method their diameter at 1.3m height over bark and height are measured, applying tree stem volume tables (1);

6.5.2. tree stem volume over bark can be calculated employing the formula:

$$V = \frac{3.1416 \cdot h \cdot d_{1.3}^2 \cdot f}{40000}\ ; \qquad (3)$$

where:

$d_{1.3}$ – tree stem diameter over bark at 1.3m height from the root collar, cm;

h – tree height, m;

f – stem form coefficient calculated employing mathematical model;

6.5.3. to obtain tree group (stems on the cutting area) volume employing tree by tree measurement method diameter of every stem at 1.3m height over bark is measured and height class for every forest (stand) element is determined. The applied stem volume tables are compiled according to height class;

6.5.4. to obtain height class the heights and diameters of 7 – 9 trees of average diameter class of every species are measured over bark at 1.3m height from the root collar. Height class for every tree species is determined comparing mean values of the measured tree stem diameter over bark and height with the values from the table "Height class estimation according to tree diameter over bark at 1.3m height and height".

6.6. the volume over bark and under bark of the topless felled tree stems is obtained measuring 1.2m in from the butt-end over bark assessing their height class. The tables of topless stem volumes indicating volumes of the whole stem and different length topless stem volumes over bark and under bark are applied:

6.6.1. to determine height class of the topless felled stems the diameters of not fewer than 10 trees of every species are measured over bark at 1.2m height and 15m in from the butt-end. The height class of every topless stem is determined according to stem diameter over bark at 1.2m height and 15m height tables (1), the mean of the height class for every tree species is calculated.

7. VOLUME AND WEIGHT MEASURING OF THE STACKED ROUND TIMBER

7.1. Calculation of the stack volume measuring stacked volume and estimating stacking coefficient:

7.1.1. timber volume in a stack is calculated employing the formula:

$$V_r = (H \cdot L \cdot B) \cdot K_g\ ; \qquad (4)$$

where:

H – height of a stack, m;

L – length of a stack, m (annex 1, figure 7)

B – width of a stack, m;

K_g – stacking coefficient

7.1.2. the height of a stack is determined as arithmetic mean. The stack is divided into 1 – 3 m length sections and the height is measured at the each stack side in the middle of the sections, as if the heights of separate parts of the sections are even. The length of the sections depends on the stack length and stacking quality. For the stacks shorter than 2m in length the height is measured in two places (annex 1, figure 8). For the stacks up to 10 m in length 1 m length sections are selected, whereas for the longer stacks – the sections must be of such a length that there were not fewer than 10 sections.

7.1.3. nominal assortment length coincides with stack width, when equal length assortments are in the stack. When assortments are uneven the average stack width is determined measuring the actual length of not fewer than 25 selected assortments and rounding their average length to 0.01 m, according to arithmetic rounding rule.

7.1.4. the length of a stack is measured as a distance between two opposite sides of a stack, whereas on a vehicle – as a distance between posts.

7.1.5. the stack volume is expressed with 0.01 m³ accuracy;

7.1.6. the stacking coefficient is determined visually, assessing:

7.1.6.1. tree species;

7.1.6.2. assortment species;

7.1.6.3. mean diameter of the assortments;

7.1.6.4. length of the assortments;

7.1.6.5. stacking quality. Closely stacked - there is no void space where the thinnest assortment could go. Well stacked – there are up to 5 voids of 1 m^2 where the thinnest stack assortment could go. Not closely stacked – there are 6 – 10 voids of 1 m^2 where the thinnest stack assortment could go. Unclosely (mechanically stacked) - 10 m^2 of the stack end is made of 3 criss-crossed assortments. Very unclosely stacked - 10 m^2 of the stack end is made of 4 – 6 criss-crossed assortments. Many criss-crossed assortments - 10 m^2 of the stack end is made of more than 6 criss-crossed assortments;

7.1.6.6. sweep of the assortment. For the thin assortments (mean diameter of the thin end (over bark) 7cm and less) the meaning of the sweep factor is doubled, for 8 – 9cm diameter at the thin end is increased by 1.5 times; straight – assortments with a sweep bigger than 1 cm/m make not more than 1%. Almost straight - assortments with a sweep of 1 cm/m make not more than 10%. With gentle crook - assortments with a sweep of 1cm/m make not more than 20%;

7.1.6.7. delimbing quality**.** Qualitatively – only branch backgrounds might be left on several assortments. Very small amount of assortments with buttresses and visible whorl. Several branches – short branch backgrounds, clear whorls and buttresses visible on minority of assortments. Many branches - branch backgrounds, whorls of big branches and buttresses visible on majority of assortments. Very many branches - branch backgrounds, whorls of big branches, several very vivid buttresses on majority assortments. Bad delimbing – roughly hand made or machinery made delimbing.

7.1.6.8. taper of assortments. Assortments with slight taper – usually middle logs with the equal and even surface. Assortments with high taper– logs with uneven taper, notable spays usually butt or top logs;

7.1.6.9. amount of residuals. Residuals in the stack – logs of up to 50cm in length, of-cuts, bark pieces, branches. For the debarked assortments bark remains.

7.1.6.10. snow content; snow or ice in the stack. It is wet or pressed snow and ice; very few – not more than 10% of the snowy and iced assortments, having effect on stack stacking, not many – not more than 20% of the snowy and iced assortments, having effect on stack stacking, many – not more than 30% of the snowy and iced assortments, having effect on stack stacking;

7.1.6.11. stack height;

7.1.6.12. bark thickness. Very thin bark – is not characteristic for the trees growing in Lithuania. Thin bark – most of the assortments have specular bark. Normal bark – the same number of the assortments having specular and uneven bark. Thick bark – the greatest part of the assortments having uneven bark;

7.1.7. standards of the visual assessment of the stack stacking coefficients are presented in timber volume tables.

7.1.8. for particle board wood, barlings, firewood, small sawlogs mean values of the described circumstances corresponding to the coefficients presented in the tables for stack stacking can be used. For the pulpwood constant stacking coefficients can be determined, pulpwood characteristics as well as tree species and piling conditions should be described in the selling agreement.

7.2. Calculation of the stack volume weigh wood and defining specific gravity.

Single wood stack or group of stacks (bundles on the vehicle) are weighed. Wood volume is defined in accordance with wood specific gravity coefficient and piece by piece measurement or xylometring of randomly selected stacks. Number of control stacks should not be less than 1% of all weighed wood. Volume of all load is defined dividing mass of all wood load by wood specific gravity coefficient expressed in parts of the unit. Volume of the bark is estimated in accordance with data of the control stacks measurement employing piece by piece method.

7.3. Defining stack volume weighing the wood and using standards of wood specific gravity coefficients

7.3.1. Single wood stack or group of stacks (bundles on the vehicle) are weighed. Over bark volume of the wood is defined using standards of wood specific gravity coefficients and moisture content of the wood, which is estimated by moisture measurement devices. Volume of the bark is estimated in accordance with data of the control stacks measurement employing piece by piece method.

7.4. Wood weight.

7.4.1. the method is employed to calculate the volume of bundles, the volume of round wood loaded on ships and other transportation means, however moisture content should be estimated. To do so all-

over or selective methods can be employed.

7.4.2. wood weight is determined weighing with dynamometer or according to ship draught with accuracy of 0.1tonne;

7.4.3. Wood weight is calculated employing the formula:

$$Q_S=Q_W\cdot(1-K_W/100); \quad (5)$$

where:

Q_S – oven-dry wood weight;

Q_W – wood weight with actual moisture content;

K_W – moisture content, % determined in the laboratory.

8. DEFINING STACKED VOLUME OF THE MASHINERY STACKED PILE OF BRANCHES.

8.1. Stacked volume of the machinery stacked pile of branches the length of which is usually bigger than width is calculated employing formula:

$$V_{erdm} = f \times p \times h \times L , \quad (6)$$

where:

V_{erdm} – stacked volume of the pile of the branches;

L – length of the pile of branches (m);

p – width of the pile of branches (m);

h – height of the pile of branches (m);

f – form coefficient of the pile cross-section area of branches.

8.1.1. length of the pile of branches is measured in the middle of the pile height (annex 1 illustration 9);

8.1.2. average width of the pile of branches is measured at the ground level;

8.1.3. – average height of the pile of branches is measured as a distance between ground surface and the average height visually drawn perpendicular to the surface line (annex 1 illustration 9);

8.1.4. form coefficient of the pile cross-section area of branches depends on the relation between width and height of the pile of branches. Form coefficients of the pile cross-section area of branches are compiled in the table 9.1

9. DEFINING STACKED VOLUME OF THE MANUALLY STACKED PILE OF BRANCHES

9.1. Stacked volume of manually stacked pile of branches the form which reminds circle cut is determined according to stack height and mean diameter of its background. (table 9.2);

9.1.1. height of a stack of branches is defined as the distance between ground level and the highest point of the stack;

9.1.2. the average diameter of the stack of branches is measured in two directories at the ground level and its mean is calculated.

10. DEFINING STACKED VOLUME OF THE HAND STACKED PILE OF BRANCHES

10.1. Solid volume of the stack of branches is calculated multiplying stacked volume by stacking coeficient:

$$V_{ktm} = k \times V_{erdm} , \quad (7)$$

where:

k – stacking coefficient of the stack of branches;

V_{erdm} – stacked volume of the stack of branches;

10.1.1. stacking coefficient of the stack of branches depends on tree species and duration of the storing;

10.1.2. stacking coefficient of the stack of branches are compiled in table 9.3.

11. SELECTION OF THE TEST SAMPLE

11.1. To solve the arguments between sellers and buyers control sampling of the stacking coefficients is performed, to ensure objectivity impartial timber scalers might be invited. Control stack stacking coefficients are applied for the entire load.

11.2. To test for the stacking coefficients the stacks are to be grouped according to assortment thickness, length, tree species and quality type. Stacks, bundles or trucks for the control test are chosen randomly or systematically. The choice size is determined according to the chosen test accuracy.

11.3. Test sample volume is calculated measuring the assortments employing piece by piece method, weighing or plunging into water. The stacking coefficient for each control sample stack, bundle or truck is determined dividing the calculated solid volume by stacking volume. Total stacking coefficient for the entire load is calculated as the weighed average of the stacking coefficients of the control sample stacks, bundles and trucks.

11.4. Taking into account the size of the stacks and bundles and stacking quality the number of the stacks and bundles chosen for the control should be so large that the standard error did not exceed 2%. If the loads do not exceed 7500 m^3 15 stacks, bundles or trucks are chosen for the control test, if it exceeds 7500 m^3 - 30 stacks, bundles or trucks are chosen.

ANNEX 1

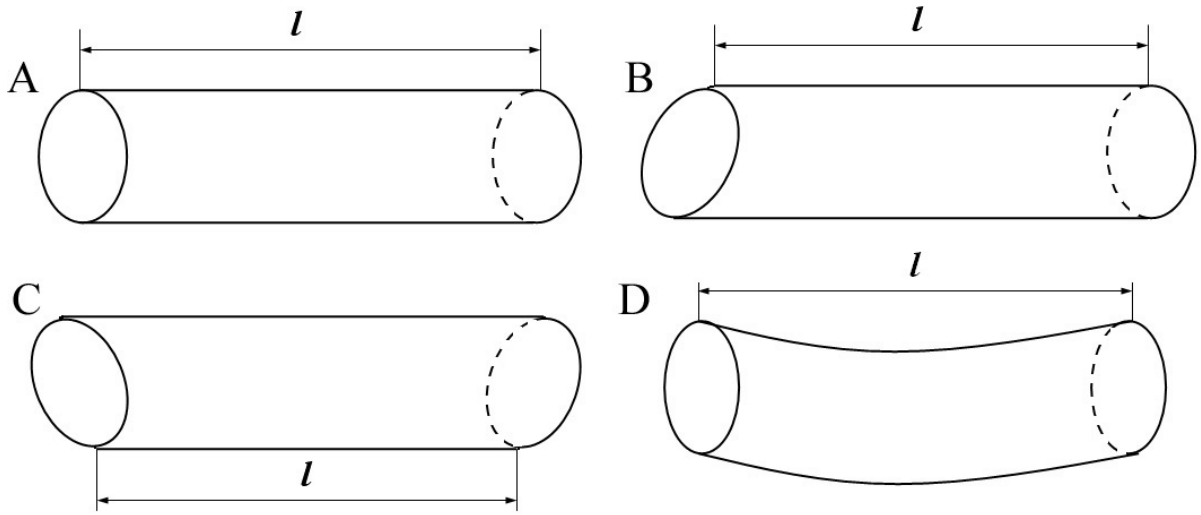

Illustration 1. Measurement of the length of straight roundwood (A, B, C) and roundwood with simple sweep (D).

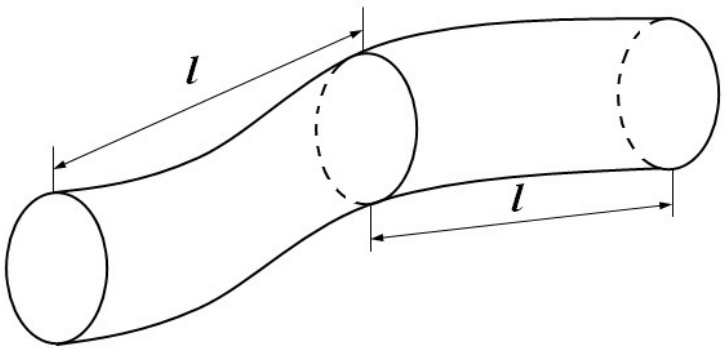

Illustration 2. Measurement of the length of roundwood with a multiple sweep.

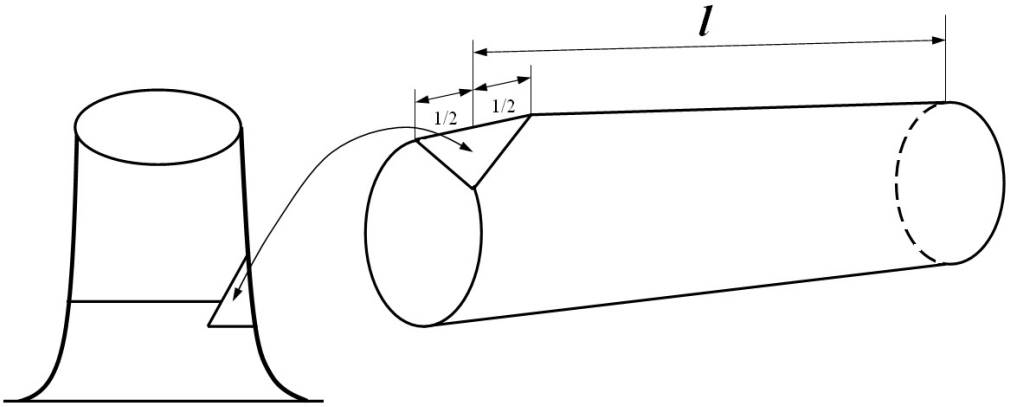

Illustration 3. Measurement of the length of roundwood with undercut.

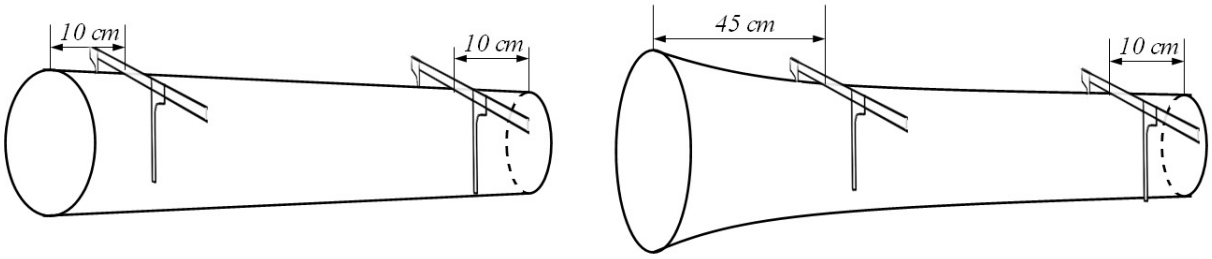

Illustration 4. Measurement of the diameter of top and large end of the pulpwood of control sample.

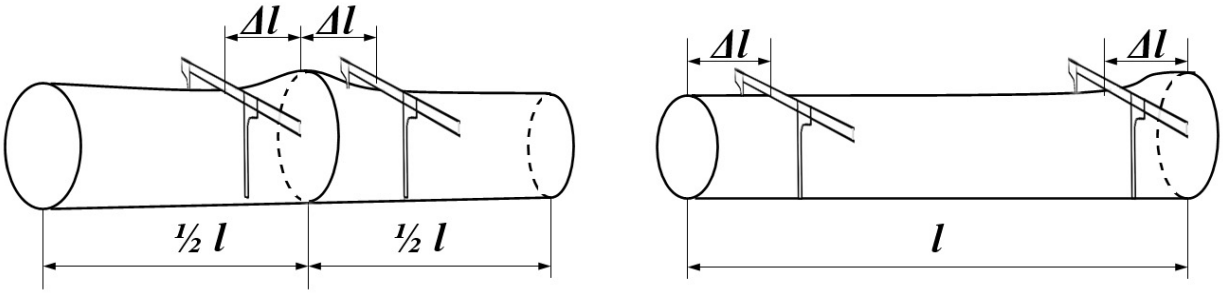

Illustration 5. Measurement of the diameter of a log with a burr on the measurement place.

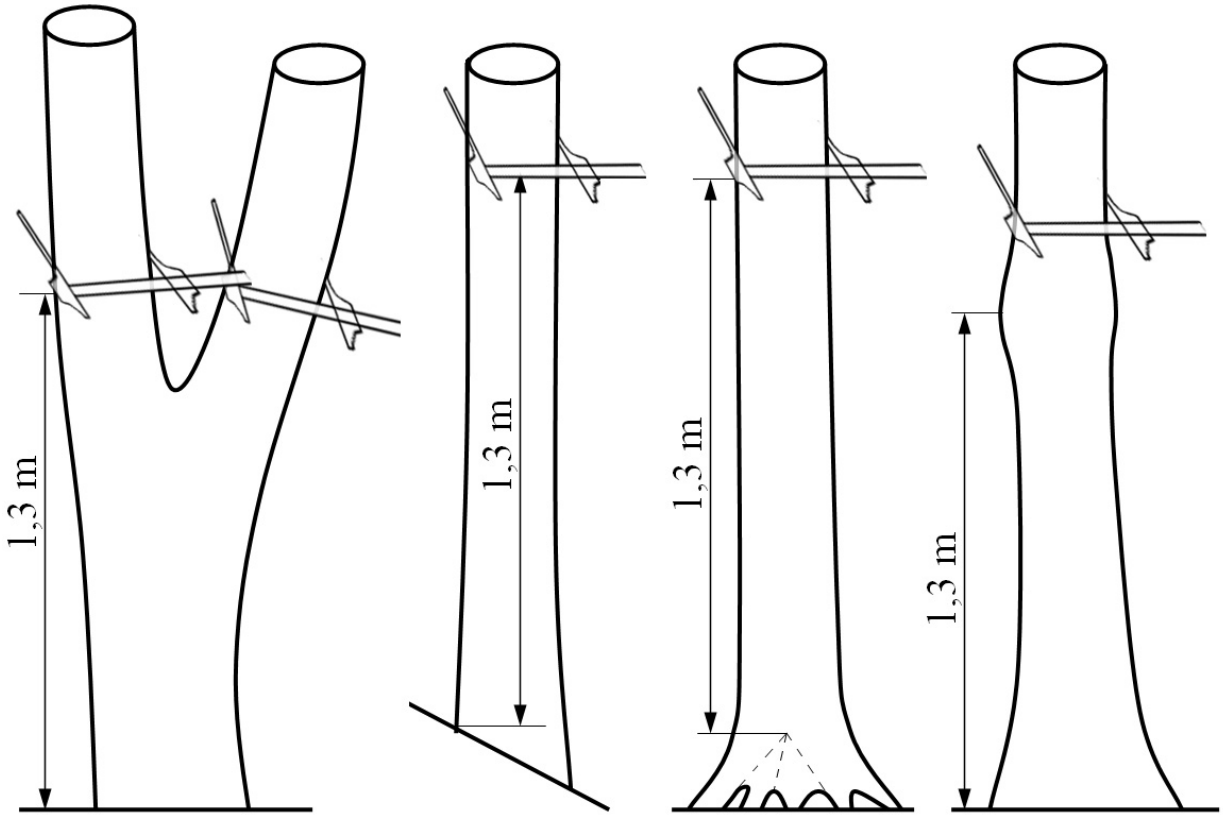

Illustration 6. Measurement of the diameter of a standing tree at 1.3m. height.

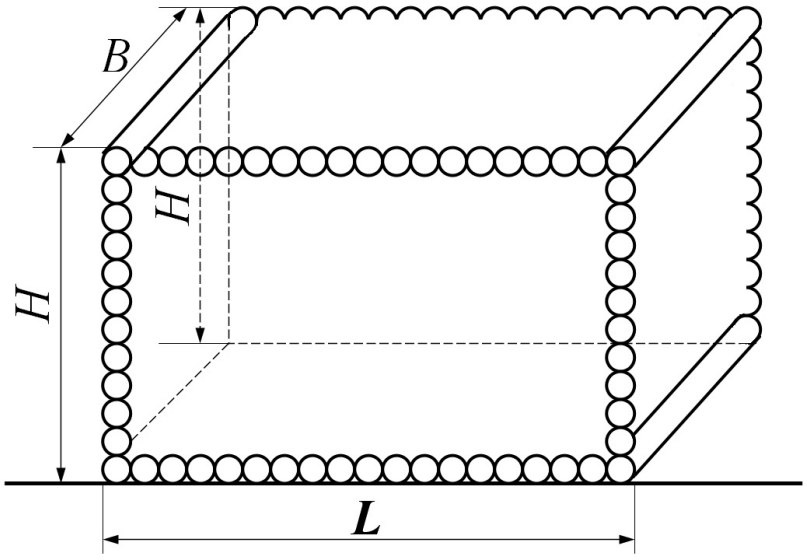

Illustration 7. Measurement of dimensions of the stack..

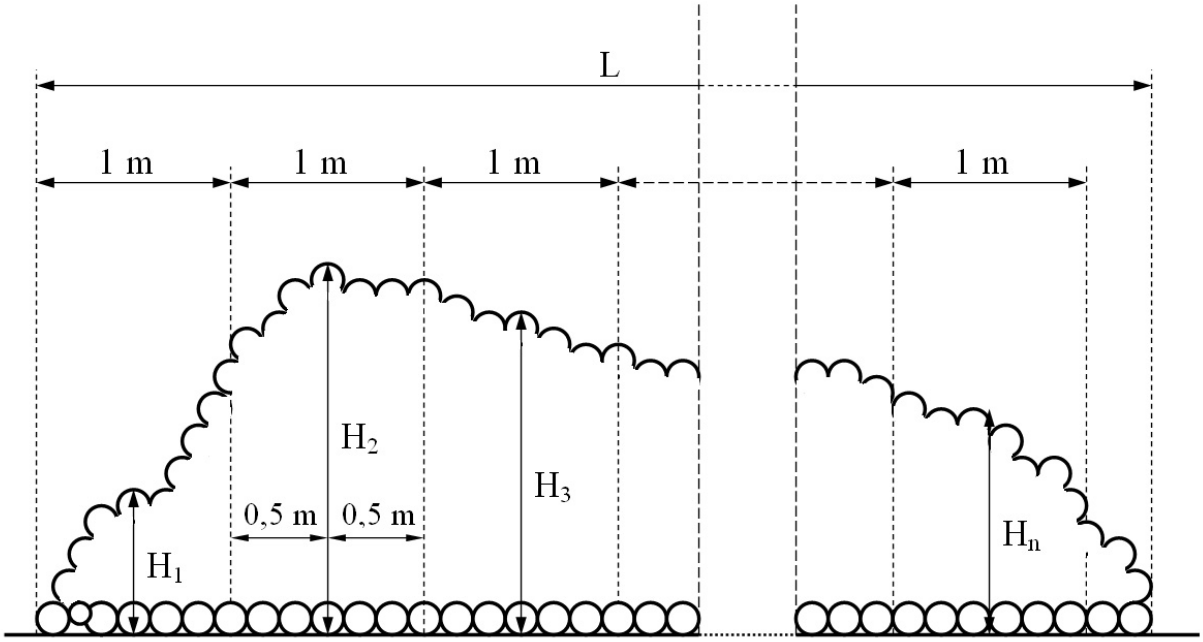

Illustration 8. Measurement of height of the stack.

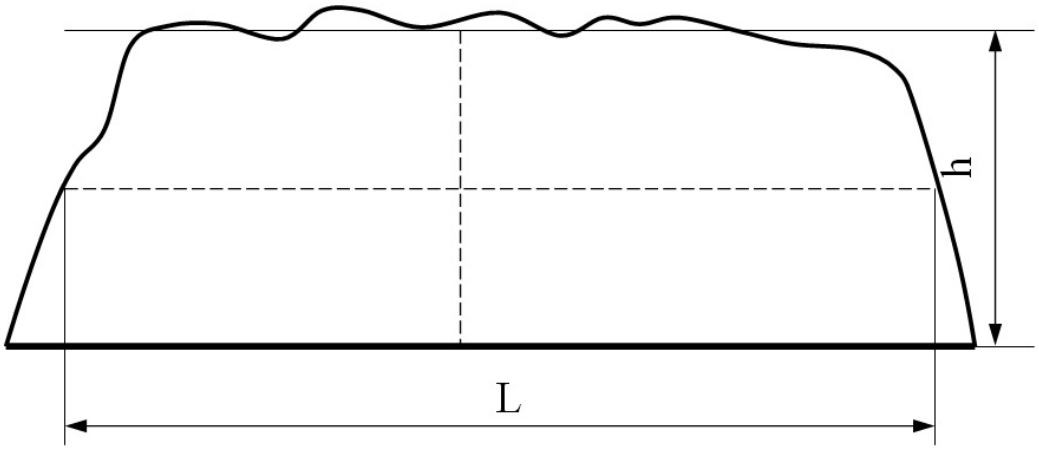

Illustration 9. Measurement of height and length of the stack of branches.