SCAN-CM 48:01
Revised 2001

SCANDINAVIAN PULP, PAPER AND BOARD
TESTING COMMITTEE

Wood chips for pulp production

Length and length distribution, width and width distribution

0 Introduction

This SCAN-test Method replaces SCAN-CM 48:92, from which it differs in that the wood chip sample consists of a mixture of the two classes of accept chips from a chip size classification instead of one accept chip class and the length (or width) classifier is not compulsory.

1 Scope

This SCAN-test Method describes the procedure for determining the mean length and length distribution of wood chips intended for the production of chemical or mechanical pulps (accept chips). The Method also describes an apparatus used for determining the length distribution of the sample.

The Method can also be used for determining the width and width distribution of accept chips.

The Method is applicable to the determination of the quality of accept chips with regard to their length and width.

2 References

SCAN-CM 40 Wood chips for pulp production~ Size distribution

SCAN-CM 41 Wood chips for pulp production ~ Sampling

3 Definitions

For the purpose of this Method, the following definitions apply:

3.1 *Length*~ The distance between the cut end surfaces of the accept chip measured along the fibre direction on one side of the chip, as illustrated in *Figure 1*.

3.2 *Length classification*~ A procedure for separating a sample of wood chips into classes according to their length.

3.3 *Length classifier*~ Apparatus for chip classification according to length.

3.4 *Width*~ The distance between the sides of the accept chip perpendicular to the fibre direction, as illustrated in *Figure 1*.

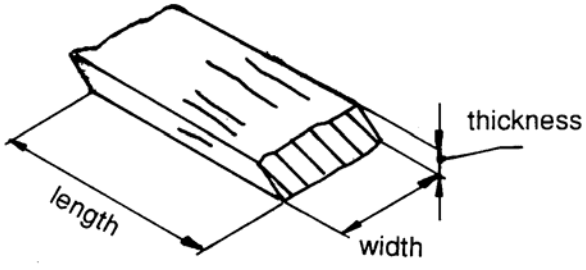

Figure 1. Sketch illustrating the definitions of the length and the width of an accept chip.

3.5 *Large accept chips (13 mm hole)* – Chips that pass the top two screens of the classifier but are retained on the third screen, when chip size classification is performed as specified in SCAN-CM 40.

3.6 *Small accept chips (7 mm hole)* – Chips that pass the top three screens of the classifier but are retained on the fourth screen, when chip size classification is performed as specified in SCAN-CM 40.

4 Principle

A sample of wood chips is screened as described in SCAN-CM 40. A portion from a mixture of the classes large accept chips and small accept chips is separated into classes by length (or by width), the mass of each length (or width) class being expressed as a percentage of the total mass of all classes contributing to the length (or width) distribution. The mean length (or width) is achieved by calculation.

5 Apparatus

5.1 *Slide-calliper* or *ruler,* accurate and readable to 1,0 mm. To facilitate the separation, a *length (or width) classifier*, described in the Annex, may be used.

5.2 *Collecting boxes,* 15 in total, for the different chip length classes. Mark the boxes with length intervals according to *Table 1*.

> *Note* Suitable boxes can be made from plastic bottles, e.g. 1 litre polyethene bottles with rectangular bases where the necks of the bottles have been cut off.

5.3 *Balance*, accurate and readable to 0,1 g.

6 Sampling and preparation of sample

The sampling procedure is not covered by this Method. Make sure that the sampling has been carried out in a manner that ensures representative samples. A suitable sampling procedure is described in SCAN-CM 41.

Weigh the wood chips sample and screen it and determine the proportions of the large and small accept chips in the original sample as described in SCAN-CM 40. Weigh the large and small accept-chip classes. Mix these classes carefully. From the mixture, take a representative sample of 3 litres of accept chips.

7 Procedure

7.1 Length determination

Measure the accept chip in the fiber direction. Place the accept chip in the collecting box corresponding to the length of the chip. If a classifier is used, use the procedure described in the Annex.

Repeat this procedure with all the chips in the sample. Weigh the chips collected in each length interval to the nearest 0,1 g.

Measurable chips have parallel section surfaces. Reject badly damaged or irregular accept chips and keep these to be weighed and reported separately.

7.2 Width determination

The procedure is the same as for length determination, except that the accept chip is measured in the direction perpendicular to the fibre direction.

8 Calculation

8.1 Length distribution

Calculate the total mass of all 15 classes and then the mass of each class as a percentage of the whole, with one decimal. This gives the weight-based length (or width) distribution.

8.2 Mean length

Calculate the mean accept-chip length (or width) according to the equation:

$$X = \frac{\sum a_i \, b_i}{100} \qquad [1]$$

where

X is the mean accept-chip length (or width) in millimetres;

a_i is the proportion by weight of the whole accept-chip sample contained in the interval i, as a percentage;

b_i is the mean accept-chip length (or width) in the interval i, in millimetres (e.g.: b_i in the interval 10-13 mm is 11,5 mm).

> *Note 1* The lengths and the widths of the accept chips in the extreme intervals i <10 mm and i >49 mm must be individually measured with a ruler and the mean values of the classes calculated.

Report the mean length (or width) with one decimal.

8.3 Rejected accept chips

Calculate the proportion of rejected accept chips as a percentage of the test sample.

9 Report

The test report shall include reference to this SCAN-test Method and the following particulars:

(a) date and place of testing;
(b) identification mark of the sample tested;
(c) the results (distribution and mean value);
(d) the standard deviation, or coefficient of variation;
(e) the rejected part of the sample;
(f) the shares of the classes large accept chips and small accept chips in the original wood chip sample;
(g) any departure from the standard procedure and any other circumstances that may have affected the results.

10 Precision

Six laboratories tested the same three accept-chip samples under normal laboratory conditions according to this Method. The repeatability and reproducibility of the length distribution, calculated as the standard deviations within and between laboratories respectively, are given in *Table 1*. The mean length obtained by the six laboratories is given in *Table 2*. The standard deviation of the mean length was 0,66 within and 0,63 between the laboratories.

Table 1. Mean percentage by weight in different intervals by length for all analyses and standard deviations within and between laboratories.

Interval, mm	≤10,0	10,1-13	13,1-16	16,1-19	19,1-22	22,1-25	25,1-28	28,1-31	31,1-34	34,1-37	37,1-40	40,1-43	43,1-46	46,1-49	≥49,1
Mean	0,7	1,3	3,0	7,9	18,8	29,9	20,4	9,9	4,3	1,9	1,0	0,5	0,2	0,1	0,1
s, within lab	0,12	0,31	0,45	1,32	2,10	1,48	1,41	1,35	0,76	0,43	0,29	0,18	0,01	0,08	0,05
s, between labs	0,26	0,30	0,55	1,57	3,27	3,99	2,53	3,49	1,35	1,44	0,62	0,41	0,26	0,20	0,17

Table 2. Mean accept chip length analysed by six laboratories. The sample has been analysed three times at each laboratory.

	mean length, mm	*s*
Laboratory 1	23,9	0,73
Laboratory 2	24,8	0,17
Laboratory 3	24,1	0,13
Laboratory 4	23,8	0,10
Laboratory 5	24,0	0,98
Laboratory 6	24,3	0,16

s = standard deviation

Annex
Length (or width) classifier

A.1 Apparatus

A.1.1 *Length (or width) classifier*, to facilitate the classification of the wood chip sample, made of between 10 mm and 12 mm plywood or similar material with dimensions, for example, as shown in *Figure A.1*. The equipment consists of the following components:

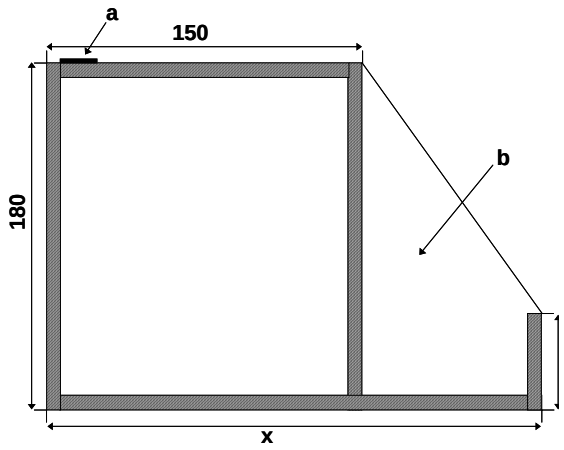

Figure A.1. Side view of the apparatus for classification of accept chips according to length (or width).

This classifier is made of plywood glued and screwed together, with dimensions as given in the figure.

The choice of the dimension x *is left open, depending on the dimensions of the collecting boxes.*

a*) bar made of steel (A.1.2);*

b*) space for the collecting boxes (A.1.4).*

A.1.2 *A bar,* of steel, with a thickness of (2 ± 0,1) mm, fixed on top of the classifier. A suitable bar could be a steel ruler.

A.1.3 *Black marks*. The top plane of the classifier is white and has black marks 3 mm wide distributed along the plane to indicate the length classes. Each mark is parallel to the bar at a distance from the bar to the nearest edge of the mark corresponding to the length class. The distances are marked on the top plane, starting at 10 mm and increase up to 49 mm at intervals of 3 mm, see *Figure A.2*, giving a total of 15 length classes.

A.1.4 *Collecting boxes*. A box is placed opposite each mark to collect the chips.

> *Note 1* Suitable boxes can be made from plastic bottles, e.g. 1 litre polyethene bottles with rectangular bases where the necks of the bottles have been cut off.

A.2 Procedure

A.2.1 Length determination

Place an accept chip on the plane of the apparatus against the bar (A.1.2) with the fibre direction at right angles to the bar in the manner shown in *Figure A.3*. Move the accept chip along the bar, from the left-hand to the right-hand side, until the end farthest from the bar falls within a black mark (A.1.3), see *Figure A.3*. Place the accept chip in the corresponding box (A.1.4).

Repeat this procedure with all the accept chips in the sample. Weigh the accept chips collected in each length interval to the nearest 0,1 g.

A.2.2 Width determination

The procedure is the same as for length determination except that the accept chip is placed so that the fibre direction is parallel to the bar.

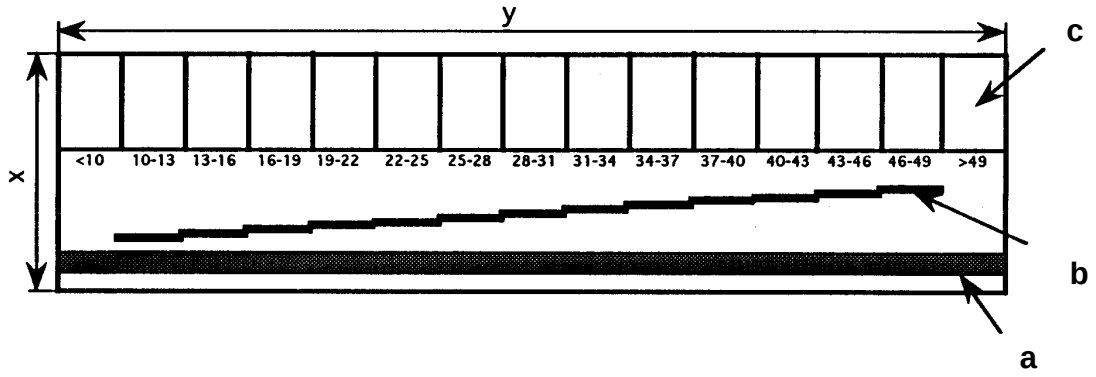

Figure A.2. Top view of the classifier.

The dimensions x *and* y *are chosen depending on the dimensions of the collecting boxes.*

a*) bar;*

b*) black mark;*

c*) collecting box, 15 in total.*

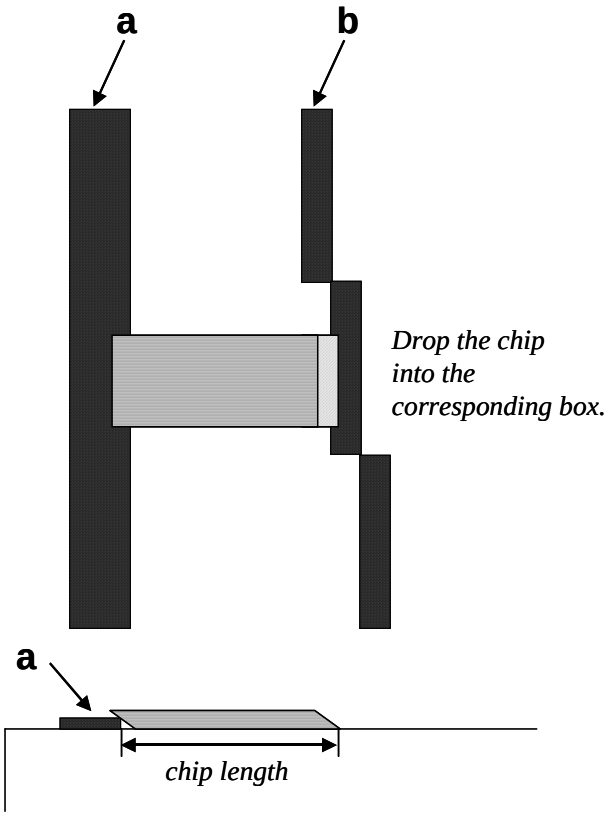

Figure A.3. Principle for chip length measurement.
a*) bar;*
b*) black mark.*

SCAN-test Methods are issued and recommended by KCL, PFI and STFI-Packforsk for the pulp, paper and board industries in Finland, Norway and Sweden.
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