INTERNATIONAL STANDARD

ISO 801-1

Second edition
1994-08-01

Pulps — Determination of saleable mass in lots —

Part 1:
Pulp baled in sheet form

Pâtes — Détermination de la masse marchande des lots —
Partie 1: Balles de pâte en feuilles

Reference number
ISO 801-1:1994(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 801-1 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 5, *Test methods and quality specifications for pulp*.

This second edition cancels and replaces the first edition (ISO 801-1:1979), of which it constitutes a technical revision.

ISO 801 consists of the following parts, under the general title *Pulps — Determination of saleable mass in lots*:

— *Part 1: Pulp baled in sheet form*

— *Part 2: Pulps (such as flash-dried pulps) baled in slabs*

— *Part 3: Unitized bales*

Annexes A and B of this part of ISO 801 are for information only.

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Pulps — Determination of saleable mass in lots —

Part 1:
Pulp baled in sheet form

1 Scope

This part of ISO 801 specifies a method for determining the dryness of a lot of pulp baled in sheet form and for calculating its saleable mass.

This method is applicable to all kinds of pulp baled in sheet form. It does not apply to pulp baled in lots in slab form or to pulp baled in unitized lots.

An example of a full certificate of analysis and related calculations is given in annex A. Annex B gives details of equipment for marking the position of specimen sheets in sample bales.

2 Definitions

For the purposes of this part of ISO 801, the following definitions apply.

2.1 lot: The total number of bales of the same sort of pulp of specific characteristics.

The number of bales comprising a lot is indicated by the invoice or by agreement between the interested parties.

A lot of bales of pulp is said to be "with specification" if it is accompanied by a certificate of origin stating for each bale either

— its gross mass (2.2) and its absolute dryness (2.4),

or

— its saleable mass (2.7).

2.2 gross mass: The total mass of a bale, a part of a lot or a lot comprising

— contents;

— wrappers (pulp — paper);

— packaging wires or strappings.

2.3 oven-dry mass: The mass obtained on drying pulp at 105 °C ± 2 °C, until constant mass is reached.

2.4 absolute dryness: The ratio of the oven-dry mass (2.3) of the pulp to its initial mass, expressed as a percentage.

2.5 air-dry mass: The mass of the pulp when its moisture content is in equilibrium with the ambient atmosphere.

2.6 theoretical commercial dryness: A conventional equilibrium value of 88 % or 90 % according to the country and/or commercial agreements.[1)]

2.7 saleable mass: The gross mass (2.2) multiplied by the absolute dryness (2.4) divided by the theoretical commercial dryness (2.6). Usually, it approximates to the air-dry mass (2.5).

2.8 invoiced mass: The saleable mass (2.7) indicated by the vendor on the invoice.

1) If the air dryness is 90 %, the pulp contains 90 parts by mass of absolutely dry fibres and 10 parts by mass of water. For an air dryness of 88 %, the corresponding figures are 88 and 12.

3 Principle

From the lot, sample bales are taken in number which is a function of the total number of bales in the complete lot and in accordance with a sliding scale. These sample bales are weighed[2] and collected in groups of six bales.

Five specimen sheets are selected from each sample bale under defined conditions.

From each specimen sheet, a test piece is cut in the form of a triangle, as indicated in clause 6.

The test pieces are weighed and dried to constant mass to determine their oven-dry mass (2.3).

The saleable mass (2.7) of the lot is then calculated.

4 Apparatus

4.1 Scale, suitable for weighing the bales to an accuracy of at least 1/1 000.

4.2 Balance, suitable for weighing the test pieces to an accuracy of at least 1/5 000. The balance shall have a capacity of at least 5 kg and a sensitivity of 0,1 g. Its weighing pan (or weighing table) shall be wide enough to accommodate the test pieces so that they do not protrude outside the rim of the pan.

NOTE 1 As the test pieces are weighed when still hot, they cause an upstream flow of air around the weighing pan and, in consequence, a negative error in the balance reading. This error is minimized if the pan is wide enough so that no part of the test pieces protrudes outside the rim of the pan.

4.3 Equipment, for marking the position of the specimen sheets to be selected (see annex B) and the test pieces in these sheets, as well as for cutting them.

4.4 Equipment, for storing at least 30 test pieces to prevent them from gaining or losing mass before weighing.

4.5 Drying oven, with good ventilation, and capable of being controlled at 105 °C ± 2 °C.

5 Sample bales

All the sample bales shall be representative of the lot and for this purpose, so far as possible, these bales should be selected at random from all parts of the lot. In the absence of any other agreement between the interested parties, the available part of the lot to be examined shall be not less than half the complete lot at the time of examination.

If the bales have identification numbers relating to several series, the sample bales shall be selected as far as possible in proportion to the size of each of these series.

The sample bales shall be intact and damaged as little as possible, and shall not include

— bales showing signs of definite drying or wetting, as may happen with bales situated on the external faces of a stack;

— bales or wrappings of bales having deteriorated, or showing clear signs of accidental localized wetting or loss;

— bales carrying traces of previous sampling;

— bales whose number is illegible or is not contained in the specification, if this is a lot specified bale by bale.

The number of sample bales to be taken is given in table 1.

Above 5 000, the minimum number to be taken is 100 plus 1 % of the bales in excess of 5 000, the maximum number being 200 plus 1 % of the bales in excess of 5 000. In all cases, the total number of sample bales shall be a multiple of 6.

When the lot is relatively uniform, and the number of bales rejected (exclusive of bales from the outer faces of the stack) does not exceed 10 % of the minimum number of bales to be selected (see table 1), then the minimum number shall be taken. Otherwise, the analyst shall decide, within the limits set in table 1, the number of bales to be selected.

For frozen pulp, the sampling shall be postponed until the bales have thawed, so that satisfactory test pieces can be cut from the sheets.

2) The mean of the gross mass of the sample bales is considered as being the mean of the gross mass of all the bales in the lot.

Table 1 — Number of sample bales to be taken

Total number of bales in lot	Number of sample bales	
	min.	max.
Up to 100	12	24
101 to 200	18	36
201 to 300	24	48
301 to 400	24	48
401 to 500	24	48
501 to 600	30	60
601 to 700	30	60
701 to 800	36	72
801 to 900	36	72
901 to 1 000	42	84
1 001 to 2 000	48	96
2 001 to 3 000	60	120
3 001 to 4 000	72	144
4 001 to 5 000	96	192

6 Procedure

6.1 Weighing of sample bales

Determine the gross mass of each sample bale separately and report the results to an accuracy between 1/500 and 1/1 000; report, if possible, their marks and references in the order of their weighing. Check the scale (4.1) before the weighings and during the course of the operation.

If the moisture content of the sheets of pulp serving as wrappers obviously differs from that of the rest of the bale, or if the wrappers are invoiced separately, test them separately in accordance with 7.2.

6.2 Selection of specimen sheets

Select five specimen sheets from each sample bale, as specified below, as soon as possible after weighing.

Draw five sheets from each sample bale, the distance between the sheets being constant and equal to one-fifth of the total thickness of the bale (see the note). Do not take the sheets from the same positions in each bale, but select them according to the procedure specified below and illustrated in figure 1. In sample bale No. I, the first sheet is taken 1 cm from the extreme top, and the last sheet (the fifth) will be one-fifth of the thickness of the bale from the bottom. In sample bales Nos. II, III, IV, V and VI, each sheet is taken from a slightly lower position (actually 1/50 of the thickness of the bale) than the corresponding sheet of the preceding bale; thus, in sample bale No. VI, the first sheet will be taken 1/10 of the height of the bale from the top, and the last sheet will be 1/10 of the height of the bale from the bottom. The sample bale No. VII, being a part of the next group of six sample bales, will recommence the cycle and be treated in the same way as the sample bale No. I, etc.

NOTE 2 Pulp bales composed of sheets folded or in juxtaposition. Pulp sheets are sometimes delivered folded two or more times into laps to conform to the size of the bale. In such cases, the word "sheet" should be interpreted as applying to only one thickness of the lap. If several sheets are folded into one lap, the test piece should be drawn from the sample sheet defined above. It is advisable to cut the pulp sheet(s) along the fold of the lap to determine the exact position from which the specimen sheet should be drawn.

Where the bales are composed of two adjacent sheet piles, the two sheets in juxtaposition on the same level should be considered as constituting one specimen sheet.

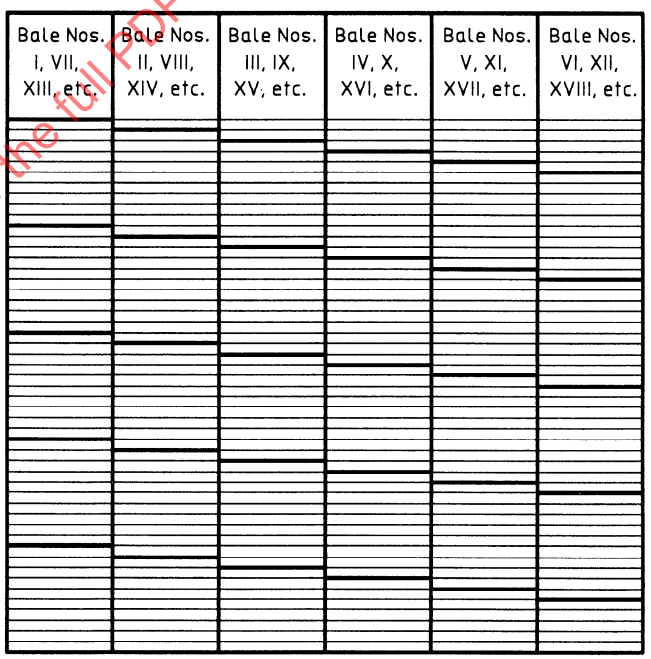


Figure 1 — Diagram indicating the position from which specimen sheets shall be taken

Select all specimen sheets very carefully, especially those within about 5 cm from the top and the bottom of the bale.

The specimen sheets can be selected easily with the aid of an appropriately graduated measuring rod (see annex B). Place the rod in an inclined position against the side of the bale, so that its lower end is at the level of the bottom face on the bale, and the upper line at the level of its top. The faces on the rod cor-

respond to the six bales in a bale group and the lines correspond to the five specimen sheets in the table.

If the top and bottom of the bales can be established by means of numbers or other identifying marks, start the selection of specimen sheets from the top of the first group of six sample bales and from the bottom of the second group of six sample bales. Follow this alternating procedure for successive groups of six bales.

6.3 Cutting the test pieces

6.3.1 General

From each of the specimen sheets selected, take a triangular test piece by making two straight cuts through the sheet from the edge to the midpoint. These triangles (see note 3) have their bases at the outside edges and apices at the midpoint of the sheets. All test pieces used in the test have either the same area, or a constant apex angle of 24°.

It is very important that each specimen sheet remain in contact with the sheet underneath when the test piece is cut and that the cutting of the test piece is carried out on the same bale at the moment when the specimen sheet is exposed.

Place the test pieces in the storage equipment (4.4) to prevent gain or loss of moisture until the desired quantity has been accumulated for weighing as a batch.

NOTE 3 As a result of a very full study, it has been decided to adopt two alternative ways of cutting the triangular test pieces.

In alternative 1, the test pieces are cut in such a way that they are equal in area.

In alternative 2, the test pieces are cut so that the angle at the peak is constant; hence, the areas of the test pieces vary according to the position from which they are taken in the specimen sheets.

Alternative 1 is theoretically correct for representative sampling but believed by some to be difficult to operate in practice. Alternative 2 is considered by some to be easier to follow. Data collected show that, in practice, the difference between the results obtained by the two ways of cutting the test pieces is likely to be negligible, and for this reason it has been agreed to recognize both alternatives.

6.3.2 Alternative 1: Constant area

From the first bale of a group of six sample bales, proceed as follows:

Cut test pieces in the shape of triangles in which the apices are at the midpoint of the sheets and where the lengths of the bases of the triangles are

$$\frac{l_1}{7,5} \quad \text{and} \quad \frac{l_2}{7,5}$$

where

l_1 is the length of the long side of the sheet;

l_2 is the length of the short side of the sheet.

The test piece cut from the first specimen sheet has one side which coincides with a sheet diagonal (starting point shown in figure 2).

If the specimen sheets vary in grammage, and, hence also in thickness, compensate this by cutting narrower test pieces from the thicker sheets and wider ones from the thinner sheets.

Cut the test pieces from the consecutive specimen sheets as indicated in figure 2. These five triangular pieces together form the sample from bale No. I.

In sample bale No. II, cut the test pieces from consecutive positions clockwise of the respective test piece positions in sample bale No. I, and progressively for sample bales Nos. III, IV, V and VI.

Use the same procedure for each group of six sample bales.

For each of these groups, the total area of the test pieces is equivalent to one sheet. If, however, the pulp properties and sheet shapes cause difficulty in cutting the test pieces, it is permissible to double the area of every test piece.

The procedure for cutting test pieces with constant area is illustrated in figure 2.

6.3.3 Alternative 2: Constant angle

From the first bale of a group of six sample bales, proceed as follows.

Cut test pieces in the shape of triangles in which the angle at the apices is constant and equal to 24°. The apices shall be at the midpoint of the sheets.

The test piece cut from the first specimen sheet has one side coinciding with a sheet diagonal (starting point shown in figure 3).

Cut the test pieces from the consecutive specimen sheets with an anticlockwise displacement of 72° between their bisections; the five triangular pieces together form the sample from bale No. I.

In sample bale No. II, cut the test pieces in the same way but with the apex angles displaced 24° anticlockwise of those in the first sample bale, and in sample bale No. III, cut the test pieces with the same angle displacement of 24° anticlockwise of those in bale No. II. In sample bales Nos. IV, V and VI, the position of the test pieces is identical with that of the test pieces in bales Nos. I, II and III respectively.

Use the same procedure with the successive groups of six sample bales.

For each of these groups, the total area of the test pieces is equivalent to two complete sheets.

The procedure for cutting test pieces with a constant angle at the apex is illustrated in figure 3.

6.4 Weighing and drying of the test pieces

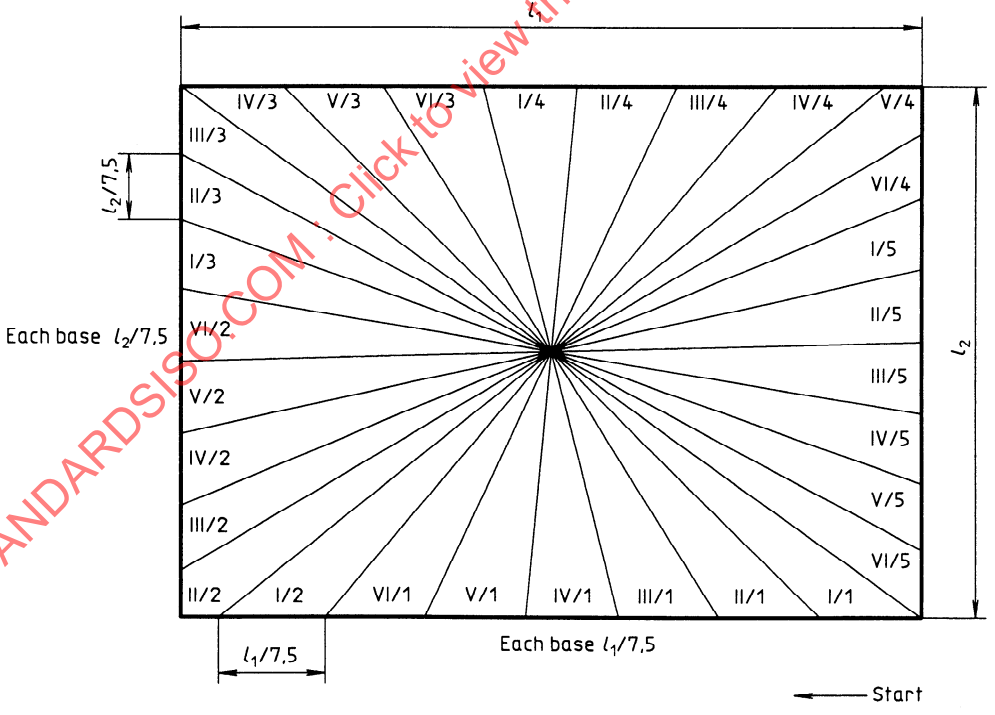
Collect the test pieces obtained in batches containing those from the group of six bales and weigh to an accuracy of at least 1/5 000.

It is essential that test pieces be prevented from losing or gaining mass before weighing (see 4.4).

Dry the test pieces in the ventilated oven (4.5), controlled at 105 °C ± 2 °C, until the mass is constant. This mass is considered to have been reached when two consecutive weighings at an interval of at least 1 h do not differ by more than 1/5 000.

Weigh the test pieces on the balance (4.2) immediately after their removal from the oven. The time interval from removal to weighing shall be less than 30 s.

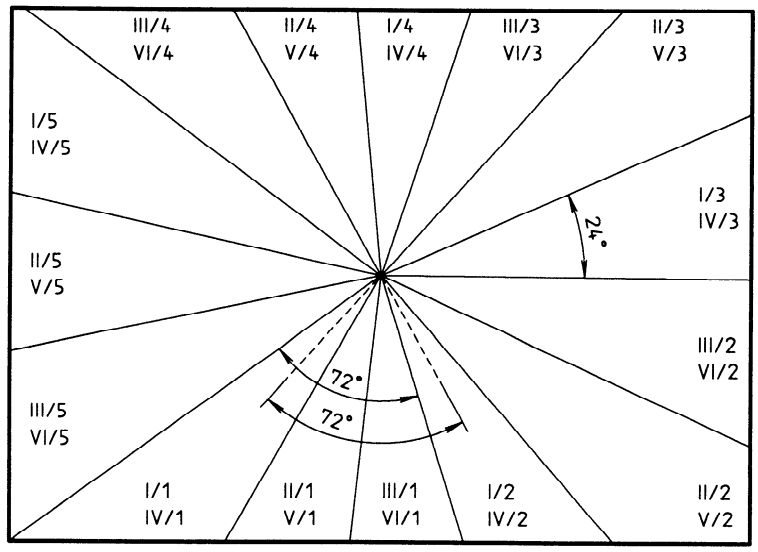
NOTE 4 A prolonged time period between removal and weighing can cause a positive error in the oven dry mass, due to uptake of moisture from the ambient atmosphere.



Roman figures: number of bale

Arabic figures: number of specimen sheet

Figure 2 — Diagram illustrating how test pieces of constant area are to be cut from specimen sheets selected according to the diagram given in figure 1



Roman figures: number of bale

Arabic figures: number of specimen sheet

Figure 3 — Diagram illustrating how test pieces with constant angle at the apex are to be cut from specimen sheets selected according to the diagram given in figure 1

7 Expression of results

7.1 Bales without wrappers and without specifications

The saleable mass X (at c %) of pulp in the lot is given, in kilograms, by the equation

$$X = \left(m_1 \frac{a_1}{100} + m_2 \frac{a_2}{100} + \ldots + m_n \frac{a_n}{100}\right) \times \frac{N_1}{N_2} \times \frac{100}{c} = \frac{(m_1 a_1 + m_2 a_2 + \ldots + m_n a_n) \times N_1}{N_2 \times c} \quad \ldots (1)$$

where

$m_1, m_2, \ldots, m_n$ is the gross mass (2.2) of each group of six sample bales (total of the mass of six bales) (see 6.1), expressed in kilograms;

$a_1, a_2, \ldots, a_n$ is the absolute dryness (2.4) of each group of six sample bales, expressed as a percentage and rounded to one decimal place;

N_1 is the total number of bales in the lot;

N_2 is the number of bales sampled;

c is the theoretical commercial dryness (2.6), expressed as a percentage.

Express the result to the nearest 1 kg.

7.2 Bales wrapped in pulp or paper sheets

If the wrappers are to be analysed separately, each bale shall be weighed intact and the wrapper or wrappers removed and weighed separately (see 6.1) (the wrapper comprises all the pulp or paper sheets which are folded over the sides of the bales and the sheets outside of these). The gross mass (2.2) of the wrappers is then deducted from the gross mass of the intact bales to determine the gross mass of the contents of bales. The mass of packaging wires or strappings is included in the mass of the contents of the bales.

The wrappers of each group of six bales are sampled by selecting a single test piece comprising a diagonal strip 10 cm wide cut simultaneously from all the wrappers on one bale in every group of six. The absolute dryness (2.4) is determined in the same manner as for triangular test pieces.

The contents shall be sampled in the ordinary way as for unwrapped bales.

The saleable mass of such bales is arrived at by adding together, for each group of six bales, the saleable masses, separately determined, of the wrappers and the contents.

7.3 Lots with specification bale by bale

The average saleable mass of the sample bales (arrived at by dividing the total saleable mass of the sample bales, according to the maker's specification, by the number of sample bales) should, as far as possible, be within ± 0,5 % of the average specified saleable mass of the whole lot (arrived at by dividing the specified saleable mass of the whole lot by the total number of bales).

In such cases, the saleable mass Y (at c %) of pulp in the lot, accompanied by a complete specification, is given by the equation

$$Y = \left(m_1 \frac{a_1}{100} + m_2 \frac{a_2}{100} + \ldots + m_n \frac{a_n}{100}\right) \times \frac{d}{e} \times \frac{100}{c}$$

$$= \frac{(m_1 a_1 + m_2 a_2 + \ldots + m_n a_n) \times d}{ec} \quad \ldots (2)$$

where

$m_1, m_2, \ldots, m_n$ is the gross mass (2.2) of each group of six sample bales (total of the masses of six bales) (see 6.1), expressed in kilograms;

$a_1, a_2, \ldots, a_n$ is the absolute dryness (2.4) of each group of six sample bales rounded to one decimal place, expressed as a percentage;

c is the theoretical commercial dryness (2.6), expressed as a percentage;

d is the saleable mass (at c %) of the lot according to the invoice, expressed in kilograms;

e is the saleable mass of the sample bales as calculated using the specification, expressed in kilograms.

Express the result to the nearest 1 kg.

7.4 Combined groups

If, for some reason, the test pieces from more than one group of six sample bales are combined into batches for weighing, the appropriate terms in equations (1) and (2) are defined as follows:

$m_1, m_2, \ldots, m_n$ is the gross mass (2.2) of combined groups of six sample bales (see 6.1), expressed in kilograms;

$a_1, a_2, \ldots, a_n$ is the absolute dryness (2.4) of combined groups of six sample bales rounded to one decimal place, expressed as a percentage.

8 Test report

The test report shall include the following particulars:

a) a reference to this part of ISO 801;

b) all the indications necessary for complete identification of the sample;

c) the saleable mass of the lot, expressed in kilograms;

d) the method of cutting the test piece (constant area or constant angle);

e) any unusual features observed in the course of the test;

f) any operations not specified in this part of ISO 801, or regarded as optional, which might have affected the results.

A typical form used for reporting test results is given in annex A.

Annex A
(informative)

Example of a full certificate of analysis and related calculations

A.1 Certificate of analysis

We certify that we have sampled and tested for saleable mass a lot of bales of prime unbleached sulfate pulp said to consist of 200 bales, order No. 12 345.

Marked:	AAA blue
Stored at:	EFGH mill
Method of storage:	In enclosed building
Name and address of seller and buyer:	Mamoë-Durand — Papeterie Dupont
Documents identifying the lot:	Number and date of manufacture, specifications of dryness bale by bale
Method of transport:	Ship
Date of sampling:	1978-11-15
Place of sampling:	ABCD
Number of bales available before testing (approximately):	200
State of bales:	Good
Type of wrapper:	Pulp sheets

The analysis was carried out in accordance with ISO 801-1, *Pulps — Determination of saleable mass in lots — Part 1: Pulp baled in sheet form*, cutting the test pieces with constant area/angle*.

Number of bales sampled:	36
Total number of bales in lot:	200
Calculated oven-dry mass of sample bales:	5 300,7 kg
Saleable mass (at 90 %) of sample bales as calculated using the specification (when available):	(5 881,7) kg**
Saleable mass (at 90 %) of bales of pulp in lot according to the invoicing (when available):	(32 676) kg
Saleable mass (at 90 %) of baled pulp in lot according to the analysis:	32 720 kg
If required	
a) shortage or excess (on invoiced mass) expressed in kilograms:	excess 44 kg
b) shortage or excess (on invoiced mass) expressed as a percentage:	excess 0,135 %

The details of sample bales and test pieces are given in A.2.

Certified by: ..... (Name)

Date: .....

* Delete that which does not apply.

** Values corresponding to calculations using the specification are given in brackets.

A.2 Details of sample bales and test pieces

(The gross mass of the bales has been expressed to the nearest 0,2 kg)

Group No.	Bale		Test pieces			Bale group	
	Order number	Gross mass	Initial mass	Oven-dry mass	Absolute dryness	Oven-dry mass calculated according to test	Oven-dry mass calculated according to specification
		kg	g	g	%	kg	kg
1	25 912 25 867 25 789 25 748 25 707 25 826	199,2 199,0 198,6 198,4 199,2 199,0					(155,1) (153,5) (150,5) (146,3) (153,7) (152,9)
	TOTAL Wrappers Pulp	1 193,4 14,0 1 179,4	142,2 858,7	120,9 662,3	85,0 77,1	921,2 11,9 909,3	(924,0) (12,0) (912,0)
2	25 670 25 625 25 587 25 550 24 309 24 268	198,0 198,2 199,2 199,0 197,0 197,2					(150,5) (148,3) (153,7) (151,3) (129,1) (131,0)
	TOTAL Wrappers Pulp	1 188,6 15,0 1 173,6	137,8 921,0	115,7 671,6	84,0 72,9	868,1 12,6 855,5	(875,9) (12,0) (863,9)
3	22 491 22 292 22 454 22 413 22 255 22 210	197,8 197,2 197,2 198,0 197,4 197,6					(130,3) (140,3) (133,5) (138,3) (138,3) (138,7)
	TOTAL Wrappers Pulp	1 185,2 15,6 1 169,6	152,4 990,8	124,5 699,5	81,7 70,6	838,4 12,7 825,7	(831,4) (12,0) (819,4)
4	21 354 22 131 22 173 22 095 21 317 21 276	197,2 197,4 198,0 197,6 196,2 197,0					(135,3) (137,3) (136,7) (142,7) (132,5) (134,5)
	TOTAL Wrappers Pulp	1 183,4 14,8 1 168,6	140,8 966,0	114,7 670,4	81,5 69,4	823,1 12,1 811,0	(831,0) (12,0) (819,0)
5	21 239 18 506 18 469 18 428 18 151 18 106	197,0 198,8 199,0 198,2 199,4 199,2					(126,9) (150,5) (145,5) (149,9) (154,9) (143,3)
	TOTAL Wrappers Pulp	1 191,6 14,6 1 177,0	140,7 877,3	115,8 659,7	82,3 75,2	897,1 12,0 885,1	(883,0) (12,0) (871,0)
6	26 671 26 708 26 786 26 749 26 868 26 831	198,2 199,2 193,4 199,2 199,2 198,8					(154,9) (151,7) (159,5) (156,5) (156,1) (157,5)
	TOTAL Wrappers Pulp	1 193,0 13,8 1 179,2	149,0 853,2	127,4 680,9	85,5 79,8	952,8 11,8 941,0	(948,2) (12,0) (936,2)
					TOTAL	5 300,7	(5 293,5)

A.3 Calculation

A.3.1 Without specification

$$\left(m_1 \frac{a_1}{100} + m_2 \frac{a_2}{100} + \ldots + m_n \frac{a_n}{100}\right)$$

$$= 921{,}2 + 868{,}1 + 838{,}4 + 823{,}1 + 897{,}1 + 952{,}8$$

$$= 5\ 300{,}7 \text{ kg}$$

$$X = \frac{5\ 300{,}7 \times 200 \times 100}{90 \times 36}$$

$$= 32\ 720{,}3 \text{ kg}$$

$$X = 32\ 720 \text{ kg}$$

A.3.2 With specification

Oven-dry mass of sample bales using the specification

$$= 924{,}0 + 875{,}9 + 831{,}4 + 831{,}0 + 883{,}0 + 948{,}2$$

$$= 5\ 293{,}5 \text{ kg}$$

$$e = \frac{5\ 293{,}5 \times 100}{90}$$

$$= 5\ 881{,}7 \text{ kg}$$

$$Y = \frac{5\ 300{,}7 \times 32\ 676 \times 100}{90 \times \dfrac{5\ 293{,}5 \times 100}{90}}$$

$$= \frac{5\ 300{,}7 \times 32\ 676 \times 100}{90 \times 5\ 881{,}7}$$

$$= 32\ 720{,}4 \text{ kg}^*$$

$$Y = 32\ 720 \text{ kg}$$

Percentage shortage or excess: + 0,135 % or 44 kg

* The first expression of Y may be simplified if one does not make the calculation of e.