INTERNATIONAL STANDARD

ISO 801-3

First edition
1994-08-01

Corrected and reprinted
1996-06-15

Pulps — Determination of saleable mass in lots —

Part 3:
Unitized bales

Pâtes — Détermination de la masse marchande des lots —

Partie 3: Ballots

Reference number
ISO 801-3:1994(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 801-3 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 5, *Test methods and quality specifications for pulp*.

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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Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Pulps — Determination of saleable mass in lots —

Part 3:
Unitized bales

1 Scope

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

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

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 unitized bales of the same sort of pulp of specific characteristics.

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

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

— its gross mass (2.4) and its absolute dryness (2.6),

or

— its saleable mass (2.9).

2.2 unit: A set of bales strapped together. Usually a unit (unitized bale) consists of eight individual bales, each having its own wrappings and wires, strapped together with steel bands to facilitate shipping and handling.

2.3 bale: An individually strapped package of pulp sheets.

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

— contents;

— wrappers (pulp — paper);

— packaging wires or strappings of individual bales.

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

2.6 absolute dryness: The ratio of the oven-dry mass (2.5) of the pulp to its initial mass, expressed as a percentage.

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

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

2.9 saleable mass: The gross mass (2.4) multiplied by the absolute dryness (2.6) divided by the theoretical commercial dryness (2.8). Usually, it approximates to the air-dry mass (2.7).

2.10 invoiced mass: The saleable mass (2.9) indicated by the vendor on the invoice.

3 Principle

From the lot, sample units are taken in number which is a function of the total number of units in the complete lot. The bales in the sample units are weighed[2)] and collected so that the bales of each unit form one group.

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 (2.5).

The saleable mass (2.9) 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, of sensitivity 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 40 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 units

All the sample units shall be representative of the lot and for this purpose, so far as possible, these units 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 units or bales in the units have identification numbers relating to several series, the sample units shall be selected as far as possible in proportion to the size of each of these series.

The sample units shall be intact and as little damaged 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 unit by unit.

The number of sample units, n, to be taken is, up to a lot size of 650 units, determined by the formula

$$n = \sqrt{N}$$

where N is the total number of units in the lot.

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.

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

For lots exceeding 650 units, the number of sample units is 25 plus one additional sample unit for each additional 100 units in the lot.

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

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

NOTE 2 If the number of sample units is determined as stated above, the number of sample bales will be of the same order as the maximum number of sample bales in ISO 801-1 for a similar lot. Practice has shown that the minimum number of bales as stated in ISO 801-1 very seldom is enough for a satisfactory accuracy. One reason for this is that nowadays the gross masses of the bales are not always adjusted to 200 kg but can vary by almost 10 %.

Table 1 — Number of sample units to be taken

Total number of units in lot	Number of sample units
Up to 12	3
13 to 20	4
21 to 30	5
31 to 40	6
41 to 55	7
56 to 70	8
71 to 90	9
91 to 110	10
111 to 130	11
131 to 155	12
156 to 180	13
181 to 210	14
211 to 240	15
241 to 270	16
271 to 305	17
306 to 340	18
341 to 380	19
381 to 420	20
421 to 460	21
461 to 505	22
506 to 550	23
551 to 600	24
601 to 650	25
651 to 750	26
751 to 850	27
851 to 950	28
etc.	

6 Procedure

6.1 Weighing of sample bales

Determine the gross mass of each sample bale in each sample unit 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; from the results, calculate the gross mass of each sample unit. 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.

NOTE 3 The sample units can be weighed as such, if there is a scale suitable for weighing the units to an accuracy of at least 1/1 000. In this case, the strappings (steel bands) holding the unit together are weighed separately and their mass is subtracted from the gross mass of the unit.

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. 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. If the number of bales in the units deviates from eight, give the bales a running number starting from sample unit 1, sample bale 1 and take the sample sheets according to the diagram in figure 1. Thus, in the 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, VII and VIII, each sheet is taken from a slightly lower position (actually 1/70 of the thickness of the bale) than the corresponding sheet of the preceding bale; thus, in sample bale No. VIII, 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. IX will recommence the cycle and be treated in the same way as the sample bale No. I, etc.

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 its top. The faces on the rod correspond to the cycle of eight bales and the lines correspond to the five specimen sheets in the table.

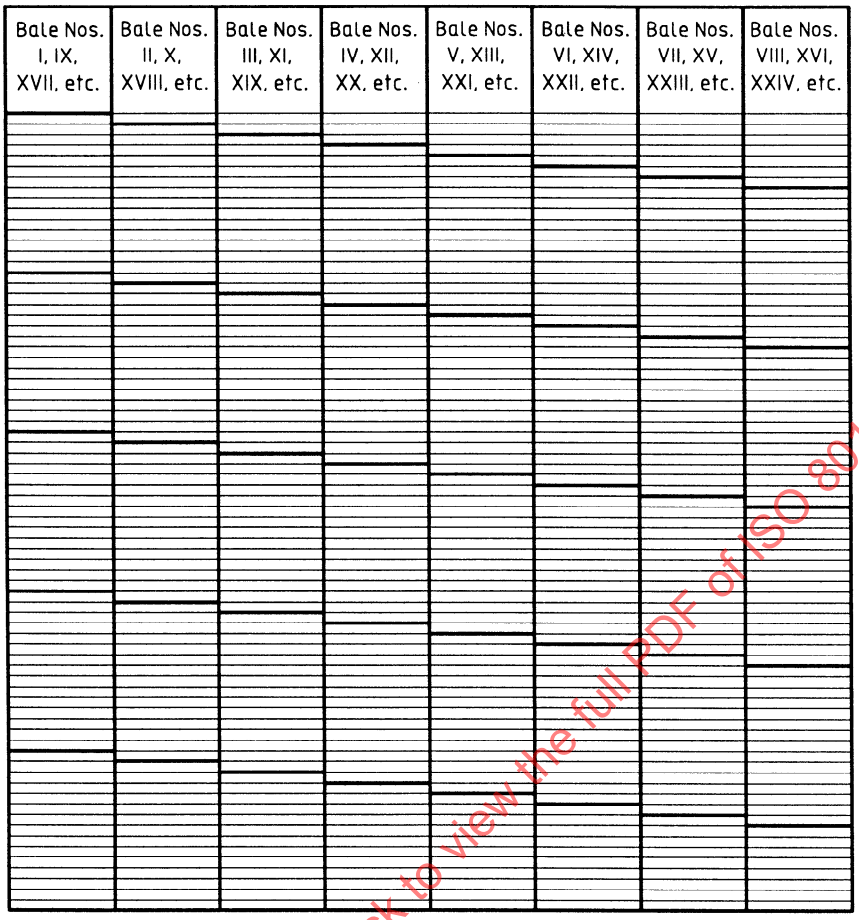

Figure 1 — Diagram indicating the position from which specimen sheets shall be taken

Bale Nos. I, IX, XVII etc.	Bale Nos. V, XIII, XXI etc.
Bale Nos. II, X, XVIII etc.	Bale Nos. VI, XIV, XXII etc.
Bale Nos. III, XI, XIX etc.	Bale Nos. VII, XV, XXIII etc.
Bale Nos. IV, XII, XX etc.	Bale Nos. VIII, XVI, XXIV etc.

Figure 2 — Diagram illustrating the numbering of the bales in the sample units

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 have their bases at the outside edges and apices at the midpoint of the sheets. All test pieces used in the test have a constant apex angle of 18°.

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.

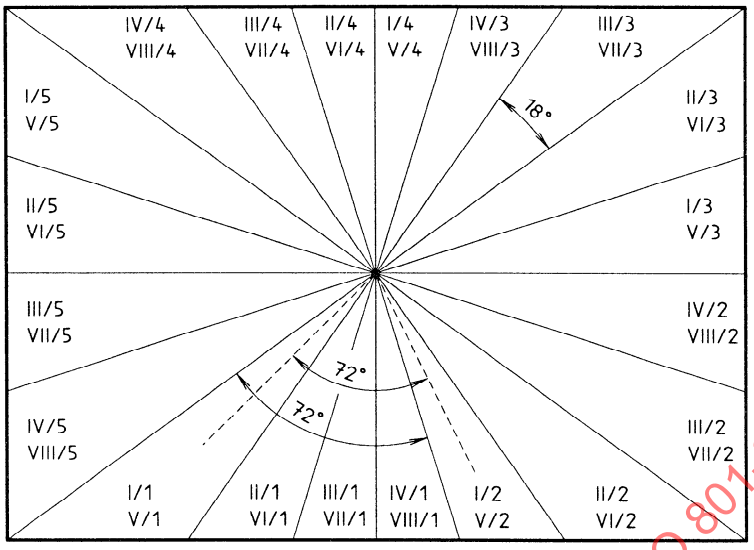

Figure 3 — Diagram illustrating how test pieces with constant angle at the apex are to be cut from specimen sheets selected according to the diagram given in figure 1

6.3.2 The constant angle method

From the first bale of a sample unit, proceed as follows.

Cut test pieces in the shape of triangles in which the angle at the apices is constant and equal to 18°. 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 18° anticlockwise of those in the first sample bale, and in sample bale No. III, cut the test pieces with the same angle displacement of 18° anticlockwise of those in bale No. II. In sample bale No. IV, the displacement is 18° anticlockwise of those in bale No. III. In sample bales Nos V, VI, VII and VIII, the position of the test pieces is identical with that of the test pieces in bales Nos. I, II, III and IV respectively.

Use the same procedure with the successive sample units. If the number of bales in the units differs from eight, use the running number given to each sample bale to determine the position from which the test pieces are cut.

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

NOTE 4 The reason for using a smaller angle is entirely a practical one. Very often the units consist of eight bales which means that forty sheets are drawn from each unit. By using the smaller angle the total area of the sample triangles equals the area of two sheets, which is the same as the area sampled in ISO 801. Experience has shown that this is very close to the maximum amount that can be handled especially when large lots are inspected.

6.4 Weighing and drying of the test pieces

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

It is essential to prevent test pieces 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 5 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.

7 Expression of results

7.1 Bales wrapped in pulp or paper sheets, wrappers not analyzed separately

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

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

$$= \frac{(m_1 a_1 + m_2 a_2 + \ldots + m_n a_n) \times N_1}{N_2 \times c}$$

where

$m_1, m_2, \ldots, m_n$ is the gross mass (2.4) of each sample unit, expressed in kilograms;

$a_1, a_2, \ldots, a_n$ is the absolute dryness (2.6) of each sample unit, expressed as a percentage and rounded to decimal place;

N_1 is the total number of units in the lot;

N_2 is the number of units sampled;

c is the theoretical commercial dryness (2.8), expressed as a percentage.

Express the result to the nearest 1 kg.

7.2 Bales wrapped in pulp or paper sheets, wrappers analyzed separately

If the wrappers are to be analyzed separately, each sample 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 of the wrappers is then deducted from the gross mass of the intact bales (2.4) to determine the gross mass of the contents of bales. The mass of packaging wires or strappings belonging to the individual bales is included in the mass of the contents of the bales.

The wrappers of each sample unit 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 sample unit. The absolute dryness (2.6) is determined in the same manner as for triangular test pieces.

The contents shall be sampled as stated in clause 6.

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

7.3 Lots with specification unit by unit (see 2.1)

The average saleable mass of the sample units (arrived at by dividing the total saleable mass of the sample units, according to the makers specification, by the number of sample units) should be within ± 0,5 % of the average specified saleable mass of the units comprising the whole lot (arrived at by dividing the specified saleable mass of the whole lot by the total number of units).

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

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

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

where

$m_1, m_2, \ldots, m_n$ is the gross mass (2.4) of each sample unit (total of the masses of the sample bales in the sample unit) expressed in kilograms;

$a_1, a_2, \ldots, a_n$ is the absolute dryness (2.6) of each sample unit, expressed as a percentage;

c is the theoretical commercial dryness (2.8), 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 units as calculated using the specification, expressed in kilograms.

Express the result to the nearest 1 kg.

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

e) 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 bleached sulfate pulp said to consist of 20 units, order No. 12345.

Marked:	AAA
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 units available before testing (approximately):	20
State of bales:	Good
Type of wrapper:	Pulp sheets

The analysis was carried out in accordance with ISO 801-3, *Pulps — Determination of saleable mass in lots — Part 3: Unitized bales*, cutting the test pieces with constant angle.

Number of units sampled:	4
Total number of units in lot:	20
Calculated oven-dry mass of sample units:	4 676,9 kg
Saleable mass (at 90 %) of sample units as calculated using the specification (when available):	(5 173,2) kg*
Saleable mass (at 90 %) of units of pulp in lot according to the invoicing (when available):	(25 866) kg
Saleable mass (at 90 %) of baled pulp in lot according to the analysis:	25 983 kg
If required	
a) shortage or excess (on invoiced mass) expressed in kilograms:	excess 117 kg
b) shortage or excess (on invoiced mass) expressed as a percentage:	excess 0,452 %

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

Certified by: ..... (Name)

Date: .....

* 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)

Unit 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	199,2					(155,1)
	25 867	199,0					(153,5)
	25 789	198,6					(150,5)
	25 748	198,4					(146,3)
	25 707	199,2					(153,7)
	25 826	199,0					(152,9)
	25 670	198,0					(150,5)
	25 625	198,2					(148,3)
	TOTAL	1 589,6				1 227,0	(1 226.8)
	Wrappers	18,6	189,1	160,8	85,0	15,8	(16,0)
	Pulp	1 571,0	1 142,1	880,9	77,1	1 211,2	(1 210,8)
2	22 491	197,8					(130,3)
	22 292	197,2					(140,3)
	22 454	197,2					(133,5)
	22 413	198,0					(138,3)
	22 255	197,4					(138,3)
	22 210	197,6					(133,7)
	24 309	197,0					(129,1)
	24 268	197,2					(131,0)
	TOTAL	1 579,4				1 153,6	(1 095,5)
	Wrappers	20,0	183,7	154,7	84,0	16,8	(16,0)
	Pulp	1 559,4	1 228,0	895,5	72,9	1 136,8	(1 079,5)
3	21 354	197,2					(135,3)
	22 131	197,4					(137,3)
	22 173	198,0					(136,7)
	22 095	197,6					(142,7)
	21 317	196,2					(132,5)
	21 276	197,0					(134,5)
	25 587	199,2					(153,7)
	25 550	199,0					(151,3)
	TOTAL	1 581,6				1 100,1	(1 140,0)
	Wrappers	19,7	187,7	152,9	81,5	16,1	(16,0)
	Pulp	1 561,9	1 288,0	893,9	69,4	1 084,0	(1 124,0)
4	21 239	197,0					(126,9)
	18 506	198,8					(150,5)
	18 469	199,0					(145,5)
	18 428	198,2					(149,9)
	18 151	199,4					(154,9)
	18 106	199,2					(143,3)
	26 671	198,2					(154,9)
	26 708	199,2					(151,7)
	TOTAL	1 589,0				1 196,2	(1 193,6)
	Wrappers	19,5	187,6	154,4	82,3	16,0	(16,0)
	Pulp	1 569,5	1 169,7	879,6	75,2	1 180,2	(1 177,6)
					TOTAL	4 676,9	(4 655,9)

A.3 Calculation

A.3.1 Without specification

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

$$= 1\ 227{,}0 + 1\ 153{,}6 + 1\ 100{,}1 + 1\ 196{,}2$$

$$= 4\ 676{,}9 \text{ kg}$$

$$X = \frac{4\ 676{,}9 \times 20 \times 100}{90 \times 4}$$

$$X = 25\ 983 \text{ kg}$$

A.3.2 With specification

Oven-dry mass of sample units using the specification

$$= 1\ 226{,}8 + 1\ 095{,}5 + 1\ 140{,}0 + 1\ 193{,}6$$

$$= 4\ 655{,}9 \text{ kg}$$

$$e = \frac{4\ 655{,}9 \times 100}{90}$$

$$= 5\ 173{,}2 \text{ kg}$$

$$Y = \frac{4\ 676{,}9 \times 25\ 866 \times 100}{90 \times \dfrac{4\ 655{,}9 \times 100}{90}}$$

$$= \frac{4\ 676{,}9 \times 25\ 866 \times 100}{90 \times 5\ 173{,}2}$$

$$= 25\ 982{,}8 \text{ kg}^*$$

$$Y = 25\ 983 \text{ kg}$$

Percentage shortage or excess: + 0,452 % or 117 kg

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