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**REVIEW OF THE UNECE STANDARDS FOR EGGS AND EGG PRODUCTS**

**Hen egg products for use in the food industry**

**Document submitted by the secretariat**

This draft standard was prepared by a UNECE consultant in accordance with the decision of the Working Group on Agricultural Quality Standards to begin revision of the UNECE standards for eggs and egg products (document ECE/TRADE/C/WP.7/2007/27, para. 35).

**UNECE STANDARD EGG-2**  
**concerning the marketing and commercial quality control of**  
**HEN EGG PRODUCTS FOR USE IN THE FOOD INDUSTRY**

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## I. INTRODUCTION

### A. UNECE standards for egg products

1. The purpose of the UNECE standards for egg products is to facilitate trade by recommending an international language for use between buyer and seller. The language describes egg products traded internationally and defines a coding system for communication and electronic trade.
2. As the standards are updated regularly, egg-product manufacturers who believe that changes are needed are encouraged to contact the UNECE secretariat. Changes requiring immediate attention are published on the UNECE website at: <http://www.unece.org/trade/agr/standards.htm>
3. In the chapter III of the UNECE coding system, the following code is used for egg products:

Egg product	UNECE code (data field 1)
Hen-egg product	90

### B. Scope

4. This standard recommends an international language for products made from eggs obtained from hens of the species *Gallus gallus* which are intended for use in the manufacture of food for human consumption and produced as UNECE quality foodstuffs. It provides a variety of options to purchasers for grading, packing, labelling and other aspects of egg products traded internationally.
5. To ensure that items comply with the requirements of this standard, purchasers may choose to use the services of an independent, unbiased third party.
6. To supply egg products across international borders, legislative requirements relating to food hygiene and veterinary inspection must be complied with. The standard does not attempt to prescribe those aspects, which are covered elsewhere: such provisions are left for national or international legislation or the requirements of the importing country.
7. The standard contains references to other international agreements, standards and codes of practice which aim to provide guidance to Governments on upholding quality and food hygiene rules. The Codex Alimentarius Commission should be consulted as the international reference concerning health and hygiene requirements.

### C. Definitions used in the standard

8. **Egg products** are the products intended for human consumption referred to in chapter I, section B. Egg products may contain food raw materials used for manufacture (e.g. salt and

sugar), food ingredients and food additives intended to give them certain characteristics and/or to preserve their quality. Additives should be approved as edible under the Codex Alimentarius Commission regulations on foodstuffs<sup>1</sup> and permitted for use in importing countries.

9. **Food raw materials** are raw materials of plant, animal, microbiological, mineral or artificial origin and water used to produce foodstuffs, excluding food and biologically active additives.
10. **Food additives** are natural and/or artificial materials and combinations of such materials introduced into foodstuffs to give them specific characteristics and/or preserve their quality, the use of which is authorized by the Codex Alimentarius Commission regulations on foodstuffs<sup>1</sup> and permitted in importing countries.
11. **Food ingredients** are the constituent elements of foodstuffs specified in their composition.
12. **Whole egg without shell** is the homogeneous product obtained from the complete contents of broken-out hen eggs-in-shell, in accordance with good manufacturing practice. Small quantities of egg albumen or egg yolk may be added to whole egg in order to standardize the product so that the compositional requirements set out in the table in annex II are met.
13. **Egg yolk** is the homogeneous product produced from the separation of the yolk of broken-out hen eggs-in-shell, in accordance with good manufacturing practice. Small quantities of egg albumen may be added to egg yolk in order to standardize the product so that the compositional requirements set out in the table in annex II are met.
14. **Egg albumen**<sup>2</sup> is the homogeneous product obtained from the separation of the albumen of broken-out hen eggs-in-shell, in accordance with good manufacturing practice.
15. **Frozen egg product** is a product obtained from a liquid egg product which has been subjected to a freezing process, including deep freezing, and maintained in its frozen state.
16. **Dried egg product** is a product obtained from a liquid egg product from which water has been removed by a drying process to give a product in powder or granulated form.
17. **Concentrated (condensed) egg product** is an egg product with a higher solids content than the equivalent liquid or frozen product obtained by the removal of water. The specific value of the higher solids content in a concentrated egg product is agreed between buyer and seller.
18. **Blended egg product** is an egg product prepared in such a way that the proportion of the constituents of broken-out hen eggs-in-shell is altered in comparison with the whole egg, egg yolk and egg albumen. The specific value of the proportion of the constituents in a blended egg product is agreed between buyer and seller.

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<sup>1</sup> Procedural Manual of the Codex Alimentarius Commission, 9th ed., 1986, p. 33.

<sup>2</sup> Except for albumen obtained by the centrifugal separation of broken-out hen eggs.

19. **Conventional (natural) egg product** is an egg product obtained using conventional methods without the use of special procedures to alter the egg's properties.
20. **Modified egg product** is an egg product whose properties have been altered using special procedures which are consistent with good manufacturing practice.
21. **Fermented egg product** is an egg product obtained through the action of fermentation agents, which are used to alter its properties (e.g. enhancing its natural functional properties: foamability, emulsification) and/or to desugar it.
22. **Desugared egg product** is an egg product obtained by desugaring with the use of special procedures (such as fermentation or ultrafiltration).
23. **Acidified egg product** is an egg product obtained by adding acidity regulators (additives intended to raise the product's pH level).
24. **Heat-treated egg albumen** is dried egg albumen which has been subjected, in accordance with good manufacturing practice, to a high temperature for a specific period of time to enhance its foaming properties.
25. **Salted or sugared egg product** is an egg product obtained by adding salt or sugar in quantities prescribed by good manufacturing practice.
26. **Commodity lot** is a quantity of egg product produced under conditions which are presumed to be uniform, such as between any planned breaks in production.

## II. QUALITY REQUIREMENTS

27. The purpose of this standard is to define the quality requirements which egg products must satisfy at all stages of marketing after their preparation and packaging.

### A. Minimum requirements

28. All types of egg product shall be made with Class B and Class A eggs obtained from hens of the species *Gallus gallus* and produced in establishments regularly operated under the food safety and inspection regulations in force.
29. Egg products must be:
  - (i) Homogeneous;
  - (ii) Fit for use in the production of foodstuffs;
  - (iii) Free from shell fragments and extraneous matter;
  - (iv) The taste, colour and odour of egg products shall be natural and characteristic of each product; dried egg products shall be easily reconstituted.

## B. Purchaser-specified requirements

30. The following subsections define the requirements that can be specified by the purchaser together with the codes to be used in the UNECE coding system.

31. Additional purchaser-specified requirements, which are either not accounted for in the code (e.g. if code 9 “other” is used) or that provide additional clarification to the product or packing description, shall be agreed between buyer and seller and be documented appropriately.

### 1. Source materials

32. The following source materials are not permissible:

- (i) Egg products obtained from eggs with a damaged shell and membrane;
- (ii) Egg albumen separated from its shell by means of centrifugal separation;
- (iii) Egg products obtained from the eggs of other species of bird.

Source material code (data field 2)	Category/description
0	Not specified
1	Class A eggs
2	Class B eggs
3	Class B eggs with cracked shells but undamaged membranes
4	Egg products
5-8	Codes not used
9	Other

### 2. Product type

Product code (data field 3)	Category/description
00	Not specified
01	Liquid whole egg
02	Concentrated whole egg
03	Dried whole egg in powder form
04	Granulated dried whole egg
05-09	Codes not used
10	Liquid blended egg product
11	Concentrated blended egg product
12	Dried blended egg product in powder form
13	Granulated dried blended egg product
14-19	Codes not used
20	Liquid yolk
21	Dried yolk in powder form
22	Granulated dried yolk
23-29	Codes not used



Product code (data field 3)	Category/description
30	Liquid albumen
31	Concentrated albumen
32	Spray-dried albumen in powder form
33	Granulated spray-dried albumen
34	Pan-dried albumen in powder form
35	Granulated pan-dried albumen
36-98	Codes not used
99	Other

### 3. Physical and chemical indicators of conventional egg products

33. Liquid, frozen or dried egg products from whole eggs, egg yolks and albumen obtained using conventional technologies and not special procedures designed to change the product's characteristics shall meet the requirements set out in the table in annex II. The table also indicates the methods of analysis and sampling which must be used when determining the values of the indicators. The percentage expression of the weight ratio of the components of the egg product shall be established with regard to the egg part only of the given product.

### 4. Processing of egg products

#### (a) Pasteurization

34. Egg products shall be pasteurized in accordance with section 4.4.4.5 (Pasteurization) of the Joint FAO/WHO Codex Alimentarius Commission Code of Hygienic Practice for Eggs and Egg Products. The egg products must be treated in an establishment approved by the relevant official agency having jurisdiction.

Pasteurization code (data field 4)	Category/description
0	Not specified
1	Pasteurization
2-8	Codes not used
9	Other

#### (b) Special procedures

35. To modify egg products and/or enhance their positive characteristics, special procedures may be used, in accordance with good manufacturing practice, including fermentation, stabilization (desugaring) and regulation of acidity (acidification).

**(i) Fermentation**

Fermentation code (data field 5)	Category/description
0	Not specified
1	Fermentation
2-8	Codes not used
9	Other

**(ii) Stabilization (desugaring)**

Stabilization code (data field 6)	Category/description
0	Not specified
1	Stabilization
2-8	Codes not used
9	Other

**(iii) Regulation of acidity (acidification)**

Regulation of acidity (acidification) code (data field 7)	Category/description
0	Not specified
1	Regulation of acidity (acidification)
2-8	Codes not used
9	Other

**(iv) Heat treatment of egg albumen**

Code for heat treatment of egg albumen (data field 8)	Category/description
0	Not specified
1	Heat treatment of egg albumen
2-8	Codes not used
9	Other

(v) **Ionizing radiation**<sup>3</sup>

Ionizing radiation code (data field 9)	Category/description
0	Not specified
1	Ionizing radiation
2-8	Codes not used
9	Other

(vi) **UV radiation**<sup>3</sup>

UV radiation code (data field 10)	Category/description
0	Not specified
1	UV radiation
2-8	Codes not used
9	Other

**5. Microbiological criteria**<sup>4</sup>

36. In addition to any national requirements, the microbiological condition of egg products shall be in conformity with the minimum requirements set forth below.

(a) **Salmonellae**

37. Salmonella organisms should not be recovered from any of 10 sample units examined when the test is carried out according to the method described ( $n = 10, c = 0, m = 0$ ).<sup>4</sup>

38. In special dietary products, salmonella organisms should not be recovered from any of 30 sample units examined ( $n = 30, c = 0, m = 0$ ).<sup>4,5</sup>

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<sup>3</sup> Egg products and/or additives processed with ionizing- or UV-radiation are supplied in accordance with legislation in force in the importing country. In the case of fermented products, these indicators are registered prior to the fermentation process.

<sup>4</sup> Recommended International Code of Hygienic Practice for Egg Products (addendum 1-1978 CAC/RCP 15-1976), section 5, p. 32, Sampling Plan and Microbiological Limits (paras. 4 and 4.1).

<sup>5</sup>  $n$  = The number of sample units to be examined;  $m$  = the value at or below which no concern is recognized;  $M$  = the value beyond which the lot is rejected;  $c$  = the maximum number of sample units with values between  $m$  and  $M$  for the lot to be acceptable. These criteria are employed in describing 3-class plans. In a 2-class plan,  $M$  is not applicable.

**(b) Mesophilic aerobic bacteria**

39. Mesophilic aerobic bacteria should not be recovered in a number exceeding 1 million per gram from any of five sample units examined when the test is carried out according to the method described, or in a number exceeding 50,000 per gram from three or more of the five sample units examined ( $n = 5$ ,  $c = 2$ ,  $m = 5 \times 10^4$ ,  $M = 10^6$ ).

**(c) Coliform bacteria**

40. Coliform bacteria should not be recovered in a number exceeding 1,000 per gram from any of five sample units examined when the test is carried out according to the method described, or in a number exceeding 10 per gram from three or more of the five sample units examined ( $n = 5$ ,  $c = 2$ ,  $m = 10$ ,  $M = 10^3$ ).<sup>5</sup>

**6. Provisions concerning food additives**

41. The use of food additives shall be in accordance with the legislation of the importing country.<sup>6</sup>

**7. Provisions concerning contaminants**

42. Egg products shall not contain contaminants such as pesticide residues, antibiotics, hormones or heavy-metal contaminants in amounts greater than those specified in the legislation of the importing country.<sup>6</sup>

**8. Provisions concerning hygiene**

43. The hygiene requirements for the manufacture of egg products and the premises, equipment and personnel manufacturing or participating in their manufacture should be as specified in the Joint FAO/WHO Codex Alimentarius Commission Code of Hygienic Practice for Egg Products.

44. In addition, egg products shall satisfy the appropriate tests specified in chapter IV of this standard.

45. The permitted source material of chapter II, section B.1, of this standard (hen eggs with a cracked shell but an undamaged membrane, used to prepare egg products in non-specialized premises) shall satisfy the requirements prescribed in the International Code of Hygienic Practice for Egg Products (CAC RCP 15-1976, Codex Alimentarius Commission ALINORM 85 13).

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<sup>6</sup> In applying this provision, Governments should refer to the recommendations of the Codex Alimentarius Commission.

## 9. Product history

### (a) Traceability

46. The requirements concerning production history by the specified purchaser require that traceability systems be in place. Traceability requires a verifiable method for identifying products or commodity lots at all relevant stages of production. Traceability records must be able to substantiate the claims being made, and the procedures used to certify conformity must be in accordance with the provisions concerning conformity-assessment requirements of chapter II.12.

### (b) Refrigeration

47. The purchaser may specify the use of refrigeration for egg products, which must be consistent with the legislation of the importing country. Where no such legislation exists, the legislation of the exporting country shall be used.

**Table 10**

Refrigeration code (data field 11)	Category	Description
0	Not specified	
1	Chilled	Internal product temperature maintained at not less than 0° C or more than +4° C at all times following packing and subsequent refrigeration
2	Frozen	Internal product temperature maintained at -12° C or below at all times following packing and subsequent freezing
3	Deep-frozen	Internal product temperature maintained at -18° C or below at all times following freezing
4-8	Codes not used	
9	Other	Can be used to describe any other refrigeration agreed between buyer and seller

### (c) Functional properties

48. The purchaser may specify functional properties for the egg product which shall be consistent with the legislation of the importing country. In the absence of such legislation, the functional properties of egg products shall be agreed between buyer and seller.

**Table 11**

Functional properties code (data field 12)	Category/description
0	Not specified
1	Conventional (natural)
2	Enhanced foamability
3	Enhanced emulsification
4	Enhanced gelatinization
5-8	Codes not used
9	Can be used to describe any other enhanced function agreed between buyer and seller

**(d) Use of additives**

49. The purchaser may specify the introduction of additives into the egg product, which shall be consistent with the legislation of the importing country. In the absence of any such legislation, the use of additives shall be agreed between buyer and seller.

**Table 12**

Additive code (data field 13)	Category/description
00	Not specified
01	Food additive(s)
02-09	Codes not used
10	Added food ingredient(s)
11-19	Codes not used
20	Added salt
21-29	Codes not used
30	Added sugar
31-39	Codes not used
40	Food additive(s) and added food ingredient(s)
41	Food additive(s) and added salt
42	Food additive(s) and added sugar
43	Food additive(s), added food ingredient(s) and salt
44	Food additive(s), added food ingredient(s) and sugar
45-49	Codes not used
50	Added food ingredient(s) and salt
51	Added food ingredient(s) and sugar
52-98	Codes not used
99	Can be used to describe any other additives agreed between buyer and seller

**10. Quality level**

50. A quality level for egg products can be specified as follows:

**Table 13**

Quality code (data field 14)	Category	Description
0	Not specified	Must meet the minimum requirements set out in chapter II, section A
1	UNECE quality level	Product meets UNECE quality level
2-8	Codes not used	
9	Other	Other quality level or system agreed between buyer and seller

## 11. Provisions concerning labelling

### (a) Labelling of packages

51. Packages containing egg products shall bear the following particulars in characters which are conspicuous, clearly legible and indelible:

- (i) Product description:
  - (a) Liquid whole egg
  - (b) Frozen whole egg
  - (c) Dried whole egg (powder or granules)
  - (d) Liquid egg yolk
  - (e) Frozen egg yolk
  - (f) Dried egg yolk (powder or granules)
  - (g) Liquid egg albumen
  - (h) Frozen egg albumen
  - (i) Pan-dried egg albumen (powder or granules)
  - (j) Spray-dried egg albumen (powder or granules)
  - (k) Liquid blended egg
  - (l) Frozen blended egg
  - (m) Dried blended egg (powder or granules).
- (ii) The following indications:
  - (a) The indication “pasteurized”, or the indication “heat-treated” where the albumen has been heat-treated;
  - (b) The indication “designed” where the product has been desugared;
  - (c) The indication “acidified” where the product has been so treated.
- (iii) When products are marketed as UNECE quality they must bear the marking “UNECE QUALITY”.
- (iv) A list of ingredients, including food additives present, in descending order by weight, except where no food additives have been used.
- (v) The name, or trade mark, and address of the manufacturer, packer, distributor, exporter, importer, or vendor.

- (vi) The identification number of the egg product processing establishment and the commodity lot number, each lot being allocated a sequential number.
- (vii) The country of origin of the eggs and the egg product.
- (viii) The net weight in either SI (*Système international*) units, or *avoirdupois*.
- (ix) The date of manufacture or date of minimum durability (“use-by date”).
- (x) For concentrated (condensed) and blended egg products, the minimum percentage of egg solids content and the minimum percentage of fat content, based on only the egg portion of the egg product.

**(b) Labelling of bulk containers**

52. Where liquid egg products are marketed in a tanker churn or other suitable bulk container, the information specified in subparagraphs (i) to (v) and (viii) to (x) above may be provided in accompanying documents. The information provided for in subparagraph (vi) above, however, must appear on the container.

**12. Provisions concerning conformity-assessment requirements**

53. The purchaser may request third-party conformity assessment of specified requirements. Such conformity assessments, whether individual or in combination, may take the forms set out below. In such cases the name of the third-party certifying authority and the quality standard used must be designated as indicated in chapter II, section B.

54. **Quality conformity assessment:** a third party examines and certifies that the product meets the required quality level.

55. **Trade standard conformity assessment (trade descriptions):** a third party examines the product and certifies that it meets the purchaser-specified options as indicated in this trade standard, except for quality level. Optionally, the purchaser may indicate specific options to be certified once the third-party certifying authority has been designated.

56. **Egg/lot identification (ID) conformity assessment:** a third party examines the product and certifies that it meets the agreed requirements.

Conformity-assessment code (data field 15)	Category
0	Not specified
1	Classification/quality conformity assessment
2	Trade descriptions conformity assessment
3	Egg/lot ID conformity assessment
4	Quality and trade descriptions conformity assessment
5	Quality and egg/lot ID conformity assessment
6	Trade descriptions and egg/lot ID conformity assessment
7	Quality, trade descriptions and egg/lot ID conformity assessment
8	Codes not used
9	Other



### 13. Provisions concerning packing, storage and transport

57. Egg products shall be packed in such a manner as to protect them adequately, in accordance with the relevant requirements, and to also prevent contamination. The packaging material shall not impart any extraneous taste, odour or colour to the egg products and shall be in accordance with legislation of the importing country.

58. Storage conditions prior to dispatch and the equipment used for transport shall be appropriate to the physical condition of the egg products and shall be in accordance with the requirements of the importing country. Attention is drawn to the provisions of the UNECE Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be Used for Such Carriage (ECE/TRANS/165).

#### (a) Pack weight

59. A “pack” is a specific quantity of egg product. Its weight may also be indicated as a weight range. The definition of the weight ranges and their application and verification must be agreed between buyer and seller according to the table below:

Pack weight code (data field P1)	Category/description
0	Not indicated
1	Weight range specified
2	Weight specified
3-8	Codes not used
9	Other

#### (b) Primary packaging

60. The primary packaging is in direct contact with the product and is used to segregate the product into individual consumer or bulk units. The following types of primary packaging may be specified:

Primary packaging code (data field P2)	Category/description
00	Not specified
01	Plastic bag
02	Metal can
03	Metal churn
04	Metal canister
05	Metal tank
06	Metal container
07	Plastic pail
08	Plastic canister
09	Plastic barrel
10-98	Codes not used
99	Other

**(c) Labelling of the primary packaging**

61. Consumer labelling of the primary package may be specified as follows:

Consumer labelling code (data field P3)	Category/description
0	Not specified
1	Consumer labels must be in accordance with the requirements of the importing country.
2	Not labelled
3-9	Codes not used

**(d) Primary package weight**

62. The weight of the primary package is equal to the weight of the products it contains. The weight can also be indicated as a weight range. In this case, the definition of the weight ranges and their application and verification must be agreed between buyer and seller.

Primary package weight code (data field P4)	Category/description
0	Not specified
1	Weight range specified
2	Weight specified
3-8	Codes not used
9	Other

**(e) Secondary packaging**

63. Secondary packaging is used to protect and identify the product during transport. Secondary packages consist of one or more primary packages and must be labelled in accordance with the requirements of the importing country. The following types of secondary packaging may be specified:

Secondary packing code (data field P5)	Category
0	Not specified
1	Multiwall paper sack
2	Plastic box
3	Corrugated-paper box
4-8	Codes not used
9	Other

**(f) Secondary package weight**

64. Secondary package (packaging for transport) weight is expressed as five digits with one decimal place (0000.0 kg). Secondary package weight tolerances and weight ranges are determined by buyer and seller.

Secondary package weight code (data field P6)	Category/description
00000	Not specified
00001 - 99999	Five-digit weight in kilograms (0000.0 kg) specified

**(g) Egg product packaging and packing coding format**

65. The following table shows the general application of the coding format for describing packaging and packing for egg products:

Data field	Description	Chapter	Code range
P1	Pack weight	II.13 (a)	0-9
P2	Primary packaging	II.13 (b)	00-99
P3	Primary package labelling	II.13 (c)	0-9
P4	Primary package weight	II.13 (d)	0-9
P5	Secondary packaging	II.13 (e)	0-9
P6	Secondary package weight	II.13 (f)	00000-99999

**III. UNECE CODE FOR PURCHASER REQUIREMENTS  
FOR EGG PRODUCTS**

**A. Definition of the code**

66. The UNECE code for purchaser requirements for egg products has 17 fields and 20 digits (2 digits unused) and is a combination of the codes defined in chapter II, section B.

No.	Name	Chapter	Code range
1	Egg product	I.A	00-99
2	Source material	II.B.1	0-9
3	Product type	II.B.2	00-99
4	Pasteurization	II.B.4 (a)	0-9
5	Fermentation	II.B.4 (b) (i)	0-9
6	Stabilization	II.B.4 (b) (ii)	0-9
7	Regulation of acidity (acidification)	II.B.4 (b) (iii)	0-9
8	Heat treatment	II.B.4 (b) (iv)	0-9
9	Ionizing radiation	II.B.4 (b) (v)	0-9
10	UV radiation	II.B.4 (b) (vi)	0-9
11	Refrigeration	II.B.9 (b)	0-9
12	Functional properties	II.B.9 (c)	0-9
13	Use of additives	II.B.9 (d)	00-99
14	Quality level	II.B.10	0-9
15	Field not used	-	0-9
16	Field not used	-	0-9
17	Conformity assessment	II.B.12	0-9

**B. Example**

67. The following example describes a dried whole egg product in powder form, manufactured from Class B hen eggs. The product is pasteurized and stabilized through fermentation. It is produced without acidification, temperature control or ionizing or UV radiation and has no additives. The product has conventional functional properties and meets the UNECE quality level. It is not refrigerated during the period following packing.

68. This item has the following UNECE egg product code: 90203111000001001004.

Data field No.	Name	Requirement	Code value
1	Egg product	Egg product	90
2	Source material	Class B hen eggs	2
3	Product type	Dried whole egg in powder form	03
4	Pasteurization	Pasteurized	1
5	Fermentation	Fermented	1
6	Stabilization	Stabilized	1
7	Regulation of acidity (acidification)	Not acidified	0
8	Heat treatment	Not heat treated	0
9	Ionizing radiation	Not treated with ionizing radiation	0
10	UV radiation	Not treated with UV radiation	0
11	Refrigeration	Not refrigerated	0
12	Functional properties	Conventional (natural)	1
13	Use of additives	Without additives	00
14	Quality level	UNECE quality level	1
15	Field not used		0
16	Field not used		0
17	Conformity assessment	Quality and trade-descriptions conformity assessment	4

**IV. PROVISIONS CONCERNING METHODS OF ANALYSIS**

69. Analysis and sampling methods are set forth in annex I. Other methods and means that ensure accurate results may be used if they meet the requirements of this standard.

70. Pasteurization of egg products shall be determined by an appropriate test. Where the alpha-amylase test is used, it should be performed as specified in the Joint FAO/WHO Codex Alimentarius Commission Code of Hygienic Practice for Egg Products.

## **ANNEX I**

### **METHODS OF ANALYSIS AND SAMPLING**

#### **I. PREPARATION OF THE ANALYSIS SAMPLE**

##### **A. General**

1. The sample must be made homogeneous prior to analysis and kept in a hermetically sealed jar in a cool place.
2. For all frozen samples, the sample is allowed to thaw, or is warmed in a water bath of temperature less than 50° C, homogenized and treated as for liquid samples in all analyses.
3. For all dried samples, the sample is prepared for analysis by being passed three times through a sieve with a mesh of approximately 1 mm<sup>2</sup> to thoroughly break up any lumps.

##### **B. Reagents**

###### **1. Water**

4. Wherever water is stated for dissolution, dilution or washing purposes, distilled water or water of at least equivalent purity shall be used.
5. Wherever reference is made to “dissolution”, “dilution” or “washing” without further indication, “dissolution in water”, “dilution with water” or “washing in water” is meant.

###### **2. Chemicals**

6. All chemicals used shall be of recognized analytical reagent quality except where otherwise specified.

##### **C. Apparatus**

###### **1. Lists of apparatus**

7. Lists of apparatus contain only those items having a specialized use for purposes of analysis.

###### **2. Analytical balance**

8. Analytical balance means a balance capable of weighing to the nearest 0.1 mg.

##### **D. Expression of results**

9. The result shall not contain more significant figures than are justified by the precision of the method of analysis used.

## **E. Test report**

10. The test report shall contain all the information necessary for the complete identification of the sample.

## **II. SAMPLING**

### **A. Sampling of liquid whole egg, liquid yolk and liquid albumen**

#### **1. Samples taken from process vessels**

11. Samples for chemical examination are taken from sample cocks on process vessels or from the top. It is essential to ensure that the sample cock has been properly cleaned and also that at least 10 litres of product is withdrawn prior to taking the sample. The contents of the vessel must be thoroughly mixed immediately prior to sampling.

#### **2. Samples from churns, mobile containers, road tankers, etc.**

12. Samples should be taken by “dipping” the well-mixed container, etc., by means of a clean milk-churn dipper.

### **B. Sampling of frozen whole egg, frozen yolk and frozen albumen**

13. Obtain representative container or containers. Examine odour and appearance of contents (condition of contents can best be determined by drilling to the centre of the container with an auger and noting the odour as the auger is withdrawn. If impossible to secure individual containers, the sample may consist of composite borings from the contents of each container).

14. Take borings diagonally across the container from no fewer than three widely separated parts, starting from 2 to 5 cm in from the edge and extending to the opposite side as near to the bottom as possible. Pack the shavings tightly into a sample jar at once, filling it completely to prevent partial dehydration of the sample. Seal the jar tightly and store in freezer or with solid CO<sub>2</sub>. Before analysing, warm the sample in a bath with water temperature kept at < 50° C and mix well.<sup>7</sup>

### **C. Sampling of dried whole egg, dried yolk, and dried albumen**

#### **1. From spray drier outlet**

15. Hold a clean container (ca 500 ml) beneath outlet and allow to fill.

#### **2. From sacks, etc.**

16. Transfer to clean container (ca 500 ml) by means of clean spatula or scoop.

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<sup>7</sup> Association of Official Analytical Chemists, *Official Methods of Analysis*, 14th ed., W. Horowitz, ed., 1984, Washington.

**Method 1. DETERMINATION OF TOTAL SOLID MATTER (VACUUM OVEN, 99° C)**

**A. Field of application**

17. The method allows the determination of the total solid matter content in:

- (i) Liquid whole egg product;
- (ii) Liquid yolk product;
- (iii) Liquid albumen product;
- (iv) Frozen whole egg product;
- (v) Frozen yolk product;
- (vi) Frozen albumen product;
- (vii) Dried whole egg product;
- (viii) Dried yolk product;
- (ix) Dried albumen product;
- (x) Liquid blended/concentrated egg product;
- (xi) Frozen blended/concentrated egg product;
- (xii) Dried blended/concentrated egg product.

**B. Definition**

18. Total solid matter content: the content of total solid matter as determined by the method specified.

**C. Principle**

19. Total solid content is determined by drying the sample in a vacuum oven at an absolute pressure of less than 2.2 kPa and at a temperature of  $99 \pm 1^\circ \text{C}$ .

**D. Apparatus**

- (i) Metal weighing dishes, flat bottomed, resistant to attack by the samples and the conditions of the test;
- (ii) Vacuum drying oven, thermostatically controlled at  $99 \pm 1^\circ \text{C}$ , equipped with a thermometer and manometer;

- (iii) Desiccator, containing freshly activated silica gel with a water content indicator or an equivalent silica desiccant;
- (iv) Water bath, boiling;
- (v) Analytical balance.

### **E. Procedure**

- 20. Dry a weighing dish and lid to constant weight in the oven at  $99 \pm 1^\circ \text{C}$ .
- 21. Allow the dish with lid to cool in the desiccator to ambient temperature and weigh to the nearest 0.1 mg.
- 22. Accurately weigh approximately 5 g of liquid or frozen egg product samples or approximately 2 g of dried egg product sample into the weighing dish. Place dish on a boiling water bath to evaporate most of the water in the samples.
- 23. Replace lid loosely on dish, put in the vacuum oven and dry for approximately 5 hours at  $99 \pm 1^\circ \text{C}$ . Admit dry air into oven to restore to atmospheric pressure, tighten the lid on the dish and transfer to the desiccator. Allow to cool to ambient temperature and weigh.
- 24. Repeat process outlined in the previous paragraph but drying for 2-hour intervals until constant weight is obtained.

### **F. Expression of results**

#### **1. Formula and method of calculation**

- 25. Total solid matter content, expressed as a percentage by weight of the sample, is given by:

$$m_1/m_o \times 100, \text{ where:}$$

$m_o$  is the mass, in g, of the test portion,

$m_1$  is the mass, in g, of the test portion after drying and when constant weight has been obtained.

#### **2. Repeatability**

- 26. The difference between the results of two determinations carried out simultaneously or in rapid succession by the same analyst on the same sample shall not exceed 0.1 g dry matter per 100 g of sample.

### **G. Notes**

- 27. This method is the same in principle as that described in the fourteenth edition of the Official Methods of Analysis of the Association of Official Chemists, section 17.006 - 17.007.



## **Method 2. DETERMINATION OF FAT CONTENT**

### **A. Field of application**

28. The method allows the determination of fat in:
- (i) Liquid whole egg product;
  - (ii) Liquid yolk product;
  - (iii) Frozen whole egg product;
  - (iv) Frozen yolk product;
  - (v) Dried whole egg product;
  - (vi) Dried yolk product;
  - (vii) Liquid blended/concentrated egg product;
  - (viii) Frozen blended/concentrated egg product;
  - (ix) Dried blended/concentrated egg product.

### **B. Definition**

29. Fat content of egg products: the fat content as determined by the method specified below.

### **C. Principle**

30. The sample is hydrolysed by hydrochloric acid and the fat released is extracted by petroleum ether, recovered and calculated as a percentage by weight of the original sample.

31. Samples containing added salt and sugar are further extracted using a Soxhlet extraction of the acid hydrolysis residues.

### **D. Reagents**

- (i) Hydrochloric acid, concentrated (assay 36.5-38% HC1);
- (ii) Diethyl ether;
- (iii) Petroleum ether, with any boiling range between 30 and 60° C.

### **E. Apparatus**

- (i) Mojonnier extraction tube;
- (ii) Water bath capable of being thermostatically controlled over the range 70-100° C;

- (iii) Oven capable of being thermostatically controlled at  $100 \pm 1^\circ \text{C}$ ;
- (iv) Soxhlet apparatus with suitable thimbles;
- (v) Analytical balance.

## F. Procedure

32. Accurately weigh approximately 2 g liquid or frozen yolk product, 3 g of liquid or frozen whole egg product or 1 g dried yolk or whole egg product into a Mojonnier fat-extraction tube. Slowly add while vigorously shaking 10 ml of hydrochloric acid and, in the case of dried products, about 2 ml water, washing down any egg particles adhering to the sides of the tube.
33. Put the tube with sample in water bath set at  $70^\circ \text{C}$ , bring to a boil and continue heating at boiling point for 30 minutes. Carefully shake the tube every 5 minutes during this time. After 30 minutes remove the tube, add water to nearly fill the lower bulb of the tube and cool to room temperature.
34. Add 25 ml of diethyl ether to the tube containing the sample and mix. Then add 25 ml of petroleum ether, mix and allow to stand until the solvent layer has cleared.
35. Draw off as much as possible of the ether-fat solution into a previously weighed flask containing anti-bumping granules. Before weighing the flask, dry it and a similar flask as counterpoise in an oven at  $100^\circ \text{C}$  and allow to stand in air until constant weight is obtained.
36. Re-extract the liquid remaining in the tube twice, using 15 ml of ether each time. Thoroughly shake on each addition of ether. Allow solutions to clear and draw off ether-fat solution into flask as previously.
37. Slowly evaporate the ether from the flask by carefully placing on a boiling water bath. Dry the fat by placing the flask in the oven at  $100^\circ \text{C}$  until constant weight is reached (probably after about 90 mins.). Remove flask and counterpoise from the oven and allow to cool to constant weight at ambient temperature (note: owing to the size of the flask and the nature of the material under test, there is less error by cooling in air than by cooling in a desiccator). Correct the weight obtained by a blank determination on the reagents used.

## G. Expression of results

### 1. Formula and method of calculation

38. Fat content, as a percentage by mass of the sample, is given by:

$$m_1/m_o \times 100, \text{ where:}$$

$m_o$  is the mass, in g, of the fat obtained after extraction and blank correction,

$m_1$  is the mass, in g, of the test portion of the egg product sample.

## 2. Repeatability

39. The difference between the results of two determinations carried out simultaneously or in rapid succession by the same analyst on the same sample shall not exceed 0.3 g fat per 100 g of sample.

### H. Notes

40. The fat content of an egg product containing salt and sugar is obtained using the above procedure, except that the fat is further extracted from the acid solution obtained after the third extraction by the following procedure:

- (i) Filter the aqueous layer remaining after extraction through a filter paper and wash filter paper with hot water until the washings do not affect the colour of blue litmus paper. Place the filter paper on a watch glass or Petri dish and dry for 1 hour in an oven at 100° C. Allow to cool and then insert into an extraction thimble of a Soxhlet apparatus using tongs to handle the filter paper. Remove any traces of fat from the watch glass or Petri dish with cotton wool moistened with petroleum ether extraction solvent and then place cotton wool in the thimble. Place the thimble in the extraction tube;
- (ii) Add extraction solvent to the Soxhlet apparatus and extract for 4 hours by placing the extraction flask in a sand bath or water bath or some such similar apparatus. After extraction, remove the solvent from the extraction flask and treat as in paragraph 37;
- (iii) Add the weight of fat obtained by the method described in subparagraph (ii) to the weight obtained by the method described in paragraph 37 to give a corrected weight  $m_0$ , which is the mass, in g, of the fat obtained after extraction.

41. This method is the same in principle as that described in the fourteenth edition of the Official Methods of Analysis of the Association of Official Analytical Chemists, sections 17.012-17.013.

42. The further Soxhlet extraction procedure is the same in principle as that described in CAC/RM 55-1976 Determination of Fat in Foods for Infants and Children; Method 1.

### **Method 3. ALPHA-AMYLASE TEST**

#### **A. Field of application**

43. The efficiency of pasteurization is determined in:

- (i) Liquid whole egg product;
- (ii) Liquid yolk product;
- (iii) Frozen whole egg product;
- (iv) Frozen yolk product;
- (v) Dried whole egg product;
- (vi) Dried yolk product;
- (vii) Liquid blended/concentrated egg product;
- (viii) Frozen blended/concentrated egg product;
- (ix) Dried blended/concentrated egg product.

#### **B. Definition**

44. Efficiency of pasteurization: the absence/presence of active alpha-amylase by the method specified below.

#### **C. Principle**

45. The presence of any active alpha-amylase (present in unpasteurized or insufficiently pasteurized egg product) is indicated by its ability to break down added starch, thereby preventing the formation of a starch-iodide complex on subsequent addition of an iodine solution.

#### **D. Reagents, apparatus, procedure and interpretation**

46. The method to be employed is the method set out in the Codex Alimentarius Commission Code of Hygiene Practice for Egg Products CAC/RCP - 15-1976, annex I.

#### **Method 4. FREE FATTY ACIDS (CALCULATED AS OLEIC ACID)**

##### **A. Field of application**

47. The method determines the acidity of the diethyl ether extract, calculated as oleic acid, in:
- (i) Dried whole egg product;
  - (ii) Dried yolk product;
  - (iii) Dried blended/concentrated egg product.

##### **B. Definition**

48. Free fatty acid content: the acidity of the diethyl ether extract, calculated as oleic acid, as determined by the method specified.

##### **C. Principle**

49. The sample is extracted with diethyl ether. The ether is evaporated and the extracted residue is dissolved in toluene. Free fatty acid content is determined by titration against standard ethanolic sodium hydroxide solution using phenolphthalein indicator.

##### **D. Reagents**

- (i) Diethyl ether;
- (ii) Toluene: use best quality available; if not neutral titrate, 50 ml against 0.05 mol/l standard ethanolic sodium hydroxide and correct subsequent results accordingly;
- (iii) Phenolphthalein, 1% w/v in ethanol;
- (iv) Ethanolic sodium hydroxide, 0.05 mol/l, dissolve a piece of metallic sodium, approximately 1 ml in volume, in 800 ml of absolute alcohol (ethanol). Titrate 10 ml standard 0.1 mol/l hydrochloric acid against this solution using phenolphthalein as indicator. Calculate the volume of ethanol that must be added to the solution to make 0.05 mol/l. Standardize against 0.1 mol/l hydrochloric acid on each day the solution is used.

##### **E. Apparatus**

- (i) Erlenmeyer flask (ca 250 ml), lipped;
- (ii) Water bath, boiling;
- (iii) Analytical balance;
- (iv) Oven, capable of being thermostatically controlled at  $100 \pm 1^\circ \text{C}$ .

## F. Procedure

50. Accurately weigh approximately 2 g of dried egg sample into a small lipped Erlenmeyer flask, add 30 ml of diethyl ether and mix thoroughly. Allow to clear and decant through a small filter paper into a flask. Repeat the extraction three more times, using 20 ml of diethyl ether for each extraction.

51. Evaporate ether on a boiling water bath and then dry the extract for 15 minutes in an oven at 100° C. Cool the extract, add 30 ml of toluene and 3-4 drops of phenolphthalein indicator solution and titrate against standard ethanolic sodium hydroxide solution. The end point is reached when the yellow colour changes to orange.

## G. Expression of results

### 1. Formula and method of calculation

52. Free fatty acid content of the sample, calculated as oleic acid, is given by:

$$(V_1 \times 2.81)/2m_o \text{ where:}$$

$V_1$  is the volume, in ml, of the standard 0.05 mol/l ethanolic sodium hydroxide used,

$m_o$  is the mass, in g, of the sample taken.

53. Free fatty acid content, calculated as oleic acid, and expressed on the fat portion of the egg product is given by:

$$((V_1 \times 2.81) \times 100)/(2m_o \times \% \text{ fat}) \text{ where:}$$

$V_1$  and  $m_o$  are as above,

% fat is the percentage of fat in the egg product as determined by method 2.

### 2. Repeatability

54. The difference between the results of two determinations when carried out simultaneously or in rapid succession by the same analyst on the same sample shall not exceed 0.3 g free fatty acid per 100 g of fat in the sample.

## H. Notes

55. The addition of salt or sugar to the egg product should not affect this determination.

56. This method is the same in principle as that described in the fourteenth edition (1984) of the Official Methods of Analysis of the Association of Official Analytical Chemists, sections 17.033-17.034.

57. Care must be taken when working with diethyl ether, as the substance has anaesthetic properties and is highly flammable.

**Method 5. DETERMINATION OF EXTRANEOUS MATTER<sup>8</sup>**

58. In order to determine the presence of shell residues or other extraneous matter, place 100 g of the substance under examination in a graduated cylinder of 1,000-ml capacity, add distilled water up to the 1,000-ml mark, mix carefully and pass through a sieve with perforations 1 mm in diameter. After sieving there should be no residue on the sieve.

59. For dried egg products, the test should be carried out on the reconstituted product.

**Method 6. DETERMINATION OF LACTIC ACID**

60. AOAC Official Method 944.05, Lactic Acid in Eggs, Colorimetric Method. Association of Official Analytical Chemists, *Official Methods of Analysis* (17th ed., Rev. 2, Official Method 944.05).

**Method 7. DETERMINATION OF SUCCINIC ACID**

61. AOAC Official Method 948.14, Succinic Acid in Eggs, Ether Extraction Method. Association of Official Analytical Chemists, *Official Methods of Analysis* (17th ed., Rev. 2, Official Method 948.14).

**Method 8. DETERMINATION OF BETA-HYDROXYBUTYRIC, LACTIC AND SUCCINIC ACID**

62. AOAC Official Method 970.31, Beta-Hydroxybutyric, Lactic and Succinic Acid in Eggs, Gas Chromatographic Method. Association of Official Analytical Chemists, *Official Methods of Analysis* (17th ed., Rev. 2, Official Method 970.31).

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<sup>8</sup> This method has been tentatively accepted by the Group of Experts pending the development of a method which will detect particles of a size smaller than 1 mm.

## Annex II

### PHYSICAL AND CHEMICAL INDICATORS OF CONVENTIONAL EGG PRODUCTS

	Product						
	Whole egg		Egg yolk		Albumen		
	Liquid and frozen	Dried	Liquid and frozen	Dried	Liquid and frozen	Dried	
1	2	3	4	5	6	7	8
Minimum solid matter content (%), method 1	23.5	95.0	43.0	95.0	10.5	84.0	92.0
Minimum fat content (%), method 2	9.8	39.0	26.0	56.0	-	-	-
Albumen matter (%)	10.0	45.0	15.0	35.0	11.0	85.0	85.0
Free fatty acid <sup>9</sup> (% fat content), method 4	-	< 3.5	-	< 3.5	-	-	
Extraneous matter, method 5	No particles over 1 mm in 100 g	Same	Same	Same	Same	Same	
Alpha-amylase text, method 3	Negative	-	Negative	-	Negative	-	
Minimum concentration of hydrogen ions (pH)	7.0	7.5	5.9	6.0	8.0	8.0	
Maximum beta-hydroxybutyric acid <sup>10</sup> (mg/kg), method 8	10	10	10	10	10	10	
Maximum lactic acid <sup>4</sup> (mg/kg), method 6	1 000	-	1 000	-	1 000	-	
Maximum succinic acid <sup>4</sup> (mg/kg), method 7	25	-	25	-	25	-	

*Note:* For dried egg products, the weight ratio of fat and albumen matter is calculated as solid matter.

<sup>9</sup> Maximum free fatty acid (expressed as equivalent oleic acid) in product fat (%).

<sup>10</sup> Lactic acid (used only for processing), succinic and beta-hydroxybutyric acid are considered to be solid matter. Eggshell, membrane and other particles in egg products should not exceed 100 mg/kg of egg product.