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DRAFT EAST AFRICAN STANDARD

Processed Meats — Code of Practice

EAST AFRICAN COMMUNITY

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Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the principles and procedures for development of East African Standards.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

The committee responsible for this document is Technical Committee EASC/TC 004, *Meat, poultry, game, eggs and related products.*

This second/third/… edition cancels and replaces the first/second/… edition (US nnn-n:yyyy), which has been technically revised.

Attention is drawn to the possibility that some of the elements of this document may be subject of patent rights. EAC shall not be held responsible for identifying any or all such patent rights.

Processed Meats — Code of Practice

1 Scope

This draft East African Standard provides guidance for the main processing steps involved in the production of processed meats intended for human consumption.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EAS 38 prepackaged food labelling — General requirements

EAS 955 Production of packaged meat products — Hygienic requirements

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Smallgoods

refer to manufactured meat products such as hams, bacons, other cured products, and cooked meat.

3.2 Processed meat

meat product containing not less than 300 g/kg meat, where meat either singly or in combination with other ingredients or additives, has undergone a method of processing other than boning, slicing, dicing, mincing or freezing, and includes manufactured meat and cured and/or dried meat flesh in whole cuts or pieces

3.3 Processing areas/rooms

include all areas where raw materials and ingredients are prepared (e.g. thawed, cut, weighed, pre-mixed, injected, cured, massaged, tumbled, emulsified, filled), processed (e.g. cooked, cooled, dried, fermented, sliced), and packed

3.4 post—processing

process steps or activities undertaken after the application of a lethal heat or preservation treatment such as cooking, fermentation, or drying.

3.5 Process control

all conditions and measures applied during the production process that are necessary to produce a safe and suitable product

3.6 Operator-defined limit

measurable limit established by an operator to manage the fitness for purpose of a particular product

3.7 Tempering

in the case of frozen product, tempering means the elevation of the temperature to any point that is lower than the freezing point of the product. (Meat begins to freeze at about -2°C)

3.8 Water activity (a_w)

measure of the water in the food which is available for microbial growth. It is the ratio of the water vapour pressure of the food (P) to that of pure water (P_o) at the same temperature, $a_w = P/P_o$.

3.9 Monitor

act of conducting a planned sequence of observations or measurements of control parameters to assess whether a process step or control measure is under control

3.10 Cooling medium

any solid, liquid or gaseous medium that is introduced and comes in contact with wrapped or unwrapped product with the objective of removing heat.

3.11 Cooking

application of heat to a product to destroy vegetative pathogens that may pose a hazard to human health.

3.12 Comminution

process of reducing meat or meat product in size by methods such as mincing, flaking, slicing, dicing, but does not include mechanical separation.

3.13 Control measure

any action and activity that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level

3.14 Thawing

Process of taking a frozen product to a temperature of 0 ºC

4 General requirements

4.1 Regulatory standards

The operator should meet all relevant product and processing requirements set out in the respective meat and meat product standards

4.2 Hygienic Practices

Processed meats should be prepared and handled under strict hygienic conditions in accordance with EAS 955

4.3 Documentation and Records

4.3.1 Operators should document any regulatory limit and/or operator-defined limit relevant to their product or process. These limits may be expressed as a:

a. product requirement (e.g. microbiological limit, pH, a_w)

b. process parameter (e.g. minimum cooking time-temperature combination); or

c. performance criteria (e.g. 6D reduction in *Listeria monocytogenes*)

4.3.2 When no regulatory limit is specified and when necessary for food safety, the operator should define and justify their own limits.

NOTE: Operator-defined limits should be taken from sources such as reputable codes of practice, peer-reviewed scientific information, predictive models, scientific information from a person or organisation known to be competent, or developed from the operator's own trials and experiments.

4.3.3 Operators should document the following in their records:

a. processing procedures, and product and process parameters

b. procedures for monitoring and verifying compliance to established processing procedures and parameters, particularly critical limits at identified critical control points

c. corrective actions for any non-compliance or deviation to any regulatory limit or operator-defined limit, procedures, and product and process parameters

4.3.4 Operators should maintain accurate records, particularly those for the monitoring and verification of product and process parameters critical to food safety.

4.4 Product Formulations

4.4.1 Product formulations should be developed by a suitably skilled person, and be documented. The skilled person should be familiar with permitted levels of ingredients and additives, and understand the effect of any change in the formulation on product characteristics, allergen status of the product, process parameters and labelling

4.4.2 A suitably skilled person should assess the effect of any change in a product formulation on any regulatory or operator-defined limits and/or processing parameters, and ensure that any consequential changes in processing are made before the new formulation is used commercially. For example, a different proportion of meat and cereals in emulsion sausage formulations may require changing the cooking cycle

4.4.3 Product formulations should be properly adjusted to account for the addition of any rework. The operator should establish a limit for the amount of rework which can be added to a batch since this can affect its functionality and the additive levels (e.g. nitrite) in the finished product.

4.4.4 Product formulations should result in additive levels in the finished product that comply with any permitted levels specified in the Codex Stan 192.

4.4.5 The operator should be able to provide evidence that additive levels in finished products comply with permitted levels in the product standard. Operators are not required to routinely test all batches of products against these criteria, but it is recommended that samples of products are occasionally tested as part of the verification programme.

4.5 Traceability

4.5.1 The operator should document and implement a tracking system that:

a. allows for the identification of all raw materials, ingredients, products, and packaging (when appropriate); and

b. enables the movement of raw materials and ingredients to be traced from the supplier; and to the next person or company that any product is transferred to for further processing, packaging, storage, distribution or sale

4.5.2 Operators should also consider developing procedures for the traceability of packaging materials and labels to enable the tracking of defective packaging and labels (e.g. barrier films with defective or missing barrier components which may adversely affect the product's shelf-life, printed materials with labelling errors such as missing allergen information).

4.5.3 The operator should document and implement procedures for inventory control

4.5.4 Inventory records (i.e. stock records) should be maintained for all raw materials (e.g. meat, additives, other ingredients); finished products; returned products; and any non-complying products.

4.5.5 All outgoing products should be clearly identified and accompanied by appropriate documentation

5. Preparation steps

This sub clause covers the process steps commonly undertaken in the preparation of processed meat before the application of a heat or preservation treatment such as cooking, fermentation, or drying.

5.1 Tempering and Thawing

5.1.1 General procedures

a. Tempering and thawing of frozen meat should be done in a manner, and under conditions, that minimise contamination of the meat and the growth of microorganisms.

b. Tempering and thawing procedures and parameters (e.g. time and temperature) should be documented.

c. Any equipment used for the tempering and thawing of meat (e.g. microwave) should be operated according to the manufacturer's instructions

d. Thawed meat should be processed without unnecessary delay, or it should be held under refrigeration while waiting to be further processed. Frozen meat cuts should be thawed throughout the cut to enable sufficient cure penetration or to reach a required cooking temperature.

e. When the temperature of any part of the product during thawing exceeds 10°C, the temperature should be reduced to less than 7°C within a period of time calculated as the thawing lag time at the warmest temperature recorded for the process according to the following formula: $y = 0.00185x^2 - 0.136x + 2.841$ (where x = the temperature of the product in °C, and y = log lag time in hours)

f. Procedures for the removal of plastic liners entrapped in the meat should be established and documented. The occurrence of entrapped plastic in the meat may be reduced by using thicker gauge liners which are less likely to tear, and using blue liners which are easier to see.

5.1.2 Tempering and thawing in air

a. Carcasses or cartons should be spaced apart to allow good air circulation.

b. Thawing should not result in contamination of other products with thaw drip.

c. Frozen cartoned meat may be thawed at:

i. a maximum air temperature of 10°C for 72 hours; or

ii. a maximum air temperature of 7°C for 96 hours; or

iii. a maximum air temperature of 15°C provided: no part of any product exceeds 7°C, the temperature of the product is constantly monitored, and the whole thawing process is under an automatic control system. The temperature of the product at the top leading corner of the carton (i.e. the corner that first intercepts the air flow, at the warmest location in the chiller) should be used as the reference to monitor and control the temperature

5.1.3 Thawing in water

a. Fresh potable water should be used for each thawing cycle.

b. Thawing should be carried out at a temperature that minimises the growth of microorganisms and allows the product to thaw within the desired thawing period. The temperature of the thawing water should not exceed 10 °C. A higher thawing temperature (e.g. up to 15°C) may be considered provided the operator can demonstrate that it will not result in unacceptable microbiological growth considering the holding time at the particular temperature, and any subsequent steps which may inhibit microbiological growth. For example, a higher temperature may be justifiable if the meat is injected or immersed in cold brine soon after thawing.

c. The thawing tank should not be overloaded with product. There should be adequate space to allow effective circulation of the thawing water around each product item. Good water circulation is essential for efficient thawing. A system for circulating water evenly around the tank helps avoid large temperature gradients and uneven thawing throughout the tank.

d. The thawing tank should be emptied, cleaned and sanitised after each thawing cycle (i.e. after thawing a batch of meat).

5.1.4 Other tempering or thawing methods

Operators may use other tempering and thawing methods (e.g. microwave thawing) provided that the outcomes given in section 5.1.1 can be met, and evidence is provided to demonstrate this.

5.2 Cutting, Boning and Trimming

5.2.1 Carcasses, sides and quarters should be checked for visible defects prior to the start of cutting and boning, and any defect found should be removed in a hygienic manner. Visible defects include rail dust, grease, bruises, lesions, blood clots, clusters of hair, dirt or other extraneous material.

5.2.2 Defective material and contaminated meat (e.g. dropped meat) should be immediately disposed off to waste bins or containers for animal consumption materials, as appropriate.

5.2.3 Different species of meat should be processed separately (i.e. on different tables or at different times) unless the finished product includes a mixture of those species.

5.2.4 The operation should be managed so carcasses and cuts are maintained at a temperature that prevents microbial growth during cutting and boning, or trimming.

5.2.5 Meat temperature should be maintained at ≤ 7°C during and after cutting and boning. The operator should establish how many carcasses, sides or quarters should be taken out of the chiller at a time in order to maintain the correct temperature and minimise exposure of the meat. Cuts and trimmings should not be allowed to accumulate. Unless they are to be used immediately, they should be periodically transferred to a chiller or freezer during the working period.

5.3 Comminution

5.3.1 Comminution should be done in a manner that minimises contamination and growth of microorganisms in the product.

5.3.2 Procedures for preventing metal contamination from grinders and flakers, and corrective actions when metal contamination occurs should be established and documented.

5.3.3 Grinders and flakers should be checked and maintained regularly to prevent metal contamination from equipment. Some companies also have procedures for preventing metal contamination from newly installed blades. For example, when a new or resharpened blade is installed, the first few kilograms of mince produced after installation is dumped to waste.

5.3.4 Comminuted meat should be further processed without unnecessary delay, or it should be held under refrigeration while waiting to be further processed. If the meat is not going to be used immediately after comminution, it should be refrigerated so that its temperature is reduced and/or maintained at ≤ 4°C while waiting to be further processed.

5.3.5 Grinders, flakers and other equipment should be maintained in a hygienic condition during the production period. Grinders, flakers and other equipment that are used intermittently during the day, and/or located in non-refrigerated rooms, may need to be cleaned more frequently to minimise the build-up of microorganisms on the equipment which may contaminate subsequent batches of meat.

5.3.6 Equipment which has been used but is temporarily idle should be cleaned before re-use if the delay is in excess of 4 hours. More frequent cleaning may be necessary if the equipment is located in a non-refrigerated room

5.3.7 Material left in “dead spots” of the grinder are likely to have high microbial counts. Therefore, residual meat in the screw and plates which are removed during disassembly of the grinder (i.e. at the end of the each working day, and every time the grinder is cleaned after standing idle for a long period) should be discarded.

5.4 Weighing and Assembly of Ingredients

5.4.1 **General procedures for weighing of ingredients**

a. Correct formulations or recipes should be available to, and used by, the person responsible for weighing ingredients

b. The weighing and assembly of ingredients and additives should be carried out only by designated and trained personnel

c. Accurate scales with appropriate capability should be used for weighing ingredients and additives. Weighing scales should be checked daily against test weights. Measuring devices (whether stand-alone or forming part of a piece of equipment) should:

   i. have the accuracy, precision, and conditions of use appropriate to the task performed.

   ii. be calibrated against a reference standard showing traceability of calibration to a national or international standard of measurement (where available), or (if no such standard exists) be calibrated on a basis that is documented in, or incorporated by reference into, the FSP or RMP; and

   iii. be uniquely identified (e.g. by using serial numbers, indelible tags or other permanent means of identification) to enable traceability of the calibrations and to identify calibration status.

d. All ingredients should be weighed so a single standard unit used for formulations. Uncalibrated or non-standard containers (e.g. drinking mugs or cups, or buckets) should not be used for weighing since they don’t give accurate weights and mistakes can easily happen when the container is changed.

e. The identity of ingredients and additives used, and their amounts, should be recorded (e.g. in a checklist). Restricted additives, such as nitrite, should be kept in a locked container or facility. The amount of nitrite used should be regularly reconciled (e.g. weekly) against the amount held in storage.

f. The weighing procedures should facilitate the traceability of ingredients used in all batches of products.

g. Containers and utensils used for weighing should be dedicated for the purpose. They should be clean and not be a source of contamination. Containers and utensils used for weighing should be clearly identified (e.g. by colour or label).

h. Separate containers and utensils should be used for ingredients containing allergen.

i. Handling and weighing of allergenic ingredients should be done in way that minimises the potential for cross-contamination of allergens.

5.4.2 Pre-weighing and assembly of ingredients (i.e. batching)

a) Pre-weighing and assembly of dry ingredients should be performed in a dry ingredient room, or in an area specifically designated for dry ingredient preparation and/or storage.

b) Where there are one or two designated workers who are trained in batching ingredients, the workers should not leave the weighing area or be interrupted until a batch is completed to minimise mistakes during weighing.

c) Procedures for managing foreign matter from ingredients should be established and documented.

d) Ingredients with a history of foreign matter contamination should be sieved before weighing. Other ingredients should be randomly checked for the presence of foreign matter.

e) Findings of foreign matter should be recorded and the object, bagged and labelled with the product details (e.g. name, product code, batch code/ID, production date). Appropriate action should be taken by the operator to prevent re-occurrence (e.g. notify the supplier).

f) Processors should ensure that they and their ingredient suppliers do not use staples or metal clips for sealing ingredient bags, as they can easily get into the product. The use of string for tying ingredient bags is also a potential source of foreign matter, and should be avoided.

5.5 Preparation of Curing Brines

5.5.1 The weighing of ingredients and additives should be done in accordance with the procedures given in section 5.4

5.5.2 To prevent mistakes in the use of nitrite, only one bag of pre-weighed nitrite should be present in the preparation area at a time.

5.5.3 Before adding whole cartons or whole bags of an ingredient, such as salt or phosphate, the weights should be checked. A bag of salt or phosphate may not necessarily weigh exactly the net weight declared on the bag.

5.5.4 Potable water and ice should be used for preparing the curing brine and the curing brine should be maintained cold at ≤ 5°C to minimise nitrite and ascorbate depletion.

5.5.5 Unused curing brine remaining at the end of a day's operation should be kept in the chiller. It should be checked for salt and nitrite content, and adjusted to the required level before being used.

5.5.6 Preparation of curing brines should follow the following guidance:

a. Batches of brine should be formulated to be as small as possible to prevent leftover solution, while still being economical to the process operation.

b. Water for preparing the brine should be as cold as possible – preferably near 4°C. Warm water causes nitrite depletion. If ice is used in the preparation of the brine, its weight should be included in the calculations.

c. Ingredients should be mixed in the following order to permit complete solution and to protect the nitrite and ascorbate: (i) water, (ii) phosphates, (iii) salt, sugar, dextrose and flavourings, (iv) nitrite, (v) ascorbate. If phosphates are first dissolved in a small quantity of warm water prior to adding to the curing tank, the quantity of warm water should be included in the total weight of the brine.

d. Brines should be monitored using an accurate working salinometer. The influence of phosphates on a salinometer reading may be 10-12%; this influence should be corrected for. When possible, in addition to a salinometer reading, laboratory analysis of brines is also recommended.

e. Brines should be maintained constantly; cold and temperature changes should be avoided. Any increase in temperature causes nitrite depletion. Curing brines should be continuously held at about 5°C. Keeping brines cold not only retards nitrite depletion but also increases product yield.

f. Excess or severe agitation of the brine by steam, air or mechanical means causes nitrite depletion and should be avoided.

g. Brine transfer lines should not be exposed to warm temperatures. Brines held in a pump line at 26.7°C will undergo nitrite and ascorbate breakdown.

5.6 Curing

The common methods of curing whole muscle meat products are: injection, immersion and dry curing, or a combination of these methods. For example, ham or bacon may be injected with a curing brine, tumbled, and then equilibrated under cover brine for one to two days.

5.6.1 Injection curing

a. The person responsible for operating the injector should check and ensure that the injector needles are in good working condition (i.e. no breakage, not bent or blunt, no blockage) before the start of injection.

b. The injector should be set to consistently deliver the curing brine at the required injection rate

c. Correct delivery of curing brine should be determined by measuring the green weight (un-injected) and injected weight of several samples per batch, and adjusting the machine setting until the correct injection rate is achieved.

d. Used curing brine should not be recirculated back to the fresh brine tank.

e. Used curing brine should be discarded at the end of each day's operation. An alternative may be proposed by the operator provided the procedure is validated and can be shown to be microbiologically acceptable. The used curing brine should be checked for salt and nitrite content, and adjusted to the required level before being used.

f. The injector should be maintained in a hygienic condition during processing, and should be cleaned and sanitised at least daily

g. There should be regularly top up of the recirculating brine with fresh brine when the level falls to half-full to avoid increases the numbers of contaminating organisms as the volume of the recirculating brine decrease during batch processing.

h. Injection machines that are used intermittently during the day should be cleaned more frequently (e.g. between batches) to minimise the build-up of microorganisms on the equipment which may contaminate subsequent batches of meat.

5.6.2 Immersion curing

a. Curing procedures and conditions should minimise the growth of pathogenic and spoilage microorganisms, and facilitate uniform curing. Meat pieces should be uniform in size, and periodic mixing of the batch may be necessary to ensure uniform cure penetration. The curing brine should be maintained at ≤ 5°C.

b. The meat should be completely immersed in the brine during curing. As a minimum, curing tanks should be emptied and cleaned between batches.

c. Cover brines should not be re-used because all ingredients in it are diluted during curing. It will also contain extracted components from the meat, large numbers of salt-tolerant bacteria, and probably some bacterial pathogens.

d. If cover brines are re-used, the processor should establish how long it should be kept, and the procedures (e.g. temperature control) for ensuring that it remains in an acceptable condition. The quality of the cover brine should be periodically checked (e.g. turbidity, salt level, colour), and the salt and nitrite levels adjusted before being re-used.

e. curing brines should not be kept longer than about two to three weeks, and if there is an adverse change (e.g. milkiness, off-odour), the brine should be discarded earlier.

5.6.3 Dry Curing

These requirements apply to the dry curing of bacon and ready-to-eat dried meat such as prosciutto. Additional requirements for ready-to-eat dry-cured meat are given in subclause 8: Drying

a. The meat should be salted and cured under conditions that minimise contamination, inhibit the growth of pathogenic and spoilage microorganisms, and facilitate uniform curing.

b. The correct amount of salt should be used and it should be evenly distributed on all exposed surfaces of the meat. Meat pieces should be uniform in size to facilitate uniform curing. The meat should be rotated and all surfaces of meat should be rubbed with the dry cure mixture at intervals of sufficient frequency to ensure cure penetration.

c. During curing, the temperature of the meat should be low enough to avoid spoilage and growth of pathogens while the ingredients equilibrate across the piece.

d. The temperature of the product should be maintained between 2°C and 7°C during dry curing of muscle cuts. The lower temperature is set to limit microbial growth and the upper temperature is set for the purpose of ensuring cure penetration.

5.7 Tumbling and Massaging

5.7.1 The meat should be loaded into, and unloaded from, the tumbler or massager in a hygienic manner.

5.7.2 The tumbling and massaging conditions (e.g. temperature and time) should minimise the growth of microorganisms. Depending on the product, machine and rotating speed, tumbling and massaging may be done for a short period (e.g. 30-45 min), or it may be done intermittently for longer periods (e.g. 15-20 min activity out of each hour, for 18 hours

5.7.3 Tumblers and massagers should be maintained in a hygienic condition. Tumblers and massagers should be cleaned at least daily; or after each cycle, if tumbling or massaging takes more than 24 hours

5.8 Bowl Chopping and Mixing

5.8.1 Correct formulations or recipes should be available to, and used by, the person responsible for bowl chopping or mixing.

5.8.2 The identity of ingredients and additives used, and their amounts, should be recorded (e.g. in a checklist).

5.8.3 Packaging or containers of pre-weighed ingredients or premixes should be handled and disposed of properly so that they do not become a source of physical hazard or foreign matter (e.g. plastic bag, pieces of paper, string).

5.8.4 The temperature of the meat mixture during chopping should be controlled. The required cutting temperature varies for different types of products. For cooked sausage products, chopping temperatures of 14°C allow for the desired product appearance and maximum extraction of the binding proteins. Other sausages, such as bierstick and chorizo, are cut or mixed at lower temperatures (e.g. 4°C). Temperatures greater than 15°C to 20°C can result in emulsion instability.

5.8.5 The mixture or emulsion should be used (i.e. filled into casings) without unnecessary delay, or it should be held under refrigeration while waiting to be further processed.

5.8.6 The incorporation of rework into any product should be in accordance with the procedures given in subclause 5.10.

5.8.7 Procedures for preventing metal contamination from bowl choppers and mixers, and corrective actions when metal contamination occurs should be established and documented.

5.9 Filling, Stuffing and Pressing

5.9.1 The meat mixture or emulsion should be hygienically filled into food grade casings, nets or moulds.

5.9.2 Potable water should be used for pre-soaking casings, and the water should be changed regularly.

5.9.3 The filling machine should be adjusted properly to achieve portioning accuracy and evacuation of air pockets from the product. Casings should be filled to the correct diameter. Under-filling and over-filling can affect the quality of the end product. Diameter size influences the rate of cooking, drying and smoking, and ultimately the flavour and texture of the finished product.

5.9.4 Procedures for preventing the mixing of products from one batch to the next should be established and documented. The filler should be cleaned between different products (e.g. when products have different allergen status), or the mixture from one batch should be completely purged from the filler before filling the next batch.

5.9.5 Procedures for preventing contamination from metal clips should be established and documented.

5.9.6 Presses or moulds should be regularly checked for rough or sharp edges which can puncture the casing

5.10 Rework

Product used as rework include:

a. products that do not meet quality specifications (e.g. broken pieces, leakers, misshapen pieces, and discoloured products)

b. ends of meat pieces; and

c. products that do not meet the required heat treatment.

5.10.1 Rework should be handled and stored in a manner and under conditions that minimise contamination and growth of microorganisms.

5.10.2 Rework should be clearly identified and kept separate from other products during storage.

5.10.3 Formulations should be properly adjusted to account for the addition of any rework. The operator should establish a limit for the amount of rework which can be added to a batch since this can affect its functionality and the additive levels (e.g. nitrite) in the finished product.

5.10.4 The amount of rework added to a batch should not exceed 5% of the total weight of batch because the incorporation of large amounts of rework could have a destabilising effect on the new product due to poor water or fat binding ability.

5.10.5 Any material or product, whether in stock or returned, which may have been mishandled or exposed to contamination should not be reworked into new product.

5.10.6 Procedures for tracing the batches of reworked materials and the batches of products they have been used in should be established and documented

5.11 Metal Detection

5.11.1 Metal detectors should have the appropriate sensitivity for the type and size of metal identified as a hazard in the particular product

5.11.2 Metal detectors should be located at the point(s) where contaminated products can be effectively isolated and the product is unlikely to be exposed to further metal contamination at subsequent steps.

5.11.3 Metal detectors should be checked against appropriate test pieces daily, and should be calibrated regularly.

5.11.4 All products that fail metal detection should be isolated from the process line and from acceptable products, and then broken down to determine the reason for failure.

5.11.5 Corrective action should immediately be taken when a batch of product is suspected to have been contaminated with metal

6 Cooking

This subclause covers the requirements for the validation and implementation of cooking processes or methods commonly used for processed meat in East African Partner stated. These methods include: Cooking in water, steam or dry heat.

6.1 Outcome of the Cooking Process

6.1.1 The cooking process for a product should be sufficient to render the product microbiologically safe for its intended purpose.

6.1.2 Cooked cured/salted meat products should meet the microbiological limits given in the respective meat product standard.

6.1.3 When cooking is used to control pathogens in ready-to-eat (RTE) products, the cooking process should achieve a 6 decimal reduction of *Listeria monocytogenes* (a 6D process). This process criterion, or a specific cooking time-temperature that will deliver a 6D process, should be identified as an operator-defined limit in the documented.

Note: A 6D process for the destruction of *L. monocytogenes* is generally accepted as sufficient to inactivate other vegetative forms of pathogens of concern in a particular meat product. A 6D process delivers a 10^6 -fold reduction of the pathogen (i.e. will reduce the number of bacteria from 1,000,000 to one).

6.1.4 The time and temperature combinations to deliver a 6D reduction in *Listeria monocytogenes* is given in Table 1. The temperature is the minimum that should be achieved and maintained for at least the corresponding time at the slowest heating point of the product (to be determined based on the product's shape and size).

Table 1: Time temperature combinations for 6D destruction in *Listeria monocytogenes* guidelines for the safe manufacture of smallgoods

Temperature (C)	Time (min.)
60	44
61	33
62	24
63	18
64	13
65	10
66	7
67	6
68	4
69	3
70-72	2
73-75	1
76 or higher	< 1

6.1.5 The operator may propose an alternative from the 6D process for *Listeria monocytogenes*. The alternative process should be validated by the operator, and approved by the Competent Authority before being implemented.

6.2 Validation

6.2.1 The cooking process should be developed and validated by a suitably skilled person for each product or product group. The process should be revalidated whenever there is a change to the process or product that could impact on its safety.

6.2.2 The operator should demonstrate that the validated process is capable of consistently achieving the relevant regulatory and/or operator-defined limits.

6.2.3 Smokehouses, steam cookers, water cookers and other types of cookers should be properly installed and set up so they provide uniform temperature distribution throughout the unit.

a. Temperature distribution studies should be conducted at least annually, or whenever there are changes to the equipment set-up or product arrangement that could impact on heat distribution and transfer. Each cooking unit should be set up so that normal loads of sufficiently spaced and similar sized product can be shown, by core temperature measurements at random sites throughout the unit, to have uniform cooking rates.

b. If the cooking unit does not have good heat distribution, the cooking process should be validated based on a worst-case scenario (i.e. based on the cooking rate of the product at the coldest part of the cooking unit).

6.2.4 The variation in size and weight of meat pieces should be minimised to ensure uniform cooking in each batch.

6.2.5 The operator should document the validated process parameters and conditions (e.g. cooking times and temperatures, loading capacity, cooker set up).

6.2.6 Data should be obtained based on a worst-case scenario considering the different factors that could affect the lethality of the heating process (e.g. type and size of the product, type and performance of the cooker, loading configuration of the cooker, loading capacity). Temperature distribution in the cooking equipment, and whether there are hot or cold spots, should be taken into account when validating the process.

6.2.7 In determining the appropriate number of trials to conduct, consideration should be given to equipment performance, product homogeneity and safety margin of the process. As a minimum, for a well-controlled process with low variability, at least three confirmatory runs should be conducted. This number should be increased in situations where there is large or unacceptable variation within and between runs, as determined by the suitably skilled person.

6.2.8 Records of all aspects of the validation work should be kept by the operator, including records of the temperature distribution studies.

6.3 Implementation of the Validated Process

6.3.1 Cooking should be operated in accordance with the validated process and procedures.

6.3.2 If the smokehouse or cooker is operated using pre-programmed cooking schedules (e.g. computerised smokehouses), unauthorised access to the programmed parameters should be prevented.

6.3.3 The smokehouse or cooker shall be operated within the capacity for which the cooking schedule has been validated. The smokehouse or cooker should not be overloaded. Adjustments to cooking cycles may need to be made for partially loaded batches, if this had not been previously considered in the development and validation of the process

6.3.4 Products should be adequately separated in the smokehouse or cooker to prevent products touching each other.

6.3.5 If a product is cooked in a hot water bath, the product should be completely submerged in the water. The products should be held at least 10 cm below the water surface with equipment such as a metal screen.

6.3.6 When the cooking step is a critical control point, the process should be carried out and/or supervised by appropriately trained personnel. The operator should ensure that adequate training is provided and records of the training are kept. The training should cover the operation, control and monitoring of that step

6.3.7 Calibrated temperature measuring devices should be used for determining internal product temperatures, and cooker temperatures (See subclause 5.4.1c). The internal temperature of the cooked meat product should be measured at the coldest spot in the cooker and in the centre of the largest piece of meat.

6.3.8 Records of the cooking process should be kept for each production batch (e.g. cooking times and temperatures, and the product temperature).

6.3.9 The operator should verify that microbiological limits for the product are met. Routine microbiological testing of all batches of products is not required, but it is recommended that samples of products are occasionally tested as part of the verification programme.

6.3.10 The procedures for preventing post-process contamination of ready-to-eat products given section 11.1 should be complied with.

6.3.11 Cooked products should be immediately cooled after cooking

6.4 Non-compliance to the Validated Process

6.4.1 The operator should take immediate action when any non-compliance occurs that results in the product or process not meeting the validated process and parameters, including any regulatory or operator-defined limits.

6.4.2 non-complied products should be identified and segregated until their safety and disposition has been determined by a suitably skilled person.

6.4.3 A suitably skilled person should investigate any incidence of non-compliance or process failure, determine the cause of the failure, and determine the appropriate corrective action.

6.4.4 The corrective actions should address the:

a. restoration of process control (e.g. stop processing until the assessment is completed and any necessary changes made to the product or process)

b. identification and disposition of affected product (including initiating a recall, if necessary); and

c. prevention of the recurrence of the loss of control.

6.4.5 A record of the assessment and corrective actions taken should be prepared by the suitably skilled person. The record should be appropriate to the nature of the non-compliance and should include:

a. date and time of non-compliance or process failure

b. description of the nature and scope of the non-compliance

c. description of equipment involved, when appropriate

d. description of affected product, including code and quantity

e. corrective action taken, including restoration of control, product disposition and prevention of recurrence.

f. records of any tests undertaken; and

g. the name and signature of the suitably skilled person

7. Cooling

The methods commonly used for cooling processed meat, including water showers (e.g. inside or outside of oven), immersion in water or ice water baths; or refrigerated air flow

7.1 Outcome of the Cooling Process

7.1.1 Cooked processed meat products should be cooled in a manner and under conditions that minimises the growth of bacteria

7.2 Validation

The operator should provide evidence that the established cooling parameters can be consistently achieved by all products. Data should be obtained based on a worst-case scenario considering the different factors that could affect the cooling process (e.g. type and size of the product, type and performance of the cooling facility, loading configuration, loading capacity).

7.3 Implementation of the Validated Process

7.3.1 Cooling should be done in accordance with the validated process and procedures.

7.3.2 The procedures for preventing post-process contamination of cooked or ready-to-eat products given in section 11.1 should be complied with.

7.3.3 Internal product temperatures and/or cooling medium temperatures should be monitored during cooling using calibrated temperature measuring devices in a manner which will not contaminate the product.

7.3.4 Water cooling

a. Water and ice used for cooling (e.g. water sprays or in immersion cooling) should be potable. The cooling water should be tested regularly and corrective actions taken (e.g. chlorination) to address any identified problem.

b. Cooked products should be transferred into the cooling water tank in a hygienic way. The cooked products should not come into contact with non-product contact surfaces.

c. Products being cooled in water tanks should be completely submerged in the water.

d. Cooling tanks should be emptied and the water replaced as regularly as necessary to maintain it in a hygienic condition.

7.3.5 Air cooling.

a. Chillers and freezers should be used within their design capabilities and capacity.

b. Products should be arranged and loaded in the chiller or freezer in a way that will ensure the cooling of all products within the required cooling rate.

c. The addition of warm product into the chiller or freezer should not result in significant warming of cooled product already present in the room, and/or to condensation.

d. Products should be protected from contamination from condensates from refrigeration units and other surfaces.

e. There should be effective separation between raw and cooked products

NOTE: Raw products and cooked products should not be held in the same chiller or freezer.

7.4 Non-compliance to the Validated Process

Procedures for addressing any non-compliance to the validated process is given in subclause 6.5.

8. Drying

This subclause discusses the requirements for the validation and implementation of drying processes applied to the processing of ready-to-eat dried meat products such as dry-cured meat (e.g. prosciutto) and jerky-type products (e.g. beef jerky, biltong).

8.1 Outcome of the Drying Process

8.1.1 The drying process and any additional controls (where used) should render the product microbiologically safe for its intended purpose. Dried meat products are preserved primarily by the reduction of water activity, however additional controls such as the use of salt, nitrite, and/or anti-microbial agents; application of smoke; and heating of the meat before drying may be applied during their commercial production to contribute to the lethality of the process to inactivate or inhibit bacterial pathogens of concern.

8.1.2 The product should be dried to a water activity (a_w) that will stabilise the product for food safety purposes. The operator should define this a_w, provide justification for its selection, and identify it as an operator-defined limit

Dried meat (excluding slow dried cured meat) should be dried to an a_w of ≤ 0.85. The growth of mould and yeast during storage can be prevented by drying to an a_w ≤ 0.80 and vacuum packaging, or by drying and maintaining the a_w at ≤ 0.70

Dry-cured ham ready for sale should have an a_w ≤ 0.90. At this a_w, dry-cured ham can be regarded as generally safe even when stored without refrigeration.

8.1.3 The operator should define microbiological limits for any ready-to-eat dried meat product, provide justification for their selection, and identify them as operator-defined limits. Where meat product standard does not provide microbiological limits for dried meat products, the operator can establish their own limits based on microbiological limits for similar ready-to-eat meat products; or criteria obtained from a reputable agency or research institute, or published scientific journal.

8.2. Validation

8.2.1 The drying process should be developed and validated by a suitably skilled person. It should be revalidated whenever there is a change to the process or product that may impact on its safety. The person who is responsible for validating drying processes should have good knowledge of the required regulatory and/or operator-defined limits for the product (e.g. a_w, microbiological limits), and the factors that are critical to the drying process and the consistent achievement of the defined limits. The suitably skilled person should also have a good understanding of food microbiology, process control and the procedures for validation (e.g. preparing a protocol, designing trials, collecting data, product sampling and testing).

8.2.2 The operator should demonstrate that the overall process (i.e. drying and any additional controls) is capable of consistently achieving the defined regulatory and/or operator-defined limits for the product. The overall process should control, reduce, or eliminate the biological hazards (e.g. *Salmonella* spp., *Listeria monocytogenes*, *Staphylococcus aureus* and *E. coli O157:H7*) identified in its hazard analysis. There should be additional controls to drying to reduce the pathogens to acceptable level. For example, heating step should be done prior to drying for jerky because traditional air-drying methods used may not be sufficient to destroy certain pathogens present in raw meat (e.g. Salmonella, E. coli O157*:H7*). For dried meat which do not undergo a microbiological kill step, such as heating, the safety of the process is mainly dependent on ensuring that:

a. only meat of good microbiological quality is used for the production of dried meat because there are limitations to the numbers of pathogenic bacteria that can be destroyed during drying; and

b. the drying conditions (e.g. time, temperature) are such that undesirable microbial growth and toxin formation is prevented, and any existing pathogens are inactivated to acceptable levels.

8.2.3 The operator should document the validated process parameters and conditions (e.g. drying times and temperatures, air velocity, relative humidity, loading capacity, drier set up).

8.2.4 Drying equipment or facilities should be properly installed and set up so they provide uniform drying throughout the unit.

8.2.5 Records of all aspects of the validation work should be kept by the operator.

8.3 Specific Procedures for Jerky-type Dried Meat

Jerky and biltong are commonly made by marinating slices of meat and then heating them in a hot air oven under controlled temperature and relative humidity conditions.

8.3.1 Marination and tumbling/massaging of the meat pieces should be done in a manner and under conditions that minimise contamination and the growth of microorganisms. The meat should be kept at ≤ 4°C during marination and tumbling/massaging.

8.3.2 Procedures for the preparation, storage and re-use of marinades should be documented

8.3.3 The drier should be operated within the capacity for which the drying schedule has been validated for.

8.3.4 Products should be evenly spaced in the drier, and pieces of products should not come into contact with each other

8.4 Specific Procedures for Dry-cured Meat

Microbiological inhibition and inactivation in dry-cured meat are mainly achieved by low moisture content (and low a_w), curing salts, and sodium chloride. Other factors like pH and redox potential (Eh) may also play a role in selecting against undesirable microorganisms.

8.4.1 Meat pieces should be salted and cured in accordance with the procedures given in section 5.6.3

8.4.2 The cured meat should be dried under controlled conditions (e.g. temperature and relative humidity) until the required a_w is achieved.

8.5 Implementation of the Validated Process

8.5.1 The process should be operated in accordance with the validated process and procedures.

8.5.2 If the drier is operated using pre-programmed drying schedules (e.g. computerised driers), unauthorised access to the programmed parameters should be prevented

8.5.3 The process should be monitored and verified at a frequency necessary to ensure that the established process and product parameters are consistently being met.

8.5.4 Process parameters (e.g. temperature, humidity) and product parameters (e.g. a_w, moisture content) should be measured using calibrated instruments.

8.5.5 Records of the process should be retained for each production lot.

8.5.6 When the drying step is a critical control point, the process should be carried out and/or supervised by appropriately trained personnel. The operator should ensure that adequate training is provided and records of the training are kept. The training should cover the operation, control and monitoring of drying step.

8.5.7 The operator should verify that water activity (a_w) and microbiological limits for the product are met.

8.5.8 post-process handling, packaging and storage of the dried product should be done in a way that minimises moisture re-absorption and contamination, and maintains the fitness of the product for intended purpose.

8.6 Non-compliance to the Validated Process

Procedures for addressing any non-compliance to the validated process is given in section 6.5

9. Fermentation

This subclause discusses the requirements for the processing of fermented meat products, such as salami and pepperoni, which are fermented using a starter culture. It does not cover acidulated sausages which use an acidulant (e.g. glucono-delta-lactone) and does not use a starter culture to reduce the product's pH.

Acidulated sausages are expected to be cooked and should comply with the requirements for cooked products given in section 4

9.1 Uncooked Comminuted Fermented Meat (UCFM)

Processors of UCFM products (e.g. dry and semi-dry fermented sausages such as salami and pepperoni) should meet the requirements of the relevant product standard and comply with the procedures given in guidelines for the Production of UCFM Products.

9.2 Cooked Comminuted Fermented Meat (CCFM)

9.2.1 CCFM products should meet the microbiological limits for cooked cured/salted meat products specified in the products standards.

9.2.2 A CCFM product that is intended to be shelf stable (i.e. the product can be stored at ambient or room temperature) should have a pH and/or water activity (a_w) which will not allow the growth of any pathogenic or spoilage microorganisms at ambient temperatures. The operator should define these parameters, provide justification for their selection, and identify them as operator-defined limits.

9.2.3 CCFM products which do not meet the established pH and a_w for shelf stability should be refrigerated and stored at ≤ 4°C. It is generally accepted that fermented meat products with a combination of pH < 5.2 and a_w < 0.95 are shelf stable under ambient conditions. The operator may propose other combinations of pH and water activity (a_w), but they should be able to scientifically justify the selected parameters, and validate them, if necessary.

9.2.4 CCFM products should be fermented and dried in a manner, and under conditions, that inhibit the growth of pathogens (e.g. *Staphylococcus aureus*) and the formation of toxins

9.2.5 The cooking process should be validated and implemented in accordance with the requirements and procedures given in Section 6: Cooking

10. Smoking

This subclause discusses the requirements for smoking of processed meat. It applies to various types of smoked meat such as ham, bacon, salami and other smoked sausages. Smoking of processed meat is

generally done to produce a sensory effect (aroma, flavour, colour). It is used in combination with other preservation steps, for example, some products may be cooked and smoked, and others may be smoked and dried. Smoke may be produced by burning wood chips or using an acceptable liquid smoke preparation. Processors should also refer to the relevant processing code of practice.

9.1 Procedures

9.1.1 Smoking should be done in a manner and under conditions that minimise contamination of the product and the proliferation of microorganisms.

9.1.2 When smoking contributes to the preservation of a particular product and is necessary for food safety, the smoking process and its effect should be considered in the validation of the overall process.

9.1.3 Smoke flavours are considered as food additives and should comply with requirements under relevant Standard

9.1.4 Wood or other plant material used for the generation of smoke should:

a. not contain toxic substances, either naturally occurring or through contamination with chemicals including paints, wood treatments or other impregnating materials; and

b. be free from visible microbiological or fungal growth

9.1.5 The operator should consider the potential for the formation of chemical hazards such as polycyclic aromatic hydrocarbons (PAH) during the process, and when possible, minimise product exposure to them. The operator should be aware of the conditions under which higher levels of PAHs are generated and wherever possible, manage those conditions to minimise their formation.

9.1.6 The PAH level in the final product is dependent on a number of factors. For example, the following can result in lower levels of PAH levels:

a. use of hard wood rather than soft wood (traditionally only hardwoods have been acceptable for smoke generation)

b. indirect smoking rather than direct smoking

c. shorter processing times

d. bigger distance between the product and the heat source (i.e. product located closer to the heat source can have higher polycyclic aromatic hydrocarbon (PAH) levels

e. filtering or cooling the smoke prior to use

f. washing or water cooling the product after smoking; and

g. keeping equipment clean and maintained.

11. Post Processing

This section discusses the process steps or activities undertaken after the application of a heat or preservation treatment such as cooking, fermentation, or drying.

11.1 Prevention of Post-process Contamination

11.1.1 The operator should document and implement procedures for preventing post-process contamination of cooked or ready-to-eat (RTE) products.

11.1.2 Separation between raw and RTE product and processes.

a. The design and layout of processing facilities and equipment in the premises should:

i. facilitate separation between raw and RTE products and processes

ii. facilitate the control of movement of personnel, raw materials and products, and equipment from raw to RTE product areas

iii. facilitate effective cleaning and sanitation between raw and RTE operations; and

iv. prevent cross-contamination between raw and RTE products.

b. Raw and cooked or RTE products and processes should be physically separated from each other; or they should be separated by time or distance; as appropriate to the type and size of the operation, and based on an assessment of the potential for product contamination and risk to human health posed by the product.

c. When processing of raw and RTE products is separated by time, RTE products should be processed first at the start of the day, when there is no raw product around and when equipment is clean, before processing raw products. Slicing and packaging of raw and RTE products could also be done on different days.

d. When raw and RTE products and processes are separated by distance or location within a room or area, the distance between them should be such that any contact or contamination between products, equipment, processes or personnel is avoided.

11.1.3 Personnel hygiene and movement control

a. Personnel should comply with the hygienic practices and procedures given in EAS 955

b. Procedures should be established for controlling the movement of personnel between raw and RTE product areas.

c. Whenever possible, employees should not work in both raw and RTE areas. Where unavoidable, employees should complete an appropriate hygiene routine every time they move from raw to RTE areas (see section 11.1.3e).

d. Different coloured smocks or hats can be used so that workers in the raw and RTE areas can readily be distinguished.

e. Personnel should undergo a hygiene routine before handling RTE products, and every time there is a change from raw to RTE operations. They should:

i. thoroughly wash their hands

ii. change their protective clothing

iii. clean and sanitise their footwear

iv. discard and replace disposable gloves (or wash and sanitise multi-use gloves); and

v. ensure that they are free from any contamination originating from raw products/processes and other sources

f. Outer protective clothing (e.g. smocks, aprons, or disposable protective coverings) used in RTE processing areas should be removed before leaving the area.

11.1.4 Equipment

a. Separate equipment (e.g. slicers, conveyors, packaging machines, containers, trolleys), maintenance tools and utensils should be used for the RTE and raw product areas; or they should be thoroughly cleaned and sanitised before being used in RTE areas or for RTE products.

b. Colour-coding may be used to identify portable equipment and utensils (e.g. containers, knives, cutting boards and slicers) for exclusive raw or RTE use.

c. Different slicers should be used for slicing raw and cooked meat since they can be a major source of recontamination of RTE products.

d. Pallets are difficult to clean and can serve as a source of cross-contamination therefore, pallets that are used for raw materials should not be used in RTE areas.

e. Procedures should be established for controlling the movement of equipment between raw and RTE product areas.

f. Wheels of transport equipment (e.g. carts, forklifts, mobile racks) should be cleaned and sanitised before entry to RTE product areas.

11.1.5 Cleaning and sanitation

Cleaning of post- processing areas and equipment should be in accordance with the procedures given in EAS 955

11.1.6 Dropped meat procedures

a. Procedures should be established and implemented for the handling and disposition of products that come into contact with the floor (i.e. dropped meat) and other non-product-contact surfaces.

b. The procedures should clearly indicate the actions that should be taken (e.g. trim, wash, reprocess or dump) for the different types of products, and how these actions should be done in a hygienic manner.

11.2 Slicing and Dicing

11.2.1 Slicing / dicing and packaging should be done in a manner and under conditions that minimises contamination of products and microbiological growth. Products should be cooled to ≤ 4°C before slicing/dicing and/or packaging

11.2.2 The removal of casings, cook-in-bags and other product packaging prior to slicing or repackaging should be done in a way that minimises the contamination of the product.

11.2.3 Edible trimmings (e.g. sausage and ham ends) should be collected in clean containers. If they are not sliced/diced and then packed or reworked immediately, they should be protected from contamination and placed in a chiller so that their temperature is maintained at ≤ 4°C.

11.2.4 There should not be any unnecessary delay between slicing and packaging. Products should be packed immediately after slicing.

11.3 Packaging and Labelling

11.3.1 The specifications, handling and storage of packaging materials should meet the requirements given in EAS 38.

11.3.2 Only new packaging material should be used for ready to eat (RTE) products and other meat products.

11.3.3 Adequate separation, to prevent product contamination, should be maintained between packaging materials brought into the room for use and exposed product (e.g. use separate tables).

11.3.4 Packaging materials should be dispensed in a manner that protects the materials and the product from contamination.

11.3.5 Packaging machines should be set up correctly so that they produce effective seals.

11.3.6 Packaging seal or closure integrity should be checked regularly to ensure the safety of the product. This may include visual or physical testing (e.g. complete seal, no cracking or wrinkling, maintenance of vacuum).

11.3.7 Products should be labelled in accordance with the requirements EAS 38

11.3.8 Products should be transferred promptly to the chiller or freezer after packaging.

11.3.9 Only enough packaging materials for one shift should be moved into the packaging room. Packaging materials should not be stored in the packaging room past the end of the shift.

11.4 Storage

11.4.1 Chilled products should be maintained at ≤ 4°C.

11.4.2 The chiller temperature should be monitored continuously (with an automatic temperature reading device), or it should be read manually and recorded at regular intervals.

11.4.3 Chillers should not be loaded beyond their capacity.

11.4.4 Procedures should be in place for identifying and holding finished product awaiting test results for release. Records should include the total amount of product in the lot or batch and its location

11.4.5 A first-in-first-out or plant specific rotation inventory control system should be maintained for finished products.

11.4.6 Doors on chillers and freezers should not be left open for extended periods. Doors should be closed immediately after use.

11.4.7 Products with damaged packaging should be handled in a manner that will minimise:

a. the exposure or spillage of the product (e.g. products can be wrapped and sealed)

b. contamination or deterioration of the product; and

c. contamination of other products and the storage area.

11.5 Repackaging

11.5.1 Finished products that do not meet packaging specifications (e.g. coding, labels) may be repacked without receiving any additional treatment provided that the products:

a. have not been dispatched

b. are within their shelf-life period; and

c. are of acceptable quality and have been handled properly.

11.5.2 Repackaging of product due to damaged packaging should be done in a manner that minimises contamination. Any product that has been detrimentally affected as a result of the packaging damage should be considered as non-complying product.

11.5.3 The label of repacked products should indicate the original production code and any shelf-life given should be based on the original date of production of the product.

Bibliography

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