

No. R. 1229

11 October 2002

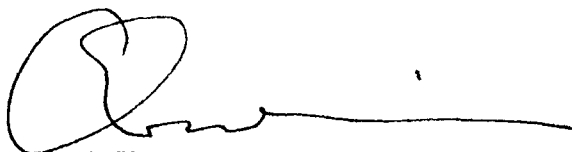
STANDARDS ACT, 1993

PROPOSED REPLACEMENT OF THE COMPULSORY SPECIFICATION
FOR FROZEN FISH, FROZEN MARINE MOLLUSCS AND FROZEN
PRODUCTS DERIVED THEREFROM

It is hereby made known under section 22 (3) of the Standards Act, 1993 (Act No. 29 of 1993), that the Minister of Trade and Industry intends to withdraw the compulsory specification for frozen fish, frozen marine molluscs and frozen products derived therefrom, as amended, published by Government Notice No. R530 of 14 May 1999, and to replace it with the specification contained in the Schedule.

The purpose of this replacement of the compulsory specification is to incorporate the latest developments in technology in the treatment of fish and fish products, and to replace outdated microbiological test methods with recently overprinted ISO methods.

Any person who wishes to object to the intention of the Minister to thus replace the compulsory specification concerned, shall lodge his objection in writing with the President, South African Bureau of Standards, Private Bag X191, Pretoria, 0001, on or before the date two (2) months after publication of this notice.



A ERWIN

Minister of Trade and Industry

SCHEDULE

PROPOSED COMPULSORY SPECIFICATION FOR FROZEN FISH, FROZEN MARINE MOLLUSCS AND FROZEN PRODUCTS DERIVED THEREFROM

1 Scope

This specification covers the requirements for the handling, preparation, processing, packaging, freezing, storage and quality of frozen fish, frozen marine molluscs, frozen fish products and frozen marine mollusc products intended for human consumption. It also covers requirements for factories and employees involved in the production.

2 Definitions

For the purposes of this specification, the following definitions apply:

2.1

acceptable

acceptable to the authority administering this specification

2.2

brine pre-freezing

a process by which fish are rapidly frozen by total immersion in refrigerated brine at a temperature of -7°C or lower

NOTE Brine pre-freezing does not complete the process of freezing defined below as the "freezing process" (see 2.11).

2.3

by-product

a product not intended for human consumption

2.4

chill room

an insulated and refrigerated room that is specially designed for the storage of foods at temperatures not lower than -1°C and not higher than 4°C , that has sufficient refrigeration capacity to maintain the desired storage temperature and that could also have sufficient refrigeration capacity to cool products placed in the chill room to that temperature

NOTE Where the product is to be stored with ice in a chill room, the above definition is not applicable.

2.5

factory

any premises, vehicle or vessel on or in which fish (see 2.6) or fish products (see 2.8) are handled or treated to prepare them for freezing for commercial purposes

NOTE This definition excludes fish shops, hotels, boarding houses, restaurants or other eating houses.

2.6

fish

any edible cold-blooded marine or freshwater aquatic vertebrate that has gills throughout its life, and that has any limbs modified into fins, and all marine molluscs and cephalopods (see 2.13)

2.7**fish bone defect**

a fish bone of length equal to or exceeding 10 mm, or of diameter equal to or exceeding 1 mm

NOTE A bone of length not exceeding 5 mm is not considered a defect if its diameter does not exceed 2 mm. The foot of a bone, where it has been attached to the vertebra, whose width does not exceed 2 mm, or if it can easily be stripped off with a fingernail, does not constitute a defect.

2.8**fish product**

any fish product, whether in a processed form or not, wholly or partly derived from fish (see 2.6), and intended for human consumption

2.9**freezer**

a room or equipment that is specially designed to lower the temperature of a food product through the zone of maximum crystallization (see 2.11) and down to an equilibrium temperature of -20°C or lower in a period of time that is acceptable for the product

2.10**freezer storage room**

an insulated freezer room that is specially designed for the storage of frozen foods and that has sufficient freezing capacity to maintain a product temperature of -20°C or lower when products that have already been frozen to that temperature are being stored

NOTE A freezer storage room is not designed to freeze products.

2.11**freezing process**

the continuous process whereby the temperature of the product is lowered through the zone of maximum crystallization, which, for most products lies between -1°C and -5°C , at a rate of at least 6 mm of product thickness per hour, and that is only completed when the temperature of the entire product, after thermal stabilization, has reached -20°C or lower

NOTE The process whereby a product that has undergone brine pre-freezing is so further frozen that the temperature of the entire product, after thermal stabilization, is -20°C or lower, is considered a continuous process in terms of this specification, provided that the temperature of the product is not raised above -7°C during this process.

2.12**frozen fish product**

a fish product (see 2.8), smoked or unsmoked, cooked or uncooked, that has undergone a freezing process and has been preserved by storage in the frozen state

2.13**marine mollusc**

any marine invertebrate of the phylum Mollusca, that has a soft unsegmented body and often a shell, secreted by a fold of skin known as the mantle

NOTE The group includes bivalves (such as clams and mussels) and cephalopods (such as squid).

2.14**minced fish**

minced particles of skeletal muscle of fish that have been separated from, and that are acceptably free from, fish bones and skin

2.15**outer container**

master container

the box, carton or case into which packages of frozen fish products, with or without wrappers, are packed for storage and distribution

2.16**package**

immediate container

the immediate carton, plastics pouch or other container in which the product is packed for storage and distribution

2.17**preserve**

to maintain in sound edible condition by the prevention of deterioration

2.18**process**

the course of operations during production (see 2.20) of the product

2.19**product**

fish, marine molluscs, fish products or marine mollusc products for human consumption, in the course of transportation, handling, preparation, processing or packaging for freezing, in the course of being frozen, or after having been frozen, as indicated by the context of the specification

2.20**production**

the handling, preparation, processing or packaging for freezing, in the course of being frozen, or after having been frozen, including the process of frozen storage, as indicated by the context of the specification

2.21**quick-freezing process**

the continuous process whereby the temperature of the product is lowered through the zone of maximum crystallization, which, for most products lies between $-1\text{ }^{\circ}\text{C}$ and $-5\text{ }^{\circ}\text{C}$, within 4 h at a rate of at least 25 mm of product thickness per hour, and that is only completed when the temperature of the entire product, after thermal stabilization, has reached $-20\text{ }^{\circ}\text{C}$ or lower

2.22**quick-frozen product**

a fish product (see 2.8), smoked or unsmoked, cooked or uncooked, that has been frozen by the quick-freezing process

2.23**skewer**

a pin for holding cuts of fish, with or without vegetables or fruit (or any combination thereof), and that may be made of wood, metal or a plastics material specially suitable to be used in contact with food

2.24**smoke**

wood smoke

smoke that is derived from wood or from woody plants that are acceptably free from gum and resin, paint, timber preservative and other added substances, in a state of combustion or friction and that can be used to smoke fish in kilns designed for the purpose, or that can be condensed in, or absorbed into, a suitable food grade liquid or powder for the preparation of a smoke dip

2.25**suitable**

acceptable and complying with the requirements for the intended purpose

2.26**suitable corrosion-resistant material**

water-impermeable material that has smooth surfaces that are free from pits, crevices and scale, that is non-toxic and that is unaffected by sea water, ice, fish slime and any other corrosive substance with which it is likely to come into contact and that is capable of withstanding exposure to repeated cleaning, including the use of detergents

2.27**suitable measuring instruments**

in the case of a digital instrument, an instrument that has a resolution of at least one tenth of the tolerable negative error; in the case of an analogue instrument that allows for interpolation between discrete divisions, an instrument that has a division size equal to at least one fifth of the tolerable error

3 Requirements for the factory**3.1 General**

All the statutory requirements contained in the Occupational Health and Safety Act, 1993 (Act 85 of 1993), in the Health Act, 1977 (Act 63 of 1977), in the Perishable Products Export Control Act, 1983 (Act 9 of 1983), and in any other relevant Acts shall be complied with.

3.2 Factory construction, layout and conditions**3.2.1 Location, size and hygienic design and conditions**

3.2.1.1 The location of the factory shall be such that the buildings can be kept acceptably free from objectionable odours, smoke, dust and other contamination, in order to comply with the relevant requirements for hygiene and sanitation of the Health Act, 1977 (Act 63 of 1977). The factory buildings shall be of sound construction, in good repair, and large enough to prevent crowding of equipment and employees and to permit adequate cleaning and the maintenance of product quality and hygiene.

3.2.1.2 The factory premises shall be well drained and adequately fenced to keep out larger animals, such as cats and dogs, and also unauthorized persons and vehicles. Outdoor work areas and roads and pathways on the premises shall have a permanent surface of concrete, brick, bitumen or other durable material. Areas outside buildings and not in actual use shall either be covered by lawn or have a surface that is not liable to produce dust and that does not contain toxic substances.

3.2.1.3 The factory and equipment shall be so designed as to permit the processing of raw materials without undue delay. The buildings shall be so designed and constructed as to prevent the entry and harbouring of insects, birds, rodents and other vermin.

3.2.2 Roofs and ceilings

3.2.2.1 Roofs shall be weatherproof and made of non-absorbent material. Roofs and, where applicable, ceilings shall fit tightly to the walls and shall be at least 2,4 m above the floor. In the preparation, processing and packaging areas, the roof and, where applicable, the ceiling shall be at least 300 mm above any equipment and high enough to allow the free movement of mobile equipment and moving parts of other equipment.

3.2.2.2 In the preparation, processing and packaging areas and in storage areas for ingredients and packaging materials for the product, the ceiling, or, where no ceiling is provided, the roof, shall be dustproof and faced with a suitable corrosion-resistant, light-coloured and water-impermeable material that is so constructed and finished as to minimize condensation, mould development, flaking and the lodgement of dirt, and that is capable of being cleaned without damage. The underside shall have a smooth surface.

Areas where sauce is prepared or where the cooked product is handled, or where ingredients and packaging materials are stored, shall have a ceiling.

3.2.3 Walls and doors

3.2.3.1 Outer walls shall be weatherproof and impermeable to water. Interior wall surfaces shall be faced with a smooth, light-coloured, washable material that is impermeable to water and free of unnecessary projections. In addition, the walls in the preparation, processing and packaging areas shall be faced with a suitable corrosion-resistant, light-coloured, washable and impact-resistant material to a height of 2 m above the floor, except that when soiling of the walls could occur above this height, the facing shall be continued to a higher level. All ledges on the inside of walls and all windowsills shall be sloped towards the floor at an angle of at least 45°. The ledges shall be kept to a minimum size and windowsills shall be at least 1 m above floor level. In the preparation, processing and packaging areas and in freezers, chill rooms and freezer storage rooms, the wall-to-wall and wall-to-floor junctions shall be coved, the minimum radius of the coving being 25 mm and 40 mm respectively.

3.2.3.2 Doors and door frames shall be sheathed with, or made from, a suitable corrosion-resistant material and shall have seamless, light-coloured, water-impermeable and washable surfaces. If wood is used, it shall be sheathed to render it impermeable to water. Doors through which the product is moved between the preparation, the processing and the packaging areas shall be wide enough to prevent contamination of the product and damage to the doors. All doors that open direct from the outside atmosphere into the preparation, processing and packaging areas shall be provided with effective air screens or shall, as far as is practicable, be self-closing and tight-fitting. Freezer, chill room and freezer storage room doors shall be tight-fitting.

3.2.4 Floors

3.2.4.1 Floors shall be constructed of concrete or other material that is suitably water impermeable, corrosion resistant and easy to clean, and that has an even surface that is smooth but not slippery, and that is free from cracks and open joints.

3.2.4.2 Floors of the preparation, processing and packaging areas and of freezers, chill rooms and freezer storage rooms shall be suitably sloped and shall be drained to external gullies, sumps and sewers. Outlets shall have, immediately outside the factory walls, a trap that prevents the entry of rodents.

3.2.4.3 Drainage channels shall be of the open type with removable covers, where necessary, and shall be designed to cope with the maximum expected flow of liquid without overflowing or causing flooding. There shall be no installations in a drainage channel that could obstruct the flow of water or the cleaning activities. Gully traps shall be fitted with easily removable strainers. Where necessary, duckboards of easily cleaned, water-impermeable material shall be provided. Wooden duckboards shall not be used in wet areas. Floors and drains shall be maintained in good condition and repair.

3.2.5 Lift cages and staircases

3.2.5.1 The inside surfaces of lift cages shall be suitably corrosion resistant, and lift shafts shall be properly drained and accessible for cleaning. Mesh doors may be used, provided that they are not such as to be conducive to unhygienic conditions.

3.2.5.2 Staircases in rooms where the product is prepared, processed, packaged or handled shall have the spaces between treads closed in with solid risers. Staircases shall have solid balustrades of such a height as to prevent contamination of products underneath the stairs.

3.2.6 Cables and pipes

3.2.6.1 Cables and pipes shall, where applicable, be

- a) fixed above ceilings, or
- b) chased into walls, or
- c) fixed away from walls or ceilings and above the floor, and spaced in such a way that the ceilings, walls, floor, cables and pipes can be easily cleaned and maintained in a hygienic condition, or
- d) carried under the floor.

3.2.6.2 Drainage and sewer pipes shall not be installed above ceilings in preparation, processing or packaging areas, nor shall they be installed in such a way that accidental leakages could contaminate the product. The drainage and sewer pipes shall have an inside diameter of at least 100 mm and shall be properly vented to the outside atmosphere.

3.2.7 Illumination

An illumination of at least 220 lx in general work areas and of at least 540 lx at points where close examination of the product is carried out, shall be provided and shall be such that it does not significantly alter the appearance of the colour of the product. Luminaires suspended over the work areas where the product is handled at any stage during preparation, processing or packaging shall be of the safety type or otherwise so protected as to prevent contamination of the product in the event of breakage of a luminaire or lamp.

3.2.8 Ventilation

The ventilation shall be such that it keeps the air fresh, removes excess water vapour, and that it prevents the build-up of excessive heat, the formation of condensate and the growth of mould on overhead structures. The air shall be free from noxious fumes, vapours, dust and contaminating aerosols. The airflow shall be from the more hygienic to the less hygienic areas. Natural ventilation shall be augmented, where necessary, by mechanical means.

Windows that open for ventilation purposes shall be insect-screened. The screens shall be easily removable for cleaning and shall be made from suitable corrosion-resistant material.

3.2.9 Hand-washing facilities

3.2.9.1 The following shall be provided at those entrances to the preparation and processing areas of the factory that are used by the employees, and at other conveniently situated places in the preparation and processing areas of the factory within easy reach of the employees, and at the toilet exits:

- a) an acceptable number of wash-hand basins, with an abundant supply of hot and cold or warm running water in the temperature range 40 °C to 50 °C and that complies with the requirements of 3.4.1;
- b) an ample supply of unscented liquid soap or acceptable detergent in active condition;
- c) disposable paper towels and/or hot-air dryers; and

d) taps operated by means other than the hands or elbows, for example knee-operated or foot-operated taps, or push-button taps with preset volume control.

3.2.9.2 Disinfectant hand dips, where provided, shall be of such a design that they can be adequately cleaned. Access to hand-washing facilities shall at all times be unobstructed. The wash-hand basins shall be of a suitable corrosion-resistant material, shall have a smooth finish and shall drain into drainage channels direct.

3.2.9.3 In the case of a factory ship, at least one wash-hand basin in the toilet block and one in the processing and packaging area shall be supplied with hot and cold running water.

3.2.10 Footbaths

Unless their absence in particular circumstances is acceptable, or unless alternative acceptable cleaning and disinfecting facilities are provided, footbaths that contain a suitable disinfectant solution shall be provided at each entrance to the preparation, processing and packaging areas that is used by employees, and shall be so located that employees cannot obtain access to those areas without disinfecting their footwear. Footbaths shall be so constructed that they can be adequately drained and cleaned.

3.2.11 Notices

Notices shall be strategically displayed in the preparation, processing, packaging and storage areas, in the changerooms and in the toilet facilities. The notices shall require that hands be washed with soap or detergent and shall indicate that spitting, the use of chewing gum and of tobacco in any form, and the taking of refreshments are prohibited in those areas.

3.2.12 Separation of processes and facilities

Separate rooms or well-defined areas of suitable size shall be provided for

- a) the receipt and storage of raw materials,
- b) preparatory operations such as the heading, gutting and washing of fish,
- c) processing operations such as filleting, steaking and freezing,
- d) packaging, and
- e) the storage of the product.

3.2.13 Stores

3.2.13.1 General

The production area of the factory shall not be used for storage purposes.

3.2.13.2 Edible ingredients

Storage facilities for edible ingredients used in the preparation of the frozen product shall be dry, free from dust and any other source of contamination, and shall be verminproof.

3.2.13.3 Packing and packaging materials

Clean, dustproof, verminproof and dry storerooms shall be provided for the storage of packaging materials.

3.2.13.4 Storage facilities for poisonous and other harmful materials

3.2.13.4.1 Storage facilities for pesticides or other poisonous and harmful materials

Pesticides or other poisonous and harmful materials and the equipment for their application shall be stored in a room in which no foodstuff, food-handling equipment, packaging material or food containers are stored and which shall be kept locked. All dangerous materials shall be prominently and distinctly labelled and shall at no time come into contact with food containers, packaging materials, raw materials or the product.

3.2.13.4.2 Storage facilities for cleaning and disinfecting materials

Cleaning and disinfecting materials and the equipment for their application shall be stored in a room in which no foodstuff, food-handling equipment, packaging material or food containers are stored and shall at no time come into contact with food containers, packaging materials, raw materials or the product. All cleaning and disinfecting materials shall be prominently and distinctly labelled.

3.2.14 Storage facilities for utensils and spare parts

Utensils and spare parts that, when in use, come into contact with the product, shall, when not in use, be kept in a disinfectant solution or stored in a hygienic manner in a dry area that is free from dust and any other source of contamination, and that is verminproof. Spare parts for machinery that are capable of contaminating the product shall be kept in a separate storage area away from the processing areas.

3.2.15 Smoke room

Doors used during the firing of smoke rooms shall not open direct into processing areas, unless the smoke generator is so designed as to obviate pollution of these areas. Separate facilities shall be provided for the storage of smoke-generating materials.

3.2.16 Freezers, chill rooms and freezer storage rooms

3.2.16.1 Refrigeration units, such as compressors, shall not be installed in an area where the product is handled, with the exception of equipment that is an integral part of a production unit. Where freezers, chill rooms and freezer storage rooms are located in processing areas, their floors shall either be an integral part of the floor of the processing area or adequately sealed to that floor. Any storage units shall be installed high enough above the floor to permit easy and adequate cleaning of the area under them.

3.2.16.2 The walls and floors shall be in good condition. The surfaces of ceilings, walls and floors shall be of suitable corrosion-resistant material, shall be impermeable to water and shall be smooth, and free from cracks, crevices and flaking of surface material. The floors shall be drainable, and the floors of chill rooms shall be sloped to effect complete draining.

3.2.16.3 Freezer storage rooms in factories other than factory ships shall be equipped with automatic temperature recorders that have enough suitably placed sensing elements to monitor the overall air temperature. The temperature in freezer storage rooms shall be automatically and continuously monitored and a record of the temperature shall be kept and shall be available for inspection. Temperature charts shall be so graduated that each division represents not more than 2 °C within the storage range, and shall be easily readable, to the nearest 1 °C, within the storage range. Batch freezers, other than plate freezers, shall be fitted with external gauges or other temperature indicators.

3.2.16.4 Freezer storage rooms on fishing vessels should have temperature recorders but shall have at least external gauges or temperature indicators and the indicated temperatures shall be recorded every 4 h.

3.2.16.5 The entrances to freezers, chill rooms and freezer storage rooms shall be protected from the inflow of warm air by the provision of an anteroom or a mechanical air curtain or strip curtains or self-closing shutters.

3.2.17 By-products

Any processing of by-products and non-fish products that are not intended for human consumption shall be conducted in buildings that are physically separated from the factory in such a way that there is no possibility of contamination of the product.

3.2.18 Living quarters

Living quarters shall be completely separated from areas where the product is prepared, processed, packaged or stored.

3.2.19 Refuse

A separate, suitable refuse facility shall be provided on the premises and shall be cleaned daily.

3.2.20 Comfort facilities

3.2.20.1 An acceptable number of suitable changerooms, shower baths, wash-hand basins whose taps operate as described in 3.2.9, toilets (separate for each sex) and, where appropriate, urinals, shall be provided within practical distance from the factory processing areas. Shower baths shall connect direct to the changerooms. Comfort facilities shall not open direct into a preparation, processing, packaging or storage area.

3.2.20.2 Toilets shall be completely separate from changerooms, the only permissible access being through close-fitting, self-closing doors. Toilet blocks shall have their own hand-washing facilities, separated from those provided in changerooms. An ample supply of toilet paper, hot and cold running water, nailbrushes, unscented liquid soap or an acceptable detergent solution, and disposable paper towels shall be available to employees. Receptacles shall be provided for used towels. Refuse bins of hygienic construction shall be provided.

3.2.20.3 Notices shall be posted requiring employees to wash their hands with soap or detergent after they have used the toilet. Lockers or controlled clothes baskets shall be provided, and the layout and equipment shall be such as to permit proper cleaning and maintenance. The comfort facilities shall be kept clean and tidy. The comfort facilities shall be adequately ventilated. Changerooms and dressing rooms shall not be used as living quarters or for the preparation of meals. Staff dining rooms shall be separate from the changerooms or dressing rooms.

3.2.21 Facilities for cleaning and disinfecting portable equipment

Facilities with proper drainage shall be provided for the cleaning and disinfecting of portable equipment. Such facilities shall be located in a separate room or in a designated area in the preparation, processing and packaging areas where there is an ample supply of cold potable water, and hot water where required, or saturated steam, or clean sea water, at adequate pressure, that complies with the requirements of 3.4.2.

3.2.22 Specific requirements for fishing vessels

3.2.22.1 General considerations

Fishing vessels shall be designed for the rapid and efficient handling of fish, and for easy cleaning and disinfecting. All surfaces with which the fish might come into contact shall be water impermeable and, where practicable, shall be of suitable corrosion-resistant material. The surfaces shall be easily cleanable and shall have no projections or other features that could cause damage to the product.

Deck pounds, pen stanchions and dividing boards shall be constructed of suitable corrosion-resistant material and shall be easily removable. Their number and height shall be such as to hold the estimated amount of fish and to prevent movement and crushing of the fish as a result of excess mass of fish or the vessel's motion. Where practicable, wood shall be sheathed with a suitable corrosion-resistant material such as fibreglass, or shall be so treated as to be impermeable to water. Metalwork, other than stainless steel or galvanized steel or aluminium, that does not come into contact with the product shall be coated with corrosion-resistant and non-toxic paint or other protective coating.

A suitable drainage system shall be provided. Areas where the product is prepared, processed, packaged or stored shall be well isolated from grease, oil, fuel, heat, fumes, food for crew, storage areas for material other than the product, and from the engine room and other sources of contamination.

3.2.22.2 Storage facilities for fish

If fish are unloaded on land within 8 h of the catch, the vessel shall have facilities that will at least protect the fish from the direct rays of the sun and keep the fish cool (at a temperature of 20 °C or lower) and moist.

If fish are to be kept at sea for more than 8 h but not more than 10 d, facilities for chilling or freezing (or both) shall also be provided. Vessels on which fish are to be kept for more than 10 d shall have facilities for freezing the fish.

All vessels that are equipped for chilling or freezing (or both) shall have a suitable drainage system that is able to remove the meltwater into a sump as fast as it accumulates.

3.2.22.3 Sea water and brine storage tanks

In vessels that use refrigerated sea water or refrigerated brine systems for chilling or stowing the catch, all tanks, heat exchangers, pumps and associated piping shall be made of, or coated with, suitable corrosion-resistant material. A space of at least 60 mm shall be provided between cooling coils and the tank sides, to allow for the scrubbing and flushing of fish debris from the wells. The tanks or wells shall be so designed that the fish can first be washed and pre-cooled with refrigerated sea water, and then frozen by brine pre-freezing. Pipes other than cooling coils shall be completely sunk in and covered.

3.2.22.4 Sea water intake and waste disposal

Deck hoses shall be supplied with clean sea water, at an acceptable pressure, by a pump used only for clean sea water. Subject to good naval architectural practice, the point of intake of sea water for cooling and cleaning the product shall be situated at the deepest practicable point on one side of the vessel, and the sewage and waste water disposal and engine cooling discharge shall be disposed of at the shallowest point practicable, on the opposite side of the vessel.

The water supply pipes and waste disposal lines that service the vessel's toilets, wash-hand basins and kitchen sinks shall be capable of carrying peak loads, shall be watertight and shall not pass through spaces where the catch is prepared, processed, packaged or stored. Piping for the supply of clean sea water shall have no cross-connections with the engine or condenser cooling system and shall be so constructed as to prevent any possibility of back-syphoning from the kitchen sinks or the toilets.

3.2.22.5 Water supplies

An acceptable supply of cold potable water or clean sea water at an acceptable pressure shall be available at an acceptable number of points throughout the fishing vessel. On vessels engaged in processing other than cleaning, a supply of hot water at a temperature of at least 60 °C shall be available for use. Where practicable, an acceptable water-treatment system (such as exposure to ultraviolet light) shall be provided for the treatment of sea water that is used in the processing of the product.

3.3 Equipment for production

3.3.1 General

3.3.1.1 Processing areas shall be so designed, equipped and staffed as to allow free movement of workers to facilitate cleaning and the maintenance of both hygiene and product quality.

3.3.1.2 All plant, equipment and utensils that come into contact with the product shall be smooth surfaced, light coloured and of a suitable corrosion-resistant, non-absorbent material (i.e. not wood or other absorbent or porous material), which may have an acceptable plastics-coated surface suitable for use with food but should preferably be made of stainless steel. They shall be of hygienic design, with no open joints or crevices and shall be so constructed as to facilitate their cleaning and disinfecting. Plant or equipment shall be so designed as to facilitate the cleaning and disinfecting of the areas under them. Open ends and curled edges shall be satisfactorily sealed to prevent the accumulation of organic material and dirt. Where necessary, as in the case of equipment that cannot be cleaned *in situ*, it shall be possible to dismantle the equipment for cleaning and disinfecting. Surfaces with which the product comes into contact shall not be painted.

3.3.1.3 All parts of stationary equipment or equipment that is not readily movable shall be installed away from the walls and ceilings at distances sufficient to allow access for cleaning and inspection. All permanently mounted equipment shall be either installed high enough above the floor to allow access for cleaning and inspection, or shall be completely sealed to the floor.

3.3.1.4 Equipment shall preferably not be sunk into the floor but if this is unavoidable, the installation of the equipment shall be such as to be acceptable. Sunken areas shall be well drained.

Copper, lead and their alloys (other than solder) and other metals or materials detrimental to health or to the product, shall not be used in the construction of equipment that comes into contact with the raw materials or with the unprotected product at any stage of its processing. The use of solder in equipment shall be minimized.

3.3.2 Tables

Wooden tables shall not be used in processing areas. Table frames shall be of a design and construction that will not allow the development of unhygienic conditions and bacterial build-up. The frames shall be made of smooth corrosion-resistant metal or shall have been so coated as to protect them from corrosion. Table tops shall be of seamless stainless metal or other seamless, corrosion-resistant, smooth, water-impermeable material that possesses similar surface characteristics. They shall be of hygienic construction and shall be either removable for cleaning, or so secured to their frames as to allow cleaning and disinfecting. Where metal tops are folded at the edges, the folds shall be so soldered, welded or sealed with an acceptable mastic sealant as to prevent the accumulation of organic matter and dirt. All table tops shall allow rapid and effective drainage, and shall be free from cracks and crevices. All joints in tables shall have been made watertight.

3.3.3 Cutting boards

If cutting boards are used, they shall be of hygienic construction and shall be made of acceptable light-coloured material (other than wood or other absorbent or porous material), suitable for use with food. Cutting boards shall be easily removable.

3.3.4 Utensils

Knives, shovels, brooms and other utensils shall not have handles of wood or of other absorbent or porous material. Wicker baskets shall not be used as containers for fish at any stage before, during or after processing.

3.3.5 Disinfecting and cleaning facilities

Disinfecting facilities for gloves and knives shall be available at convenient and acceptable points. Cleaning and disinfecting materials, hot and cold running water or saturated steam, hose pipes, spray nozzles, brushes, scrapers and other equipment needed for the cleaning of the fishing vessel, plant, equipment and utensils shall be available. These materials and equipment shall not be stored in a room where food-handling equipment is stored and shall at no time come into contact with raw materials, the products, or their containers or packages.

3.3.6 Ice-making equipment

All surfaces of ice-making equipment that come into contact with the ice shall be of suitable corrosion-resistant material. The ice-making equipment shall be of hygienic construction throughout. Whenever ice is transferred, stored or transported, it shall be effectively protected from contamination.

3.4 Water

3.4.1 Potable water

3.4.1.1 Subject to the provisions of 3.4.2, every factory shall have an adequate supply of clean potable water that is free from suspended matter and substances that could be deleterious to the product or harmful to health. In addition, the water shall have been so treated, by flocculation, filtration, chlorination or other acceptable processes, as to ensure compliance with the following requirements:

- a) **coliform organisms:** the count of coliform organisms shall not exceed five organisms per 100 ml of the water (see 10.16); and
- b) **faecal coliform bacteria:** faecal coliform bacteria shall not be detectable in 100 ml of the water (see 10.16).

3.4.1.2 For the purposes of the water examination, the coliform group shall include all gram-negative, non-spore-forming rods capable of fermenting lactose with the production of acid and gas at 37 °C in less than 48 h. Faecal coliform bacteria shall be regarded as gram-negative, non-spore-forming rods capable of fermenting lactose with the production of acid and gas at both 37 °C and 44 °C in less than 48 h, and of producing indole in tryptone water.

3.4.1.3 Chlorinated water that could have any deleterious effect on the product shall be dechlorinated immediately before use. In all cases, the free residual chlorine concentration shall be determined by the *N,N*-diethyl-1,4-*l*-phenylene diamine test or other acceptable test that has equivalent sensitivity.

3.4.1.4 Factory installations for the treatment of water shall be thoroughly cleaned at least once a week by an acceptable method.

3.4.2 Sea water

Clean, uncontaminated, freshly pumped sea water may be used for any purpose in the factory, provided that the count of coliform organisms does not exceed 50 organisms per 100 ml of the water (see 10.16) and no faecal coliform bacteria are detectable in 100 ml of the water (see 10.16).

3.4.3 Water for cleaning

Water used for the cleaning of the plant and equipment shall comply with the requirements of 3.4.1 or 3.4.2, as relevant. Chlorinated water that could have any deleterious effect on the product shall be dechlorinated immediately before use. In all cases, the free residual chlorine concentration shall be determined by the *N,N*-diethyl-1,4-*l*-phenylene diamine test or other acceptable test that has equivalent sensitivity.

3.4.4 Ice

The purity of ice shall be such that the water derived from it (by melting the ice under aseptic conditions at a temperature not higher than 10 °C) immediately after the ice has been manufactured, complies with the requirements of 3.4.1 or 3.4.2, as relevant.

3.5 Requirements for employees engaged in the handling, preparation, processing, packaging and storage of the product

3.5.1 Health

3.5.1.1 Before being engaged, employees shall pass an appropriate medical examination to ensure that they are free from communicable diseases, and they shall thereafter pass an annual medical examination. In the case of any absence of more than one day owing to illness, the employee shall, before resuming duty, report the nature of the illness which necessitated the absence to the factory hygiene officer who shall, should he deem it necessary, take the appropriate steps to obtain a medical opinion on the employee's fitness for work. An appropriate medical record of each employee shall be kept.

3.5.1.2 Any medical certificate submitted by an employee of a factory shall be available for inspection by the authority administering this specification.

3.5.1.3 No employee who is a carrier of, or is suffering from, any communicable disease, especially a carrier of *Salmonella* or *Shigella*, or one who shows symptoms of, or is suffering from, gastro-enteritis or an enterobacterial infection or a disorder or condition that causes discharge of fluid from any part of the skin or body, shall be allowed to come into contact with the product. Any such employee shall immediately report to the factory management.

3.5.1.4 No employee who is known to be affected with a disease that is capable of being transmitted through food shall be permitted to work in any part of the factory in a capacity in which there is a likelihood that the employee will contaminate the product with pathogenic organisms.

3.5.1.5 No employee who is suffering from any cut or injury shall be allowed to come into contact with the product unless the cut or injury has been so treated or dressed that the discharge of body fluid has been prevented, and the wound and its dressing have been so covered as to ensure that infection or contamination of the product is no longer possible.

3.5.2 Protective clothing

3.5.2.1 All employees engaged in the handling, preparation and processing of the product up to and including the packaging stage, but excluding employees operating within freezer storage rooms and chill rooms, shall wear clean, light-coloured, protective clothing, waterproof aprons, waterproof slipovers or boots, and clean, washable or disposable headgear that completely covers their hair. Woollen caps may be worn in freezer storage rooms only. Overalls shall completely cover the personal clothing of the employees.

3.5.2.2 Sleeves shall not extend below the elbows, except when covered by plastics sleevelets or when worn in freezer storage rooms and chill rooms. Waterproof protective clothing shall be of a plastics or rubber material or a similar acceptable material. All protective clothing shall be of hygienic design, shall have no external pockets, shall be in good repair and shall not constitute a source of contamination to the product.

3.5.2.3 Protective clothing, other than waterproof aprons, sleevelets and gloves, shall not be stored in work areas; when not in use, it shall be kept in changerooms and shall not be removed from the premises except for laundering under hygienic conditions. The homes of employees shall not be regarded as acceptable for this purpose.

3.5.2.4 Waterproof aprons, sleevelets and gloves shall be cleaned at each time of removal and as frequently as necessary, and shall be hung on hooks or pegs at exits from production areas during intervals between work and during visits to the toilet. Gloves shall be thoroughly cleaned and then disinfected by the use of chlorinated water or other acceptable solution or procedure. Waterproof aprons, sleevelets and gloves, and also all equipment used in the preparation, processing and packaging of the product, shall not be removed from the work areas except for repairs and for cleaning under hygienic conditions.

3.5.3 Personal hygiene

3.5.3.1 Before starting work, and after each absence from the factory production area, at regular intervals during production, or at any time when necessary, employees shall wash their hands with warm water and acceptable unscented liquid soap or detergent and rinse them in clean, running water. They may then dip their hands in an acceptable disinfectant solution, after which they shall rinse their hands in clean running water, if so required by the usage directions of the hand dip. Neither varnish nor lacquer shall be used on fingernails, and fingernails shall be kept short and clean. Jewellery shall not be worn by employees who handle raw materials or the unprotected product or both.

3.5.3.2 Neither employees' personal effects nor their food shall be present in any area where the product and its ingredients and packaging materials are handled and stored. Containers used in the preparation, processing or packaging of the product shall not be used for any other purpose.

3.5.3.3 The use of chewing gum and of tobacco in any form shall not be permitted within the areas where the product and its ingredients and packaging materials are handled or stored. Spitting shall not be allowed anywhere within the factory premises. Notices to these effects shall be posted strategically (see 3.2.11).

3.5.4 Visitors

Any person, including employees who visit or enter the production areas of the factory during the hours of operation, shall, when in those areas, comply with all hygiene requirements and shall wear clean protective clothing that shall be provided by the factory.

3.6 Hygienic operating requirements

3.6.1 General

3.6.1.1 In relation to the handling, transportation, processing, packaging, freezing and storage of the product, no operation(s) shall be performed and no conditions shall exist that are detrimental to the product. Materials liable to contaminate the product shall be kept away from the processing areas. Non-edible materials shall not be stored in the same room as edible ingredients or in the preparation or packaging areas of the factory.

3.6.1.2 There shall be no unhygienic conditions on the factory premises. Smoke from factory chimneys and exhaust fumes shall not be allowed to enter the factory building(s) in a quantity or manner that is offensive, injurious or dangerous to health, or that causes contamination of the product at any stage during the processing of the product.

3.6.2 Cleaning and disinfecting

3.6.2.1 Physical facilities

3.6.2.1.1 The building, premises, plant, equipment, utensils and all other physical facilities of the factory shall be kept clean and in good repair and shall be maintained in an orderly hygienic condition. The cleaning and disinfecting of the preparation, processing and packaging areas of factories and of all auxiliary equipment and utensils shall be organized on a regular basis and shall be carried out by trained employees. Before use, plant, equipment and utensils shall be thoroughly cleaned with a

detergent or other cleaning agent and disinfected. A detergent-disinfectant may be used. Immediately before the start of any operations, equipment shall be thoroughly rinsed with water (see 3.4.3) to remove any dust and any disinfectant (if used).

3.6.2.1.2 The processing and packaging areas, storage rooms, chill rooms, freezer storage rooms and freezers shall be kept free from mould, dust, dirt, flaking paint and other loose or extraneous material that could fall onto the product from walls, ceilings or overhead structures.

3.6.2.2 Floors and drainage channels

During periods of operation, the floors and the drainage channels in the preparation, processing and packaging areas shall be kept clean by regular sweeping, scrubbing and flushing with water. Refuse shall not be permitted to accumulate in drainage channels or on grids. Thorough cleaning of floors and drainage channels shall take place as often as is necessary and at the end of each day's operations, in order to maintain hygienic conditions. Footbaths shall be drained and cleaned regularly and the disinfectant shall be kept in active condition.

3.6.2.3 Walls of preparation, processing and packaging areas

The walls of preparation, processing and packaging areas shall, where necessary, be thoroughly washed immediately after each day's operations and the rooms shall be kept as free from dust as possible.

3.6.2.4 Cleaning and disinfecting materials

Cleaning and disinfecting materials, hot and cold running water that complies with the requirements of 3.4.3, saturated steam, hose pipes, brushes and other materials and equipment necessary for the cleaning of the factory, equipment and utensils shall be available. Cleaning materials, such as scouring wool, that could contaminate the product shall not be used.

3.6.2.5 Cleaning of water treatment installations

Factory installations for the treatment of water shall be thoroughly cleaned once a week by an acceptable method.

3.6.2.6 Cleaning of the processing system

The entire processing system shall be cleaned during each break in production that lasts for more than 1 h or whenever it is deemed to be necessary, and shall be effectively cleaned, at the end of each shift and at the end of each day's operations. It shall be clean at the time of further use.

3.6.2.7 Cleaning of utensils

Knives and similar items of equipment shall, during breaks in production, after use, or at any time when disinfection is necessary, be thoroughly cleaned and then disinfected by the use of chlorinated water or other acceptable solution or procedure. When the factory is in operation, equipment and utensils shall not be removed from the work area except for repair, cleaning or replacement.

3.6.2.8 Cleaning of the discharge system

Any discharge system at the jetty and any conveyance system to the factory shall be so drained that stagnant water does not collect. Such systems shall be regularly cleaned of stale material and cleaned before and after use. Holding tanks shall be similarly treated.

3.6.3 Repairs

3.6.3.1 Whenever maintenance or repairs have been carried out in production areas, tools and replaced equipment shall be immediately removed from these areas and the affected equipment shall be thoroughly cleaned and disinfected.

3.6.3.2 Welding repairs in the areas where the product is handled, prepared, processed or packaged shall be performed when the plant is not in production or as emergency work during breakdown only, and in such a way that the product is not exposed to welding fumes, splatter or slag particles.

3.6.4 Efficacy of cleaning

The efficacy of the cleaning and disinfecting process specified in 3.6.2 shall be such that, in samples taken in accordance with 10.15, the percentage efficacy of cleaning and disinfecting in the sample, determined in accordance with 10.15, is acceptable when scored by the system set out in 10.15.

3.6.5 Containers, bins and crates for the handling of raw materials and the product

When filled or partly filled with raw material or with the product, containers shall not be stacked in a way that allows contact of the contents of a container with the bottom of the container stacked above it. Containers that hold edible materials shall not be stacked direct on the floor or against the wall, and whenever they are moved, they shall be effectively protected from contamination. Containers that hold edible materials shall be stored at least 250 mm above floor level. Where pallets are used instead of racks, shelves or stands, there shall be a clearance of at least 100 mm above floor level. Containers shall be of hygienic design and shall either be light coloured or have a bright metallic finish. Non-edible materials shall not be stored in the same room as edible ingredients or in the preparation or processing areas of the factory.

3.6.6 Wrapping materials

Wrapping materials used during the packaging of the product shall be kept in corrosion-resistant containers of hygienic construction, and shall be so dispensed that the wrappers require only minimum handling.

3.6.7 Packaging materials

Materials for the packaging of the product shall be stored on racks/shelves at a distance of at least 250 mm from the floor or on pallets, and away from the walls.

3.6.8 Spare parts

Spare parts for machinery, and other items that are capable of contaminating the product, shall be stored away from the preparation, processing, packaging and product storage areas.

3.6.9 Freezers, chill rooms, freezer storage rooms and their equipment and instruments

Freezers, chill rooms, freezer storage rooms and their equipment and instruments shall operate efficiently and shall be kept clean and in a hygienic condition. The temperature in freezer storage rooms shall be automatically and continuously monitored and a record of the temperature shall be kept and shall be available for inspection. Products shall not be stacked direct on the floor or against the walls. No material other than the product or ingredients of the product shall be stored in freezers, chill rooms or freezer storage rooms. No condition and no object or matter that could affect the flavour, odour or appearance of the frozen product in any way shall be present in freezers, chill rooms or freezer storage rooms.

3.6.10 Removal of refuse and offal

Litter, waste and overflow shall not be allowed to accumulate or to give rise to unhygienic conditions, and shall be disposed of promptly in an efficient and hygienic way. Offal shall be removed from the processing area in a hygienic manner, and containers for offal awaiting removal from the factory shall

be well separated from the processing areas. A separate refuse room or other acceptable refuse facility shall be provided on the premises, and shall be cleaned at least once a day.

3.6.11 Vermin control

All buildings in which raw materials, ingredients and the product are stored, or in which the product is handled, prepared, processed or packaged, shall be kept free from insects, birds, rodents and other vermin. All rooms in which raw materials, ingredients or packaging materials are stored, shall, in addition, be rodentproof.

3.6.12 The use of pesticides

Pesticides shall not be used in work areas while preparation, processing and packaging are in progress, and precautions shall be taken to ensure that equipment and work surfaces are kept free from pesticide residues. Pesticides and cleaning chemicals shall at no time be allowed to come into contact with wrapping material, containers, raw materials or the product. The room in which pesticides are stored shall be kept locked and the materials contained in it shall be handled only by employees trained in their use.

3.6.13 Animals

Animals, including birds, shall not be allowed in any part of the factory.

3.6.14 Operations aboard fishing vessels

Shipboard handling, chilling, processing and freezing of the product shall be conducted under conditions of sanitation and hygiene equal to those of the equivalent procedures and practices of shore establishments. Before any product comes on board, and between hauls, the deck, deck pounds, pen stanchions and dividing boards, and all other deck equipment that will come into contact with the product, shall be hosed down with clean sea water. The deck shall be scrubbed to remove all visible dirt and debris at least once a day. During fishing trips, the hold bilge sump of the vessel shall be drained regularly. All gear shall be thoroughly cleaned when fishing has ceased. The gut of ripped fish shall be removed immediately, and the fish shall be washed in clean water that is free from entrails and liver particles. When practicable, the deck shall be cleared before the next haul is landed on deck. The deck, hold and processing areas of fishing vessels shall be thoroughly cleaned and disinfected immediately after discharge of the cargo.

3.7 Records

On fishing vessels with freezing facilities, or with both freezing and packaging facilities, and in factories on land, adequate quality records shall be maintained. Quality records and records of freezer storage temperatures on fishing vessels and in factories on land shall be kept for a period of at least two years (see 3.2.16.3 and 3.2.16.4).

3.8 The handling, preparation, processing, packaging, transportation and storage of the product

3.8.1 General

From the time the catch comes on board and during preparation, processing, packaging, transportation and storage, the product shall be protected from heat, the direct rays of the sun, frost, the drying effect of wind, and contamination by birds, dust, oil, fuel and noxious fumes. The product shall be processed as soon as possible after having been caught. Except where intended to be frozen in the round, fish shall be gutted as soon as possible and shall be thoroughly washed in clean water to remove all blood, slime and pieces of gut.

3.8.2 Fishing vessels not equipped to chill or freeze

The catch shall be transported to land, where the chilling or freezing process shall be started within 8 h of catching.

In cases where the fish are immediately processed or packed on board such a vessel, the requirements of 3.8.1 shall apply. The temperature of fish on board shall not exceed 20 °C.

3.8.3 Chilling vessels

On board fishing vessels that are equipped with chilling facilities, fish intended for processing shall, where practicable, be chilled or iced as soon as possible after they have been landed on deck. Fish that have not been chilled within 8 h of having been landed on deck shall not be processed. Fish that are to be kept at sea for between 8 h and 10 d shall, as a minimum requirement, be stowed in ice. Flaked ice, cubed ice or finely crushed cobbled ice, of diameter less than 5 cm, shall be used, and staging or shelves shall be so installed as to limit the depth of bulk storage to a maximum of 1 m. Individual layers of fish shall be separated from one another and from the floor, ship sides and bulkheads by acceptable layers of ice. Species of fish that could have a detrimental effect on one another shall be stored in separate holds or containers. Vessels that are equipped to chill but not to freeze shall not be used to keep fish at sea for more than 10 d. Fish shall not be kept iced for longer than good manufacturing practice permits. In the case of tuna, vessels that are not equipped to freeze shall keep their catch on ice or in chilled or refrigerated sea water and shall transport the catch to factories on land within 5 d.

3.8.4 Tuna

Tuna may be kept on ice for a period not exceeding 5 d (see 3.8.3). Brine pre-freezing of tuna at -7 °C is adequate for a period not exceeding 14 d. For longer periods of storage, the fish shall be frozen and kept frozen at a temperature of -20 °C or lower. If brine pre-freezing is employed, the total chloride (determined as NaCl) content of the tuna, determined in accordance with 9.9, shall not exceed 2 % (by mass).

3.8.5 Transportation by road and rail

Transportation of the product by road shall be carried out in covered and insulated or refrigerated vehicles constructed and equipped to protect the product adequately. Under dusty conditions or conditions that might affect the fish adversely, the transportation by road shall be in a vehicle with a dustproof storage hold. If the duration of road transport is longer than 1 h:

- a) unfrozen fish shall be transported in an insulated and refrigerated truck that can keep the fish at the temperature of melting ice, or in an insulated truck where the fish is on ice; and
- b) a frozen product shall be conveyed in an insulated and refrigerated storage hold in a truck, in accordance with the requirements in 7.2.2 and 7.2.3.

Transportation of the product by rail shall be carried out in insulated and refrigerated vehicles. The frozen final product awaiting transportation or loading shall not be kept unrefrigerated for longer than 1 h. Adequate precautions shall be taken to prevent the product from becoming physically damaged, for example as a result of pressure or movement during transportation. The product shall not be transported with other products that can contaminate or impair the product. The means of transport used for the product shall not at any time be used for transporting other products likely to impair or contaminate the product. The inside surfaces of the means of transport shall be so finished that they do not adversely affect the product, shall be smooth and shall be easy to clean and disinfect. If ice is used to chill the product, adequate drainage shall be provided in order to ensure that the water from the melted ice does not stay in contact with the product.

3.8.6 Freezing of the product before processing

If the product is to be frozen before processing, the freezing shall start

- a) soon after the catch is landed on deck, or
- b) in the case of white fish and flat fish and similar species with a low fat content, within 8 h of being caught, on condition that the fish temperature is never allowed to rise above 20 °C, or
- c) where the temperature of the fish in (b) above has been brought down to the temperature of melting ice, within 10 d, or
- d) in the case of high-risk fatty fish (including *Clupeidae* and *Scombridae*), within 72 h of landing on board, provided that the fish temperature is brought down to 3 °C or lower within 6 h after being caught and to 0 °C within 16 h of landing on board.

3.8.7 Thawing of the frozen product for processing

When being thawed for processing, the frozen product shall not be exposed to ambient temperatures higher than 20 °C. Thawing shall be as rapid as possible and shall be completed in less than 20 h. Unless the processing is started before or immediately after thawing is complete, the chilling of the thawed fish to a temperature as close to 0 °C as possible shall be started immediately. Freezing after processing shall, unless the processing requires a longer period, be started within 8 h of the completion of the thawing process.

3.9 Special requirements relating to marine molluscs

Marine molluscs shall be protected from heat and contamination, shall be kept moist (and alive, where possible) while on board the vessel and shall be acceptably protected during transportation. Where marine molluscs, other than abalone, cannot be kept alive, they shall either be frozen, or shall be kept in ice for a period not exceeding 2 d before being processed or frozen.

Octopus and squid may be preserved in ice for 4 d to 5 d, provided that the melted ice water is properly drained.

Processing of abalone shall start while the abalone is still alive. The flesh shall be cleaned under hygienic conditions that ensure freedom from contamination. The gut and the mouth shall be removed. The fringes and the foot need not be removed, but the epithelium between the fringes and the foot shall be brushed off. The cleaning operation shall be followed by thorough washing in running water that complies with the requirements of 3.4.1 or 3.4.2. The flesh shall be free from unsightly fork marks or other damage.

4 Requirements for the ingredients and the product

4.1 Condition of ingredients and the product

4.1.1 General

4.1.1.1 All ingredients used shall fall within the scope of, and shall comply with the requirements of, the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972), and its Regulations. All ingredients used in the preparation of the product shall be clean, sound, of good quality and in every way fit for human consumption. In addition, the product shall not contain any substance in amounts that might present a hazard to human health.

4.1.1.2 Wood smoke that is used for the smoking of the product shall be obtained by the use of wood that is acceptably free from gum and resin, paint, timber preservative and other added substances.

4.1.1.3 All units and pieces of fish presented in one of the forms described in 4.2.2 to 4.2.17 (inclusive) shall comply with the relevant description. Scraps of fish shall not be included. If frozen fish

or frozen fish pieces are glazed with chilled water before packing, the temperature of the water used for glazing shall be 5 °C or lower.

4.1.1.4 Fish products described in 4.2.18 to 4.2.24 (inclusive) shall be free from viscera, heads and gills, and acceptably free from scales, fins and tails.

4.1.2 Fish

4.1.2.1 Frozen fish

Frozen products shall be prepared and inspected in accordance with 8.1.

4.1.2.2 General characteristics

The fish used in the preparation of the product and not previously frozen shall have the following general characteristics:

- a) a characteristic fresh appearance, colour and odour, without any perceptible rancidity or sourness;
- b) where applicable, prominent, bright, clear and moist eyes;
- c) where slime is present and natural to the species, transparent or creamy white slime;
- d) where applicable, bright red gills; gill odours shall be characteristically fresh for the species;
- e) where applicable, bright abdominal blood;
- f) firm and elastic flesh adhering to the bone; and
- g) when the fish is cooked, an odour and flavour that is characteristically fresh for the species and a firm but tender and succulent texture.

4.1.2.3 Tuna

In the case of tuna, the following more specific and additional characteristics shall apply:

- a) **skin mucus:** preferably transparent but may also be milky; the colour iridescent to bright;
- b) **eyes:** brilliant colour, convex to slightly convex in shape, but not flat; the pupils black to duller black and transparent clear to slightly bloody;
- c) **gills:** bright-red, pale-red or brown-red in colour; characteristic neutral-to-sweet odour;
- d) **gill odour:** fresh, strong seaweedy, metallic, like freshly cut grass, very slightly musty, slightly peppery or oily. Definitely not acetic, butyric, fruity, faecal, sulfurous, sour, beery, malty, lactic or predominantly musty;
- e) **abdominal wall:** intact to slack, but not soft or damaged;
- f) **peritoneum:** preferably, but not necessarily, intact, but not torn or dissolved;
- g) **colour of flesh:** light pink to dark red, depending on species;
- h) **colour of flesh along backbone:** same as that of the surrounding flesh;
- i) **physical damage:** slight deformity and mutilation acceptable, but the fish shall not be split; and
- j) **cooked fish:** a flavour characteristic of the species, but not insipid, bitter or peppery. There shall

be no excessive protein curd (coagulated substances of denatured protein) on the surface of the flesh and no separation of the muscle layers (honeycombing). The colour shall be off-white or pinkish to light brown, depending on the species. There shall be no orange or green discoloration of the meat.

4.1.3 Salt

Salt used in the preparation of the product shall be edible, free from bitterness and other off-odours and off-flavours, discoloration and impurities.

4.1.4 Seasoning

Seasoning ingredients shall be free from foreign matter and adulterants.

4.1.5 Additives

Only permitted additives (see 4.1.1.1) shall be used, and then only in the permitted quantities.

4.2 Presentation of fish and fish products

4.2.1 General

Fish or fish products shall be presented whole or in other acceptable forms, such as those given in 4.2.2 to 4.2.24 (inclusive).

4.2.2 Whole (round) fish

A fish as taken from the sea and not yet processed, or a fish that has been bled only.

4.2.3 Gutted fish

A round fish that has been eviscerated.

4.2.4 Gilled and gutted fish

A gutted fish (see 4.2.3) from which the gills have been removed.

4.2.5 Headed and gutted fish

A gutted fish (see 4.2.3) from which the head has been removed.

4.2.6 Dressed fish

A headed and gutted fish from which the scales have been removed.

4.2.7 Cutlets

Crosswise cuts, of thickness not exceeding 40 mm, from fish from which all viscera and blood have been removed and in which large fish bones do not protrude conspicuously.

4.2.8 Fillet (wings on)

The fleshy side of a whole fish cut lengthwise as close to the backbone as possible and including the pectoral fin, belly flap, pin bones, neck bones and skin. It shall be an intact, unragged section of fish and shall be acceptably free from scales.

4.2.9 Fillet (single fillet)

The fleshy side of a whole fish as described in 4.2.8, but with the pectoral fin and shoulder girdle removed.

4.2.10 Skinned fillet

A fillet as described in 4.2.9, but with the skin removed.

4.2.11 Skinned and boned fillet (skinless, deboned fillet)

A fillet as described in 4.2.10, but with the fish bones removed.

4.2.12 Double fillet (butterfly fillet)

The two fillets from a single fish, as described in 4.2.9, 4.2.10 or 4.2.11, but joined together along either the back or the belly.

4.2.13 Fish blocks

Blocks of fish prepared in any acceptable form and interleaved when necessary. Subject to appropriate labelling (see 6.1(b)), the blocks may also consist of minced fish. Fish blocks shall, as far as practicable, be free from bulging, voids, surface discoloration, dehydration and "freezer burn" (deep dehydration).

4.2.14 Trawled or trawl-marked whole fish

Whole fish of good quality, showing trawl marks such as depleted skin, some bruising and some surface cuts and that are suitable only for further processing, and that, if packed, shall be marked accordingly.

4.2.15 Smoked fish**4.2.15.1 General**

Any of the fish or fish cuts described in 4.2.2 to 4.2.14 and that have been smoked (see 4.1.1.2).

4.2.15.2 Hot-smoked fish

Fish smoked at a sufficiently high temperature and for such a period of time as to ensure the heat coagulation of the protein throughout.

4.2.15.3 Cold-smoked fish

Fish smoked at a temperature at which the product does not show any signs of heat coagulation of protein.

4.2.16 Smoke-flavoured fish

Any of the fish or fish cuts described in 4.2.2 to 4.2.14 and that have been dipped in a smoke-flavoured liquid or dry material.

4.2.17 Fish fingers (sticks) and fish portions**4.2.17.1 General**

Fish fingers (sticks) (see 4.2.17.2) and fish portions (see 4.2.17.3) prepared from blocks of frozen

skinned and boned fish flesh, or formed from unfrozen fish flesh, with or without additional ingredients, into portions that are acceptably uniform in size and shape.

4.2.17.2 Fish fingers (sticks)

A product, including one with a bread coating or a batter coating, of unit mass not less than 20 g and not more than 50 g, and the length of which does not exceed three times its greatest width.

4.2.17.3 Fish portions

A product, with or without a bread coating or a batter coating, of any shape and size; if the mass of the product is less than 50 g, the qualifying word "portion" shall be acceptably inserted on the main panel of the package. Fish portions prepared from unskinned or incompletely boned fish shall be described as "skin-on" portions or "not boneless" portions respectively (or both), or shall be given another description with the same meaning.

4.2.18 Fish kebabs

Cuts of fish, with or without vegetables or fruit or any combination thereof, threaded on skewers.

4.2.19 Fish cakes, fish balls and fish patties

Cakes, balls and patties that have been prepared from edible fish flesh, with or without other ingredients, and that are acceptably uniform in shape, size and texture.

4.2.20 Fish sausages

Sausages that have been prepared, with or without other ingredients, from edible minced fish flesh or boned fish fillet and that may have been smoked. Fish sausages may have been formed in natural or artificial casings. Inedible casings shall have been completely stripped off before packing, where appropriate. Fish sausages shall be uniform in size, shape and texture, and shall be free from discoloration and from ragged ends. There shall be no off-cuts or burst, distorted or cut-marked units. Cross-cut units shall have been cleanly cut at right angles to the longitudinal axes.

4.2.21 Fish in sauce

Solid fish or pieces of fish packed in sauce, together with permitted seasoning (see 4.1.4), spices or other appropriate ingredients.

4.2.22 Fish with vegetables or cereals (or both), with or without sauce

Solid fish or pieces of fish packed with vegetables or cereals (or both), with or without sauce, together with permitted seasoning, spices or other appropriate ingredients.

4.2.23 Curried fish

Solid fish or pieces of fish, with or without batter, packed in curry sauce, together with permitted seasoning and spices.

4.2.24 Pickled fish

Solid fish or pieces of fish, with or without batter, packed with onions and curry sauce, together with permitted seasoning and spices.

4.3 Physical requirements

4.3.1 Net mass

The net mass of a frozen product, determined in accordance with 8.3 or 8.4, as relevant, shall comply with the relevant requirements of the Trade Metrology Act, 1973 (Act 77 of 1973).

4.3.2 Packing

The product shall be acceptably packed. (See also 5.1.)

4.3.3 Uniformity of size

In packs where more than one unit is packed in a package, the units shall, on visual inspection, be acceptably uniform in size except that one filler piece may be used. If packs contain units of varying sizes, this shall be declared on the label.

4.3.4 Colour and appearance

The product shall be attractive in appearance and characteristic in colour. In any one package, the units shall be acceptably uniform in colour. In flesh packs, raggedness, blood clots, blood columns, staining and discoloration shall not be present to the extent that they detract from the appearance of the pack. Roes shall be intact unless labelled as broken roes and shall have the characteristic colour of fresh roes.

4.3.5 Texture

In flesh packs, the flesh shall not be bruised and shall have the firmness of texture that is characteristic of the species.

4.3.6 Odour and flavour

The state of the raw material, the production process and the packaging shall ensure that, after the frozen product has been thawed to a temperature above 10 °C, and the units have been separated where necessary, the odour is fresh and characteristic of the product, and that off-odours and other indications of deterioration or of the use of inferior raw materials are absent. The odour and flavour of the cooked product shall also be fresh and characteristic.

4.3.7 Freedom from defects

4.3.7.1 The product shall be acceptably free from bruised or otherwise damaged material, from detached scales and from sand, grit, dirt, pieces of shell, other extraneous matter and visible parasites. The product shall be acceptably free from slime, from "freezer burn" (deep dehydration) that cannot easily be removed by scraping, and from discoloration and blemishes.

4.3.7.2 A product described as boneless shall contain not more than one fish bone defect (see 2.7) per kilogram of the fish component of the product, and shall be free from cartilage or fish bone that, after being cooked, is capable of piercing or hurting the palate.

4.3.7.3 A product described as boned or deboned shall not contain more than five fish bone defects (see 2.7) per kilogram of the fish component of the product.

4.3.7.4 A product described as skinless shall have no residual skin tissue or surface damage that materially detracts from its appearance. A product described as being "skin-on" shall be substantially free from skin damage or surface damage that materially detracts from its appearance.

4.3.8 Other physical requirements

When tested in accordance with the methods referred to in column 4 of table 1, the product shall comply with the appropriate requirements given in column 3.

4.4 Chemical requirements

When tested in accordance with 9.3 to 9.9, the product shall comply with the relevant requirements of this specification (see 3.8.4 and table 1) and of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972).

4.5 Microbiological requirements

When tested in accordance with the methods given in 10.6 to 10.14, the product shall comply with the requirements given in columns 2, 3 and 4 of table 2.

5 Packaging, glazing, freezing and storage

5.1 Packaging materials and outer containers

5.1.1 Packaging and wrapping materials

Subject to the relevant requirements of the Regulations promulgated under the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972), packaging and wrapping materials for the unprotected product shall be unused (new), clean, non-toxic and inert and of low moisture-vapour permeability, and shall not contain substances deleterious to the product or harmful to health. No packaging or wrapping material shall impart a flavour to, or in any way cause discoloration of, the product, or be itself discoloured by contact with the product. Unless the fish product is glazed (see 5.2), it shall be packed in a material of acceptably low permeability to moisture and oxygen.

Table 1 — Physical and chemical requirements

1	2	3	4
Product	Property	Minimum requirement % (by mass)	Test method subclause
Bread-coated or batter-coated fish products (raw)	Fish content	60 ¹⁾	8.2.1
Bread-coated or batter-coated fish products (partly cooked, or fried)	Fish content	50 ¹⁾	8.2.1
Fish cakes	Fish content	37,5	9.8
Fish sausages, fish balls and fish patties	Fish content	50	9.8
Fish in sauce	Washed mass	50 ¹⁾	8.2.2
Fish with vegetables or fruit or cereals or any combination thereof	Washed mass (i.e. all solid ingredients)	60 ¹⁾	8.2.2
	Washed mass of fish component	35 ¹⁾	8.2.3
Curried fish	Washed mass (i.e. all solid ingredients)	50 ¹⁾	8.2.2
	Fish content	40 ¹⁾²⁾	8.2.1
Pickled fish	Washed mass (i.e. all solid ingredients)	50 ¹⁾	8.2.2
	Mass of fish component including batter	45 ¹⁾	8.2.3
	Fish content	35 ¹⁾²⁾	8.2.1
	Onion	5 ¹⁾	8.2.5
Fish pies and similar products	Fish content of filling	50	9.8
	Mass of filling (raw)	45	8.2.4
	Mass of filling (cooked)	25	8.2.4
Fishpaste and chopped fish with vegetables, with or without cereals	Fish content	50	9.8
Bread-coated or batter-coated marine molluscs (including calamari rings)	Mollusc content	40 ¹⁾	8.2.1

- 1) Expressed as a percentage of the declared net mass of the product.
2) Only tested in the event of concern about the fish content of the coated product.

Table 2 — Microbiological requirements

1	2	3	4
Organism	Contents, max.		
	Raw products ¹⁾ (with or without added ingredients)	Cooked products ²⁾ or hot-smoked products (or both)	Cold-smoked products ³⁾
Standard plate count	1 x 10 ⁶ /g	1 x 10 ⁵ /g	1 x 10 ⁵ /g
Enterobacteriaceae	⁴⁾	100/g	100/g
Presumptive <i>E. coli</i>	Nil/10 g	Nil/10 g	Nil/10 g
<i>Staphylococcus aureus</i>	10/g	10/g	10/g
<i>Salmonella</i>	Nil/25 g	Nil/25 g	Nil/25 g
<i>Shigella</i>	Nil/25 g	Nil/25 g	Nil/25 g
<i>Clostridium perfringens</i>	Nil/25 g	Nil/25 g	Nil/25 g
<i>Vibrio cholerae</i>	Nil/25 g	Nil/25 g	Nil/25 g
<i>Vibrio parahaemolyticus</i>	Nil/25 g	Nil/25 g	Nil/25 g
<i>Listeria monocytogenes</i>	⁴⁾	Nil/25 g	Nil/25 g

1) Products that require cooking before being consumed.
2) Products that only require thawing and reheating before being consumed.
3) Intended for consumption without cooking.
4) Not to be tested.

Packaging materials shall

- a) not be such as to impair the organoleptic characteristics of the product,
- b) not be capable of transmitting substances injurious to the product or harmful to human health, and
- c) be strong enough to protect the product adequately.

5.1.2 Outer containers

Only fibreboard or other acceptable outer containers shall be used. Outer containers shall be unused (new), clean and intact, and shall be neatly and securely closed. Wooden outer containers shall not be made of green wood and shall not contain any substance that is injurious to the product or harmful to health. Outer containers shall be so closed as to prevent contamination of the contents by dust or foreign matter and shall be strong enough to protect the product adequately.

5.2 Glazing

The product may be glazed using chilled water or other acceptable glazing agent as a substitute for wrapping, provided that the glaze is maintained in an acceptable condition up to and including the final point of sale. When the product is glazed, the coating of ice shall cover the product completely to ensure that dehydration and oxidation are minimized. Water used for glazing shall comply with the requirements for potable water (see 3.4.1) or sea water (see 3.4.2), and its temperature shall be 5 °C or lower.

5.3 Freezing

The stacking of the product in freezers (other than plate or brine freezers) shall be away from floor and wall surfaces and shall be such that air circulation between packages is not impeded. The product

shall be subjected to either the freezing or the quick-freezing process as soon as possible after processing. When the product is packed into containers before freezing, it shall not be exposed to excessively high temperatures and the delay between packaging and freezing shall not exceed 3 h. The temperature of a product, other than a smoked or a precooked product or a product processed within 8 h of having been landed on deck, shall not exceed 20 °C during processing. Freezing capacity shall not be overtaxed. The freezing and the frozen storage of the product shall be carried out in a way that will obviate "freezer burn".

5.4 Frozen storage

5.4.1 Records of the temperature of freezer storage rooms shall be retained for at least two years from the date of recording, and shall be available for inspection by the authority administering this specification. (See also 3.2.16.3.)

5.4.2 The product shall be stored and maintained at a temperature of -18 °C or lower. The practical storage life of flat fish, lean fish, fatty fish and tuna at various temperatures is given in table 3, and any product stored in excess of the appropriate period shall be liable to re-inspection at the discretion of the authority administering this specification.

Table 3 — Practical storage life

1	2	3	4	5
Product	Storage temperature			
	-18 °C	-20 °C	-25 °C	-30 °C
	Maximum storage life months			
Flat fish, e.g. sole	12	15	21	25
Lean fish, e.g. hake, kingklip, skate, squid, fish sticks and fish portions	8	12	18	21
Fatty fish – glazed	6	6	9	12
– vacuum-packed	10	10	12	15
Tuna	6	6	9	12

5.4.3 If at any time during storage, the temperature of the product rises above the appropriate storage temperature, it shall be rapidly lowered to that temperature. If the temperature of the product rises above -7 °C, the product shall, in addition, be submitted to the relevant authority for re-inspection. Temperature shall be measured using a suitable measuring instrument.

6 Marking

6.1 Marking on packages that are not for export (see 6.4)

Except as allowed for in terms of 6.4, the following information shall appear on each package, in legible and indelible marking and in accordance with 6.2, in a typeface of such size and presentation as prescribed by the Regulations promulgated under the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972), and the Trade Metrology Act, 1973 (Act 77 of 1973):

- a) the name and full physical address of the manufacturer, producer, proprietor or controlling company, or, in the case of containers packed for any other person or organization, the name and full physical address of that person or organization;

- b) a true description of the product, including the name of the product and the presentation of the contents. In addition, if so desired by the person or organization referred to in (a) above, in the case of a quick-frozen product (see 2.22), the words "Quick frozen". The name and/or trade name or designation that is used in the labelling of the product shall not be misleading, and the variety of fish, except in the case of fish sticks, fish portions, fish cakes, fish balls, fish patties and fish sausages, shall be stated. The method of preparation and the presentation of the contents shall be in accordance with the description on the label or package. Where applicable, the description shall be in accordance with the relevant description given in 4.2;
- c) where applicable, a list of the ingredients, in descending order of content;
- d) a statement that the product is cooked or uncooked, as applicable, and instructions for storage, given in the following manner:
- Uncooked (or raw) – Keep frozen;
 - Partly cooked – Keep frozen. Do not refreeze once thawed;
 - Cooked – Keep frozen. Do not refreeze once thawed;
- e) in the case of products for sale in the Republic of South Africa, the net mass of the contents, where applicable (in accordance with the Regulations promulgated under the Trade Metrology Act, 1973 (Act 77 of 1973)); where the product has been glazed, the net mass declaration of the product shall be exclusive of the glaze;
- f) the country of origin;
- g) if the product has been glazed with sea water, a statement to this effect prominently displayed on the main panel of the label, in immediate conjunction with the name of the product;
- h) where relevant, directions for use;
- i) any labelling requirement specifically called for by regulation; and
- j) the date of manufacture and the identity of the factory in which the product was packed. The use of a code is permissible, provided that the key to the code is disclosed to the authority administering this specification.

6.2 Labels

6.2.1 The information required in 6.1 shall be printed on each individual package or on the overwrap covering of such a package, or on a label of acceptable material attached to the package.

6.2.2 Labels on packages shall be clean and neat and securely attached. They shall not be superimposed on other labels or on matter printed direct on the packages. They shall not be applied by any person other than the manufacturer or his authorized agent.

6.2.3 Labels or sealing adhesives that are liable to deteriorate under the conditions of storage of the packaged products shall not be used.

6.3 Marking on outer containers that are not for export (see 6.4)

6.3.1 Outer containers shall be clean, neat and unbroken, and on every such container (carton, box, etc.) shall be printed or stencilled the quantity and size or net mass of the packages it contains and the information required by 6.1 (a), (b), (d) and (e), except that the physical address required by 6.1 (a) need not be the full physical address but shall be sufficient for identification purposes. The method of preparation need not be given on the outer container.

6.3.2 The date of manufacture, the identity of the factory and the batch number (if applicable) shall be stamped or otherwise indelibly marked on the outer container or on a label securely attached to the outer container, or on a packing slip inserted into the outer container. A code may be used for the date of manufacture, provided that the key to the code is disclosed to the authority administering this specification.

6.4 Marking on outer containers and packages for export

Outer containers and packages for export shall be marked in accordance with the requirements of the importing country and may be marked differently from the requirements of 6.1 and 6.3, provided that there is no attempt to misrepresent the contents. Details as required by 6.1(j) shall be printed on each outer container and package.

7 Delivery and inspection

7.1 General

The requirements of 7.2 and 7.3 shall be subject to the requirements of the applicable statutory Acts and Regulations.

7.2 Delivery

7.2.1 General

The delivery of frozen products shall take place under hygienic conditions.

7.2.2 Delivery for export

Frozen products for export shall be conveyed from the factory to the freezer storage depot and delivered into the transporting vessel's freezer storage holds at a temperature of $-18\text{ }^{\circ}\text{C}$ or lower. If, at any time during this transportation, the temperature of the product rises above $-18\text{ }^{\circ}\text{C}$, it shall be lowered to the required temperature as rapidly as possible. The product shall be re-inspected if the temperature has risen above $-7\text{ }^{\circ}\text{C}$.

7.2.3 Delivery for local sale

Frozen products for local distribution shall be conveyed in refrigerated or insulated trucks from the factory or the freezer storage depot to the point of retail sale. The temperature of the product during local transportation shall, except at the outer surfaces of a stack, be $-18\text{ }^{\circ}\text{C}$ or lower. Refrigerated trucks shall be fitted with at least one thermometer that is so installed as to be readable from outside the refrigerated compartment.

7.3 Inspection for export

Each consignment of frozen product shall be available for inspection at the freezer storage depot from which it is to be shipped for export. The authority administering this specification shall be notified at least 14 d before the expected date of shipment of the product. Products not accepted for export shall, if stored in freezer storage rooms together with products approved for export, be segregated and clearly identified. The frozen product shall be submitted for re-inspection at the point of shipment if, while the product was being held for shipment, doubt arose as to its temperature history.

8 Methods of physical examination

8.1 Physical examination of frozen fish for its general characteristics

8.1.1 Smaller fish may be thawed whole. In the case of a large fish, cut a sample wedge of suitable size from the back of the fish just behind the head and extending down to the backbone or, alternatively, cut a cross-section piece at least 50 mm thick through the fish, just behind the head or in front of the tail. Where possible, ensure that the mass of each sample piece is at least 1 kg. Thaw the sample and examine it for odour and colour (see 4.1.2.2(a)). Cartilaginous fish such as sharks and rays should be thawed in air to facilitate the detection of any ammoniac odours.

8.1.2 In the case of tuna, thaw the sample and remove the blood by rinsing the sample in tap water. Then examine each sample for colour in general (see 4.1.2.3(g)), and for colour along the backbone (see 4.1.2.3(h)). Steam the sample until a core temperature of at least 70 °C to 75 °C has been reached and, in terms of the requirements of 4.1.2.3(j), examine for:

- a) flavour;
- b) protein curd on the surface of the flesh;
- c) separation of muscle layers; and
- d) colour.

8.1.3 Visually examine the fish for the remainder of its general characteristics in terms of the applicable requirements given in 4.1.2.

8.2 Determination of the fish content, filling content and washed mass

8.2.1 Determination of the fish content of bread-coated or batter-coated products

8.2.1.1 Record the declared net mass (m_0) printed on the package. Place the contents of the package in a water-bath maintained at 47 °C to 49 °C and allow the units to remain in the water until the breading or batter (as applicable) becomes soft and can easily be removed from the still-frozen fish flesh by means of a round-tipped spatula or table knife.

NOTE Several preliminary trials may be necessary to determine the optimum immersion time required for "de-breading" or "de-battering" the units in a package. **For these trials only**, a saturated solution of copper (II) sulfate may be used in place of the water. The optimum immersion time is the minimum time of immersion in the copper sulfate solution required before the breading or batter (as applicable) can easily be scraped off, leaving only a slight trace of blue colour on the surface of the "de-breaded" or "de-battered" fish units.

8.2.1.2 Remove the units from the water-bath and blot them lightly with paper towelling. Scrape and remove the breading or batter from the fish flesh by means of the spatula, removing the coating from narrow sides and ends first and then from wide flat surfaces. If the coating of a unit is difficult to remove, immerse the unit for up to a further 5 s and remove the residual coating. Ensure that the total immersion time does not exceed 15 s. Determine the mass (m_1) of all the "de-breaded" or "de-battered" units.

8.2.1.3 Calculate the fish content, α , expressed as a mass percentage of the product, using the following formula:

$$\alpha = \frac{m_1}{m_0} \times 100$$

where

α is the fish content in percentage;

m_0 is the declared net mass of the package, in grams;

m_1 is the total mass of all the "de-breaded" or "de-battered" units, in grams.

8.2.2 Washed mass of a product that contains sauce

8.2.2.1 Record the declared net mass (m_0) printed on the package. Place the contents of the package on a tared sieve of nominal aperture size approximately 2 mm, and rinse the product with water, pre-warmed, if necessary, to a temperature not higher than 38 °C, until free of sauce. Drain for 2 min and then determine and record the mass of the material remaining on the sieve as the washed mass (m_1) of the fish component.

8.2.2.2 Calculate the percentage washed mass of the product by using the formula given in 8.2.1.3.

8.2.3 Washed mass of fish component of a product that contains vegetables or fruit or cereals (or any combination of these)

8.2.3.1 Record the declared net mass (m_0) printed on the package. Place the contents of the package on a tared sieve of aperture size approximately 2 mm and rinse with water, pre-warmed, if necessary, to a temperature not higher than 38 °C. Remove the vegetables or fruit or cereals, as applicable. Drain for 2 min and then determine and record the mass of the material remaining on the sieve as the washed mass (m_1) of the fish component.

8.2.3.2 Calculate the percentage washed mass of the product by using the formula given in 8.2.1.3.

8.2.4 Mass of pie filling

Thaw five fish pies and then determine their total mass (m_0). Remove the crust and determine the mass of the filling (m_1). Calculate the mass of the filling, ω , expressed as a mass percentage of the product, using the following formula:

$$\omega = \frac{m_1}{m_0} \times 100$$

where

ω is the mass of the filling, expressed as a mass percentage of the product;

m_0 is the mass of five pies, in grams;

m_1 is the mass of the filling of five pies, in grams.

8.2.5 Mass of onion of pickled fish

8.2.5.1 Record the declared net mass (m_0) printed on the package. Place the contents of the package on a tared sieve of aperture size approximately 2 mm and rinse with water, pre-warmed, if necessary, to a temperature not higher than 38 °C, until free of sauce. Remove the fish. Drain for 2 min and then determine and record the mass of the material remaining on the sieve as the mass (m_1) of the onion.

8.2.5.2 Calculate the percentage mass of the onion in the product by using the formula given in 8.2.1.3.

8.3 Determination of the net mass of frozen products other than glazed products

8.3.1 Immediately after removal of the package from frozen storage, remove any ice adhering to the outside of the package and determine the gross mass of the unopened package.

8.3.2 Remove the packaging material. Wash, dry and determine the mass of the packaging material. Record the difference between the gross mass (see 8.3.1) and the mass of the packaging material as the net mass of the frozen product.

8.4 Determination of the net mass of a glazed product

8.4.1 Immediately after removal of the package from frozen storage, place the contents of the package in a container into which fresh potable water (see 3.4.1) at ambient temperature is introduced from the bottom at a flow rate of approximately 5 l/min. Leave the product in the water until all surface ice has melted. If the product is block-frozen, turn the block over several times during deglazing; probe the block and remove units from the water as they become loose.

8.4.2 After all the glaze that can be seen or felt has been removed and the units separate easily, transfer the contents of the container (see 8.4.1) to a tared sieve of nominal aperture size approximately 2 mm. Incline the sieve at an angle of approximately 20° and drain for 2 min.

8.4.3 Record the mass of the material remaining on the sieve as the net mass of the glazed product.

9 Methods of chemical analysis

9.1 General

Any internationally recognized validated method that delivers equivalent results to those listed below may be used.

NOTE During the analysis and unless otherwise specified, use only reagents of recognized analytical grade or (when such a grade is unobtainable) of the purest grade available, and use only distilled or deionized water.

9.2 Preparation of product sample

Thaw the product in its packaging and then remove the packaging. Where applicable, for example in the case of fish pies, remove the crust/casing after thawing. Pass the remaining contents of the sample twice through a meat grinder and mix the minced sample thoroughly. Transfer an appropriate quantity of the minced sample to a glass container that has a lid or screw cap that can be tightly closed. Store in a refrigerator until the tests are carried out.

9.3 Determination of lead, copper, zinc and cadmium (atomic absorption spectrophotometric method)

9.3.1 Apparatus

9.3.1.1 Atomic absorption spectrophotometer. (Refer to the manufacturer's reference manuals for wavelength, slit width, flame conditions, etc.)

9.3.1.2 Crucible, platinum, of capacity 150 ml.

9.3.1.3 Water-bath.

9.3.1.4 Temperature controlled furnace.

9.3.2 Reagents

9.3.2.1 Hydrochloric acid, 1 N, prepared by diluting 89 ml of HCl to 1 l with distilled water.

9.3.2.2 Lead standard solutions, as follows:

a) stock standard solution: 1 mg Pb/ml; and

b) working standard solution: 1,0 µg Pb/ml.

9.3.2.3 Copper standard solutions, as follows:

a) stock standard solution: 1 mg Cu/ml; and

b) working standard solution: 3,0 µg Cu/ml.

9.3.2.4 Zinc standard solutions, as follows:

a) stock standard solution: 1 mg Zn/ml; and

b) working standard solution: 2,0 µg Zn/ml.

9.3.2.5 Cadmium standard solutions, as follows:

a) stock standard solution: 1 mg Cd/ml; and

b) working standard solution: 1,0 µg Cd/ml.

9.3.3 Procedure

9.3.3.1 Preparation of sample solution

Weigh 25 g ± 0,1 g of sample into the crucible (see 9.3.1.2), and dry for 2 h at 135 °C to 150 °C. Transfer the crucible to a cold, temperature-controlled furnace and slowly raise the temperature to 450 °C. Ash the sample overnight (16 h). Remove the crucible and allow it to cool. Add 10 ml of the 1 N HCl and dissolve the ash by heating the crucible cautiously on a boiling water-bath. Transfer the contents of the crucible to a 25 ml volumetric flask. Heat the ash residue again successively with two 5 ml portions of the 1 N HCl and add it to flask. Cool, dilute to volume with the 1 N HCl, and mix.

9.3.3.2 Reagent blank

Prepare a reagent blank.

9.3.3.3 Determination of lead

Determine the absorbance of the sample solution, of the reagent blank and of the 1,0 µg Pb/ml working standard solution. If the absorbance of the sample solution minus the absorbance of the reagent blank is less than the absorbance of the working standard solution, the lead in the sample is less than 1 mg/kg.

9.3.3.4 Determination of copper

Dilute 5,0 ml of the sample solution to 50,0 ml with water. Determine the absorbance of the sample solution, of the reagent blank and of the 3,0 µg Cu/ml working standard solution. If the absorbance of the sample solution minus the absorbance of the reagent blank is less than the absorbance of the working standard solution, the copper in the sample is less than 30 mg/kg.

9.3.3.5 Determination of zinc

Dilute 5,0 ml of the sample solution to 100,0 ml with water. Determine the absorbance of the sample solution, of the reagent blank and of the 2,0 µg Zn/ml working standard solution. If the absorbance of the sample solution minus the absorbance of the reagent blank is less than the absorbance of the working standard solution, the zinc in the sample is less than 40 mg/kg.

9.3.3.6 Determination of cadmium

Determine the absorbance of the sample solution, of the reagent blank and of the 1,0 µg Cd/ml working standard solution. If the absorbance of the sample solution minus the absorbance of the reagent blank is less than the absorbance of the working standard solution, the cadmium in the sample is less than 1 mg/kg.

9.4 Determination of tin (atomic absorption method)

9.4.1 Apparatus

Atomic absorption spectrophotometer. (Refer to the manufacturer's reference manuals for wavelength, slit width, flame conditions, etc.)

9.4.2 Reagents

9.4.2.1 Tin standard solutions, as follows:

- a) **stock standard solution:** 1 mg Sn/ml; and
- b) **working standard solution:** 40,0 µg Sn/ml.

9.4.2.2 Potassium chloride solution, 10 mg K/ml, prepared by dissolving 1,91 g of KCl and diluting to 100 ml with distilled water.

9.4.2.3 Nitric acid (HNO₃), concentrated. Test the purity of a lot by diluting a portion to 1:4 (by volume) with distilled water and aspirating into an AA spectrophotometer. The absence of an Sn signal indicates suitability for analysis.

9.4.3 Preparation of sample

Accurately ($\pm 0,01$ g) weigh approximately 25 g of the sample into a 250 ml Erlenmeyer flask. Dry in an oven at 120 °C.

NOTE Do not add HNO₃ to samples (see below) unless there is time to complete this stage of digestion on the same day.

Add 30 ml of the concentrated HNO₃ to the flask and, within 15 min, heat gently in a hood to initiate digestion, avoiding excess frothing. Gently boil until 3 ml to 6 ml of digest remains or until the sample just begins to dry on the bottom. Do not allow the sample to char. Remove the flask from the heat. Without delay, continue as follows, simultaneously preparing two empty flasks for reagent blanks: add

25 ml of concentrated hydrochloric acid (HCl), and heat gently for about 15 min until sample bumping from the evolution of chlorine (Cl₂) stops. Increase the heat, and boil until a volume of 10 ml to 15 ml remains. Use a similar flask that contains 15 ml of water to estimate the remaining volume. Transfer the sample solution and the reagent blanks to 25 ml volumetric flasks. The sample solution and reagent blanks may stand overnight or longer.

Pipette 1,0 ml of the KCl solution into each volumetric flask. Cool to ambient temperature and dilute to volume with water. Mix well and filter the sample solution only through dry, medium porosity paper into a dry polypropylene or polyethylene screw-cap bottle. Transfer the blanks to similar bottles. Cap the bottles until analysis. Keep this sample solution for the determination of arsenic as well. Solutions are stable for several months.

9.4.4 Procedure

Determine the absorbance of the sample solution, of the reagent blank and of the 40,0 µg Sn/ml working solution. If the absorbance of the sample solution minus the absorbance of the reagent blank is less than the absorbance of the working standard solution, the tin in the sample is less than 40 mg/kg.

9.5 Determination of arsenic (Gutzeit method)

9.5.1 Apparatus

See figure 1 and 9.5.3.

9.5.2 Reagents

9.5.2.1 **Arsenic standard solutions**, as follows:

- a) **stock standard solution**: 1 mg As/ml; and
- b) **working standard solution**: 1,0 µg As/ml.

9.5.2.2 **Hydrochloric acid**, concentrated.

9.5.2.3 **Potassium iodide solution**, a 16,6 g/100 ml aqueous solution of potassium iodide.

9.5.2.4 **Tin (II) chloride solution**, dissolve 33 g of tin (II) chloride (free from arsenic) in 10 ml of hydrochloric acid and sufficient water to produce 100 ml.

9.5.2.5 **Mercury (II) bromide**, (HgBr₂ = 360,4 analytic reagent grade).

9.5.2.6 **Mercury (II) bromide paper**, prepared as follows: in a rectangular dish, place a 5 g/100 ml solution of mercury (II) bromide in absolute ethanol and immerse in it pieces of white filter paper of grammage 80 g/m² (Whatman No. 1 is suitable), each measuring 200 mm x 15 mm and folded in two. Decant the excess liquid and allow the papers to dry, protected from light, by suspending them over a non-metallic thread. Cut away the folded edges to a width of 10 mm. Cut the remaining strips into 15 mm squares or discs of diameter 15 mm.

Mercury (II) bromide paper should be kept in a glass-stoppered container and protected from light.

9.5.2.7 **Zinc**, granulated.

9.5.2.8 **Lead acetate solution**, a 10 g/100 ml solution of lead (II) acetate in carbon dioxide-free water.

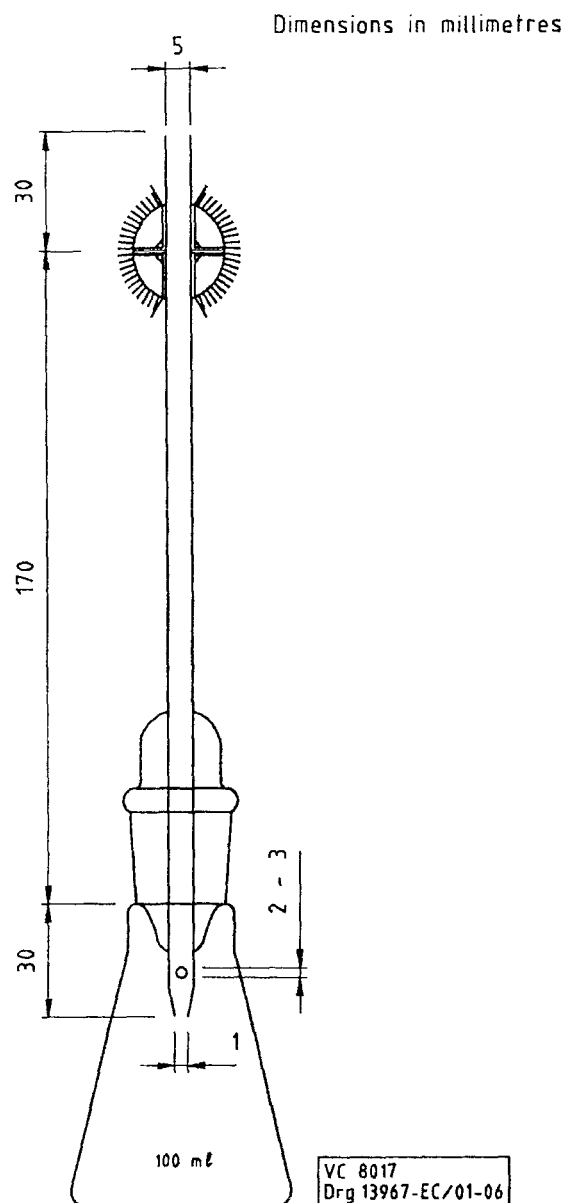


Figure 1 — Apparatus for limit test for arsenic

9.5.2.9 Lead acetate cotton, prepared as follows: immerse absorbent cotton wool in a mixture of 10 volumes of lead acetate solution and one volume of 2 M acetic acid. Drain off the excess liquid by placing the cotton wool on several layers of filter paper, without squeezing the cotton wool. Allow the cotton wool to dry at room temperature. Lead acetate cotton should be kept in an airtight container.

9.5.3 Procedure

9.5.3.1 Take 5,0 ml of the sample solution prepared for the determination of tin (see 9.4.3). The apparatus (see figure 1) consists of a 100 ml conical flask closed with a ground-glass stopper through which passes a glass tube of length approximately 200 mm and of internal diameter 5 mm. The lower part of the tube is drawn to an internal diameter of 1,0 mm and at a distance of 15 mm from its tip is a lateral orifice of diameter 2 mm to 3 mm. When the tube is in position in the stopper, the lateral orifice should be 2 mm to 3 mm below the lower surface of the stopper. The upper end of the tube has a perfectly flat, ground surface at right angles to the axis of the tube. A second glass tube of the same internal diameter and of length 30 mm, with a similar flat ground surface, is placed in contact and co-axially with the first, and is held in position by two spiral springs.

9.5.3.2 Into the lower tube, insert 50 mg to 60 mg of lead acetate cotton, loosely packed, or a small plug of cotton wool and a rolled piece of lead acetate paper of combined mass 50 mg to 60 mg.

9.5.3.3 Between the flat surfaces of the tubes, place one of the pieces of mercury (II) bromide paper (see 9.5.2.6).

9.5.3.4 In the conical flask, dilute 5,0 ml of the sample solution to 25 ml with water.

9.5.3.5 Add 15 ml of concentrated hydrochloric acid, 0,1 ml of tin (II) chloride solution, and 5 ml of potassium iodide solution, allow to stand for 15 min and then add 5 g of granulated zinc.

9.5.3.6 Immediately assemble the two parts of the apparatus and immerse the flask in a water-bath at a temperature such that a uniform evolution of gas is maintained. After not less than 2 h, any stain produced on the mercury (II) bromide paper shall be not more intense than that obtained by treating 3 ml of arsenic working standard solution (1 µg As/ml) diluted to 25 ml with water in the same way. The arsenic content of the sample will then be less than 1,0 mg/kg.

9.6 Determination of mercury

9.6.1 Apparatus

9.6.1.1 Atomic absorption spectrophotometer, fitted with a mercury hollow cathode lamp.

9.6.1.2 Cold vapour absorption cell, fitted in place of the burner of the spectrophotometer (see figure 2).

9.6.1.3 Digestion vessel (see figure 3), that consists of a stainless steel body that supports a polytetrafluoroethylene (PTFE) crucible, and a screw-on cap that has a PTFE liner to provide a PTFE sealing surface, or a similar digestion vessel.

A PTFE spout is snapped on the outside rim of the vessel to permit the quantitative transfer of the contents without contact with metal parts.

9.6.1.4 Diaphragm pump.

9.6.2 Reagents

9.6.2.1 Hydrochloric acid, concentrated.

9.6.2.2 Nitric acid, concentrated.

9.6.2.3 Sulfuric acid, concentrated.

9.6.2.4 Diluting acid solution, an aqueous solution that contains 58 ml of the nitric acid and 67 ml of the sulfuric acid per litre.

9.6.2.5 Dilute hydrochloric acid, one volume of the hydrochloric acid added to nine volumes of water.

9.6.2.6 Stannous chloride solution, 5 g of crystalline stannous chloride ($\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$) dissolved in 10 ml of the concentrated hydrochloric acid by heating, and diluted to approximately 50 ml with water. Remove trace amounts of mercury by bubbling nitrogen through the solution for 10 min.

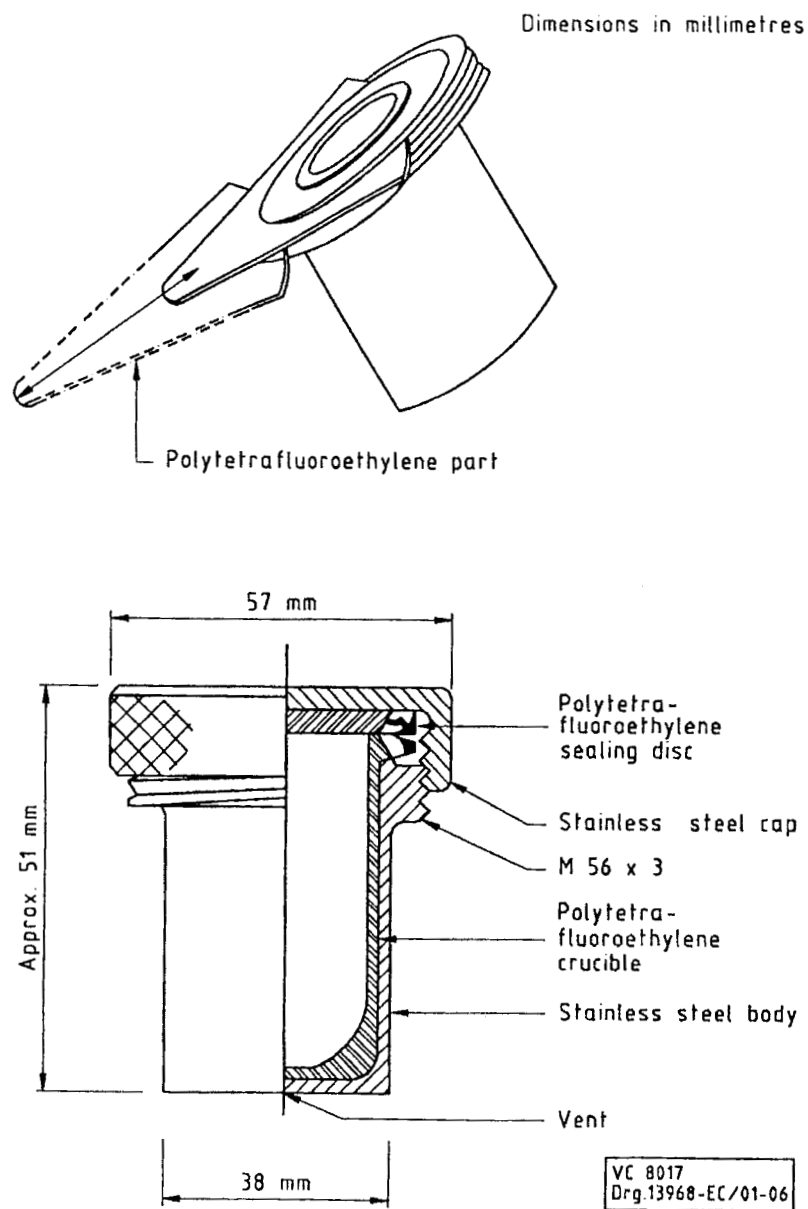


Figure 2 — Apparatus for the determination of mercury content

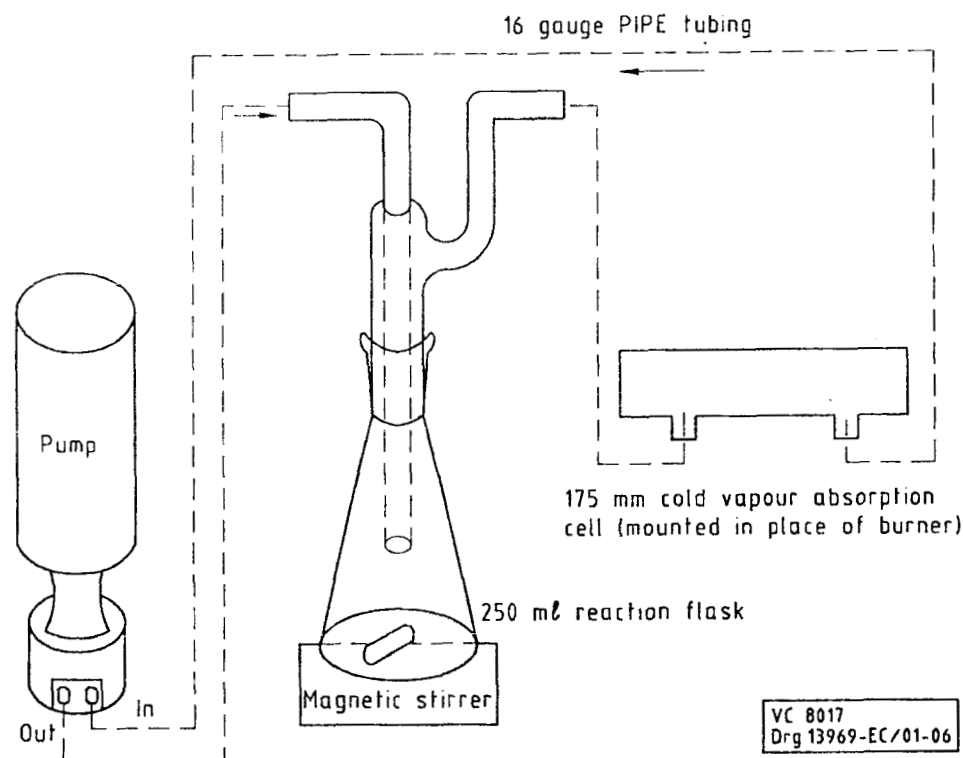


Figure 3 — Digestion vessel

9.6.2.7 Mercury standard solutions, as follows:

- a) **stock standard solution**, 1 mg Hg/ml; and
- b) **working standard solution**, 0,1 μg Hg/ml: dilute 1,0 ml of the stock standard solution (see (a) above) to 100 ml with the dilute hydrochloric acid (HCl). Then dilute 1,0 ml of this solution to 100 ml with the dilute HCl. Prepare this solution daily.

9.6.3 Reagent blank

Prepare a reagent blank.

9.6.4 Procedure

9.6.4.1 Accurately weigh out approximately $1 \text{ g} \pm 0,1 \text{ g}$ of the sample (see 9.2) (**caution:** do not use more than 300 mg dry mass; for materials with a high fat content, do not use more than 200 mg dry mass) into the digestion vessel (see 9.6.1.3), add 5,0 ml of the concentrated nitric acid (HNO_3), and close the vessel by tightening the screw cap. Place the vessel, without tilting, into an oven preheated to 150 °C for 30 min to 60 min or until the sample solution is clear. Remove the vessel and allow it to cool to room temperature. Unscrew the cap, transfer the contents of the vessel with the aid of the diluting acid solution (see 9.6.2.4) to a 100 ml volumetric flask, and dilute to volume with diluting acid solution. Keep this sample solution for the determination of antimony as well.

9.6.4.2 Switch on the mercury hollow cathode lamp, and allow the spectrophotometer to equilibrate fully at a wavelength setting of 253,7 nm. Zero the instrument.

9.6.4.3 Pipette 20 ml blank solution and 1 ml of stannous chloride solution in the reaction flask. Add a magnetic stirrer. Connect the absorption cell, the reaction flask and the diaphragm pump in series and in a closed system by means of PTFE tubing (see figure 2) minimizing the dilution of the mercury vapour by using tubing of the smallest diameter and of the shortest length practicable. Ensure that the distance between the lower end of the inlet tube and the surface of the sample solution in the reaction flask is at least 10 mm. Switch on the stirrer for 90 s, using a stopwatch, zero the machine again, then switch off the stirrer, switch on the diaphragm pump and take the reading after a few seconds to obtain a stable or blank reading.

9.6.4.4 For the standard reading take 1 ml of the 0,1 µg Hg/ml working standard solution, 19,0 ml of distilled water, 1 ml of stannous chloride and stirrer and repeat the above process.

9.6.4.5 Now pipette 20,0 ml of the sample solution, add 1 ml of the stannous chloride and stirrer in the flask and repeat the above process.

9.6.4.6 After every five sample readings, another standard should be read to ensure the stability of the instrument. The mean of the standard readings is then taken.

9.6.4.7 After each reading the diaphragm pump should be kept on to flush the system.

9.6.5 Calculation

Measure the absorbance of the 0,1 µg Hg/ml working standard solution, of the reagent blank and of the sample solution.

If the absorbance of the sample solution minus the absorbance of the reagent blank is less than the absorbance of the working standard solution, the mercury content of the sample is less than 0,5 mg/kg.

9.7 Determination of antimony

9.7.1 Apparatus

Atomic absorption spectrophotometer. (Refer to the manufacturer's reference manuals for wavelength, slit width, flame conditions, etc.)

9.7.2 Reagents

9.7.2.1 Potassium iodide.

9.7.2.2 Antimony standard solutions, as follows:

a) **stock standard solution:** 1 mg Sb/ml; and

b) **working standard solution:** 0,01 µg Sb/ml.

9.7.3 Reagent blank

Prepare a reagent blank.

9.7.4 Procedure

9.7.4.1 Follow the apparatus manufacturer's instructions for the hydride generation for antimony, ensuring that the antimony is in the Sb (III) state before analysis, by treating the sample and standards with an excess of potassium iodide.

9.7.4.2 Measure the absorbance of the 0,01 µg Sb/ml working standard solution, of the reagent blank and of the sample solution (using the sample solution obtained in the mercury determination). If the absorbance of the sample solution minus the absorbance of the reagent blank is less than the absorbance of the working standard solution, the antimony content of the sample is less than 1 mg/kg.

9.8 Determination of protein nitrogen content and calculation of fish content

9.8.1 Reagents

9.8.1.1 During the analysis, use only reagents of recognized analytical grade that are free from nitrogen, and use only distilled water or water of equivalent purity.

9.8.1.2 Hydrogen peroxide solution, 30 % (by volume).

9.8.1.3 Mercuric oxide (HgO).

9.8.1.4 Potassium sulfate or anhydrous sodium sulfate.

9.8.1.5 Sulfuric acid, concentrated (*d* at 25 °C/25 °C is 1,84).

9.8.1.6 Zinc granules.

9.8.1.7 Boric acid solution, 40 g/l.

9.8.1.8 Sodium hydroxide-sodium thiosulfate solution, 45 %: 450 g of sodium hydroxide and 80 g of sodium thiosulfate (Na₂S₂O₃·5H₂O) dissolved in water and diluted to 1 l.

9.8.1.9 Standardized sulfuric acid solution (*c*(H₂SO₄) = 0,1 mol/l).

9.8.1.10 Screened methyl red indicator, 0,125 g of methyl red and 0,083 g of methylene blue dissolved in 100 ml of ethanol (96 % (by volume)), and filtered.

9.8.2 Procedure

9.8.2.1 Accurately weigh out approximately 2 g of the prepared sample (see 9.2) and transfer this test specimen to a 500 ml Kjeldahl digestion flask. Add a few glass beads, 7 g of the potassium sulfate (or anhydrous sodium sulfate), 0,3 g of the mercuric oxide and 15 ml of the concentrated sulfuric acid. Slowly and carefully add 5 ml of the hydrogen peroxide solution and leave until the reaction has subsided.

9.8.2.2 Heat gently until frothing ceases and then heat strongly until the solution clears. Continue the digestion for at least another 30 min (approximately 1 h is required for complete digestion).

9.8.2.3 Cool and dilute the contents of the flask with approximately 250 ml of water. Cool to ambient temperature and run 75 ml of the sodium hydroxide-sodium thiosulfate solution down the side of the flask so that it forms a separate layer at the bottom and does not immediately mix with the acid solution. Add a few granules of zinc.

9.8.2.4 Connect the flask to a Kjeldahl distillation unit, mix the contents of the flask by gentle swirling, and then distil the ammonia (i.e. approximately 150 ml of distillate) into an Erlenmeyer flask that contains 50 ml of the boric acid solution and three or four drops of the screened methyl red indicator.

9.8.2.5 Titrate the ammonia in the Erlenmeyer flask with the standardized sulfuric acid solution.

9.8.2.6 Carry out a blank determination under identical conditions, but omit the test specimen.

9.8.3 Calculation

9.8.3.1 The protein nitrogen content, β , expressed as a percentage by mass of the product, is given by the following formula:

$$\beta = \frac{(V - V_1) \times c \times 2 \times 1,4}{m}$$

where

β is the protein nitrogen content, in percentage;

V is the sample titre of sulfuric acid, in millilitres;

V_1 is the blank titre of sulfuric acid, in millilitres;

c is the concentration of the standardized sulfuric acid, in moles per litre;

m is the mass of the test specimen, in grams.

9.8.3.2 Calculate the fish content, expressed as a percentage by mass of the product, by multiplying the protein nitrogen content by 37,5.

NOTE Where the product contains proteinaceous matter other than fish, apply appropriate corrections when assessing the fish content.

9.9 Determination of chloride content (as sodium chloride)

9.9.1 Reagents

9.9.1.1 During the analysis, use only reagents of recognized analytical grade and use only distilled water or water of equivalent purity.

9.9.1.2 Nitrobenzene.

9.9.1.3 Nitric acid, diluted to one-half of the concentrated strength.

9.9.1.4 Sodium carbonate solution, saturated.

9.9.1.5 Standard potassium thiocyanate solution ($c(\text{KCNS}) = 0,1 \text{ mol/l}$).

9.9.1.6 Standard silver nitrate solution ($c(\text{AgNO}_3) = 0,1 \text{ mol/l}$), accurately standardized.

9.9.1.7 Ferric ammonium alum indicator, a cold saturated solution of ferric ammonium sulfate ($\text{NH}_4\text{Fe}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$) to which a few drops of the dilute nitric acid (see 9.9.1.3) have been added.

9.9.2 Procedure

9.9.2.1 Take a sample of fish as described in 9.2 and prepare the sample in accordance with 9.2.

9.9.2.2 Accurately weigh a suitable quantity of the prepared sample into an evaporating basin or crucible, moisten this test specimen with the sodium carbonate solution, and dry on a water-bath. Char the dried specimen and ash it at a temperature not higher than 500 °C.

9.9.2.3 Extract the residue with the dilute nitric acid and filter into a 100 ml volumetric flask. Repeat the extraction and filtration once, wash the filter thoroughly with the dilute nitric acid, dilute the solution in the flask to volume with the dilute nitric acid, and mix.

9.9.2.4 To a suitable aliquot in a 250 ml Erlenmeyer flask, add 25 ml of the standard silver nitrate solution, 5 ml of the nitrobenzene and 1 ml of the ferric alum indicator, and shake well. Titrate the excess silver nitrate with the standard potassium thiocyanate solution until a permanent reddish colour persists for 15 s. Carry out a blank determination under identical conditions, but omit the test specimen. The difference between titrations of the blank determination and of the test is the volume (V) of silver nitrate used in the determination.

9.9.3 Calculation

Determine the chloride content, θ (as sodium chloride), expressed as a percentage by mass of the product, using the following formula:

$$\theta = \frac{V \times c \times 5,845}{m}$$

where

- θ is the chloride content (as sodium chloride), in percentage;
- V is the volume of standard silver nitrate solution used in the determination, in millilitres;
- c is the concentration of the standard silver nitrate solution, in moles per litre;
- m is the mass of the original test specimen represented by the aliquot used in the titration, in grams.

10 Methods of microbiological examination

10.1 General

Use aseptic techniques throughout the examination.

10.2 Laboratory glassware

10.2.1 General

Ensure that all glassware used is resistant to repeated heat sterilization and that the glass is free from inhibitory substances such as heavy metals and free alkalis. Borosilicate glass with an expansion coefficient of less than $6 \times 10^{-6} \text{ K}^{-1}$ is recommended.

10.2.2 Bottles (universal)

Bottles that have standard plastics or metal screw caps, and that have a nominal capacity of

- a) 30 ml,
- b) 100 ml,
- c) 250 ml,
- d) 500 ml, and
- e) 1 000 ml.

10.2.3 Culture tubes

Rimless cylindrical tubes that have hemispherical ends and a nominal wall thickness of 1,5 mm, and of diameter and length

a) 16 mm x 160 mm, and

b) 20 mm x 200 mm.

Plug these tubes with cotton wool plugs or with plugs of a foam rubber suitable for autoclaving. Alternatively, use screw-capped tubes of similar dimensions.

10.2.4 Graduated pipettes

Total delivery pipettes for bacteriological purposes only, that have an outflow opening of diameter 2 mm to 3 mm, are graduated in units of 0,1 ml, and are of sizes to deliver 1,0 ml, 5,0 ml and 10,0 ml.

10.2.5 Petri dishes

Petri dishes made of glass or of wettable polystyrene, and of diameter and height 90 mm x 15 mm.

10.2.6 Reagent bottles

Bottles of capacity 50 ml and 100 ml and that have polypropylene or other plastics stoppers of such design that they can be used to deliver drops of the reagent.

10.3 Equipment

10.3.1 Autoclave

A pressure vessel that is capable of producing steam (or that is connected to a central steam source) and is capable of withstanding a pressure of 300 kPa and of attaining a temperature of $121\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ within 10 min of the beginning of the sterilization cycle.

10.3.2 Incubators and water-baths

Incubators and water-baths that have thermostatically controlled heating and cooling devices, and that are so fitted with means of circulation that the temperature of the total enclosed space is maintained to within $0,5\text{ }^{\circ}\text{C}$ of the thermostat setting.

10.3.3 Hot-air oven (for sterilization by means of dry heat)

A thermostatically controlled oven, heated by electricity or gas and so fitted with means of circulation that the temperature of the total enclosed space is maintained at $170\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, the heat supply being such that the working temperature is regained within 10 min of the momentary opening and closing of the oven door.

10.3.4 Homogenizer

A mechanical mixing apparatus of either a rotating or a pulsating type, and that has sterilizable containers in which a homogeneous dispersion of the sample and the prescribed diluent can be produced. The sterilizable containers may be of glass, metal or a suitable plastics material. The homogenizing procedure shall not reduce the number or viability of the microorganisms in the sample.

10.3.5 Forceps

10.3.5.1 Type

Round-tipped forceps that have smooth inner surfaces to their jaws.

10.3.5.2 Sterilization

Sterilize by dipping in methylated spirits or technical methanol and then igniting the adherent liquid. Alternatively, use any other suitable method.

10.4 Media and reagents

10.4.1 General

10.4.1.1 Water

Use only glass-distilled water, or demineralized water of equivalent purity, that is clear, colourless and free from visible suspended matter, and of which the pH value, measured at 25 °C, is in the range 5,0 to 7,5.

10.4.1.2 Quality of ingredients

In the preparation of the media and reagents, use only ingredients of quality acceptable for microbiological purposes. Use anhydrous salts unless otherwise specified.

10.4.1.3 Accuracy

Except where otherwise specified, allow the following tolerances:

- a) on temperatures ± 2 °C
- b) on masses $\pm 1,0$ %
- c) on volumes $\pm 1,0$ %
- d) on pH value $\pm 0,1$ pH unit

10.4.1.4 Dehydrated media

Many of the media required are obtainable in dehydrated form and, for uniformity of results, the use of such media is recommended. If such media are used, follow the manufacturer's instructions strictly regarding reconstitution and sterilization.

10.4.1.5 Adjustment of pH value

Where the final pH value of a medium or reagent is specified, so adjust the pH value that it is correct at 25 °C. If necessary, adjust the pH value during preparation and, in the case of media, before sterilization. Unless otherwise specified, use a solution of hydrochloric acid ($\alpha(\text{HCl}) = 1 \text{ mol}/\ell$) or of sodium hydroxide ($\alpha(\text{NaOH}) = 1 \text{ mol}/\ell$), as appropriate, to adjust the pH values.

10.4.1.6 Dispensing

Where specified quantities of media are to be dispensed into bottles, use 30 ml universal bottles (see 10.2.2(a)) or 16 mm diameter culture tubes (see 10.2.3(a)). Where bulk sterilizing is required, use any suitable glass container of the required quality (see 10.2.1). Dispense reagents into reagent bottles (see 10.2.6). Stir media constantly while dispensing.

10.4.1.7 Sterilization

When sterilization by autoclaving is specified, and unless otherwise directed, autoclave the medium at $121 \text{ °C} \pm 1 \text{ °C}$ for 20 min. (This temperature corresponds to a pressure of 103 kPa above atmospheric pressure at sea level, i.e. 207 kPa absolute.)

10.4.1.8 Control of prepared media

Ensure, by suitable incubation tests, that prepared media are sterile and are capable of supporting the growth of the relevant organisms under the stated conditions of incubation.

10.4.1.9 Storage of media

Ensure that prepared media are carefully protected from exposure to heat and sunlight and have not evaporated or changed in concentration or in pH value, and that, unless otherwise specified, they are used within three months of preparation.

10.4.2 Buffered isotonic peptone water (diluent)

10.4.2.1 Ingredients

Peptone	10 g
Sodium chloride	5 g
Disodium hydrogen phosphate dodecahydrate	9,0 g
Potassium dihydrogen phosphate (KH ₂ PO ₄)	1,5 g
Water	1 000 ml

10.4.2.2 Preparation

Dissolve the ingredients in the water, by heating if necessary. Adjust the pH, if necessary, so that after sterilization it is 7,0. Dispense as follows:

- 9 ml volumes into 30 ml bottles (see 10.2.2(a));
- 99 ml volumes into 250 ml bottles (see 10.2.2(c)); and
- larger volumes into bulk containers.

Sterilize by autoclaving at 121 °C for 20 min.

10.5 Preparation of the sample

10.5.1 Storage of the product

Store the product, of mass at least 200 g, for the minimum practicable period under such conditions that changes in composition are prevented or minimized.

10.5.2 Preparation of the sample

When necessary, thaw the raw or cooked product in its packaging at 5 °C to 10 °C until all the visible ice has melted. Ensure that thawing is completed within 18 h. Using a sterile cutter and forceps, remove 28 g to 35 g of the product and transfer it to a previously tared and sterilized homogenizing container suitable for use with the homogenizer (see 10.3.4). Add enough of the buffered isotonic peptone water (see 10.4.2) to obtain a 1:10 dispersion of the product. Operate the homogenizer in accordance with the manufacturer's instructions for just long enough to produce a homogeneous dispersion, i.e. operate rotating homogenizers for such a time that the total number of revolutions of the macerator blades is 15 000 to 20 000, but in no case for longer than 2,5 min. Use the 1:10 dispersion of the product so obtained for the tests described in 10.6 to 10.14 (inclusive).

10.6 Standard plate count

Use SABS ISO 4833 as published in Government Notice No. 1411 of 31 October 1997. Check for compliance with 4.5.

10.7 Enterobacteriaceae count

Use SABS ISO 7402 as published in Government Notice No. 831 of 7 September 2001. Check for compliance with 4.5.

10.8 Presumptive *Escherichia coli*

Use SABS ISO 7251 as published in Government Notice No. 125 of 9 February 2001. Check for compliance with 4.5.

10.9 *Staphylococcus aureus*

Use SABS ISO 6888-1 and SABS ISO 6888-2 as published in Government Notice No. 125 of 9 February 2001. Check for compliance with 4.5.

10.10 *Salmonella*

Use SABS ISO 6579 as published in Government Notice No. 399 of 1 April 1999. Check for compliance with 4.5.

10.11 *Shigella*

Use SABS SM 1195 as published in Government Notice No. 692 of 16 May 1997. Check for compliance with 4.5.

10.12 *Clostridium perfringens*

Use SABS ISO 7937 as published in Government Notice No. R1296 of 16 October 1998. Check for compliance with 4.5.

10.13 Pathogenic *Vibrio* (*Vibrio cholerae* and *Vibrio parahaemolyticus*)

Use SABS SM 1196 as published in Government Notice No. 692 of 16 May 1997. Check for compliance with 4.5.

10.14 Detection of *Listeria monocytogenes*

Use SABS ISO 11290-1 and SABS ISO 11290-2 as published in Government Notice No. 1259 of 7 December 2001 and Government Notice No. 186 of 15 February 2002, respectively. Check for compliance with 4.5.

10.15 Test for efficacy of cleaning and disinfecting of plant, equipment and utensils

Use SABS SM 763 as published in Government Notice No. 918 of 30 July 1999. Check for compliance with 4.5.

10.16 Microbiological examination of water

Use SABS SM 221 as published in Government Notice No. 298 of 22 February 1991. Check for compliance with 4.5.