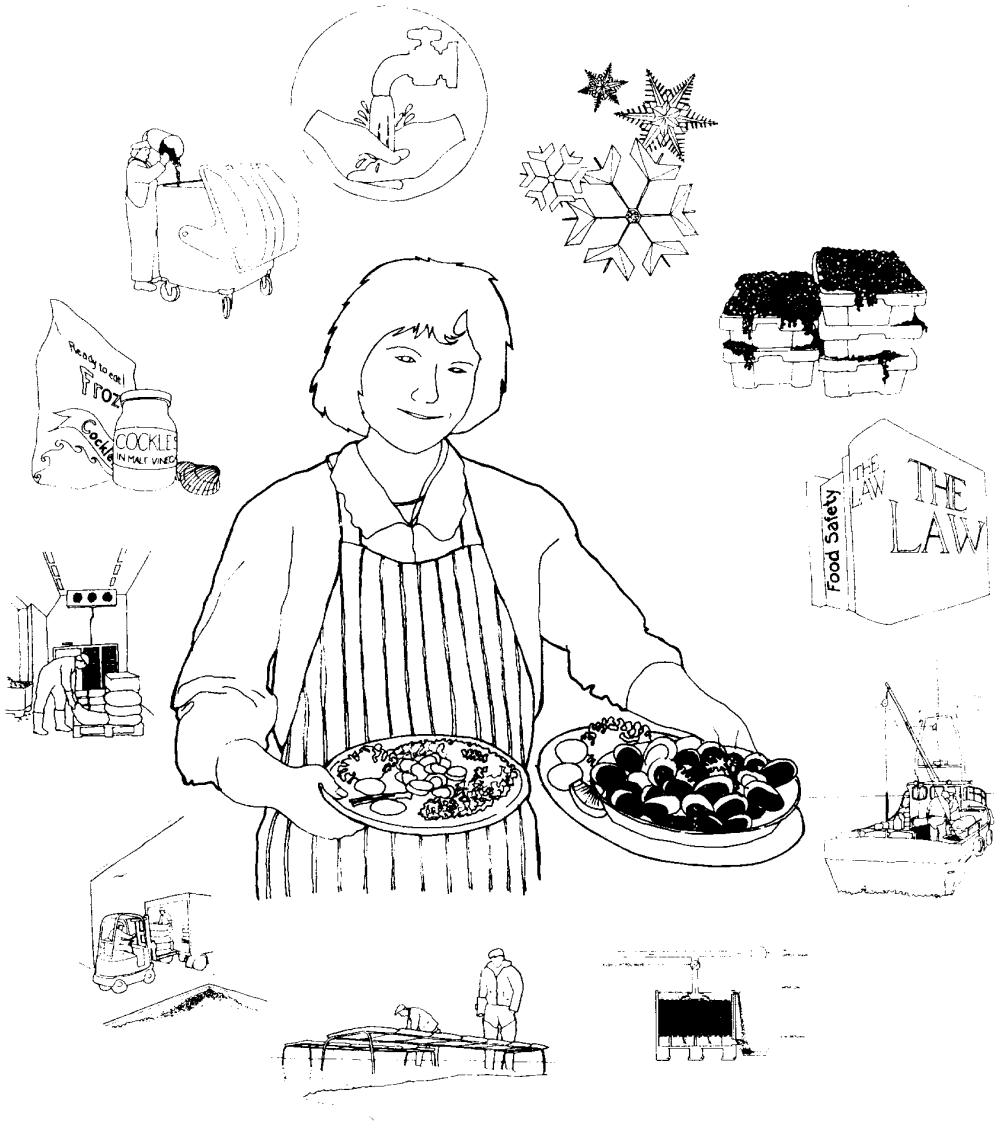
The Sea Fish Industry Authority

Seafish Technology



Guidelines for the Harvesting, Handling and Distribution of Live Bivalve Molluscs

April 1997
(Reprint 1)

Contents

Appendices

1. The Purpose and Scope of These Guidelines

Seafish, in collaboration with a panel of representatives from various sections of the trade and including Government Ministries and Environmental Health Organisations, is drafting comprehensive guidance for the facilities, practices and management of businesses handling bivalve molluscs.

In response to the need of industry to comply with the requirements of food safety legislation, particularly in respect of the facilities that must be provided, these particular Guidelines for facilities and equipment have been produced.

These Guidelines cover facilities for the handling, cleansing, storage and transport of bivalve molluscs from their harvesting through distribution to retail outlets. Detailed recommendations are made for facilities and equipment when handling bivalve molluscs as live animals, including purification and dispatch centres. Requirements for handling bivalve molluscs as fresh fishery products (i.e. as chilled fish, not as live animals) are outlined and a summary of the requirements for heat treating bivalve molluscs is given. Further guidance on the operation of purification systems is given in the series of Purification System Operating Manuals published by Seafish.

The recommendations made in this document are based on good practice, not merely the baseline of legal requirements. Relevant legal requirements and some detailed interpretation of those requirements are included but this document does not have legal status and the recommendations do not absolve the trade from compliance with the law.

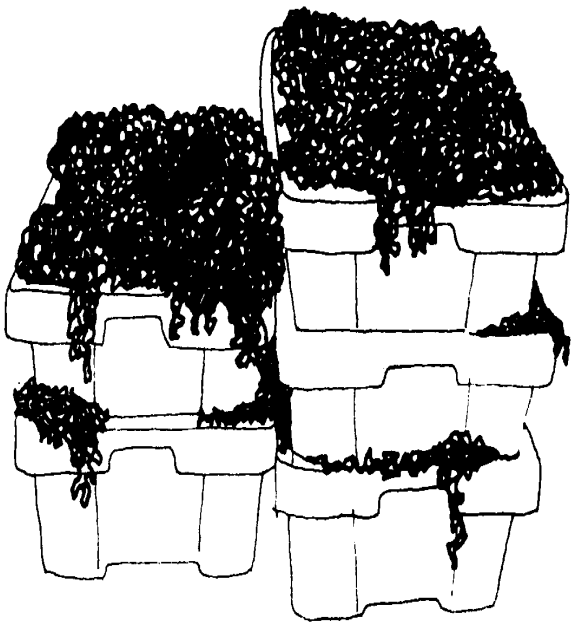
Some parts of the law may be subject to amendment in detail or in interpretation or have not yet been finalised and enacted.The recommendations made are based on the best advice available at the time. Later editions will be updated as necessary.

The sections of this document giving detailed recommendations are each sub-divided, dealing firstly with legal requirements and then giving the recommendations. Relevant parts of the legislation are shown verbatim in italic print. In some cases, the details of the Acts and Regulations applying to Scotland and Northern Ireland differ from those applying to England and Wales which are referred to. The legislation applicable to Scotland and Northern Ireland is listed in Appendix V.

The recommendations made are advisory, not mandatory. They provide guidance on equipping the trade to operate to high standards of product quality and hygiene that should ensure compliance with the law. However, these are not the only means of achieving high standards and, in addition, an offence is committed only if the baseline of legal requirements is transgressed.

2. An Introduction to the Characteristics, Food Safety Risks and Handling of Bivalve Molluscs

Bivalve molluscs carry potential risks to human health that necessitate responsible handling. The nature of the animals and of the risks, and the means of handling the animals and controlling the risks are largely unique to bivalve molluscs.



The characteristics of the various commercially traded species of bivalve molluscs vary considerably, but all are sensitive creatures that require careful handling to produce safe products of high quality.

An understanding of these matters is essential for those involved in trade in these animals.

Bivalve molluscs are a type of shellfish normally having two shell halves which hinge together. Common species include oysters, mussels, cockles, scallops and various clams. With the exception of scallops, these are normally static creatures that bury or attach themselves to the sea bed or other submerged surfaces. They feed by filtering small particles out of the surrounding water. Many of the commercial species are common in estuaries or similar shallow or drying areas where nutrient levels are high. Dense beds of the animals can develop in productive areas. These characteristics make bivalve molluscs suitable for cultivation and nowadays the cultivation in the UK of indigenous species, such as native oysters and mussels, is supplemented by breeding and farming introduced species, such as pacific oysters and manila clams.

The nature of bivalve molluscs varies greatly with species. Those adapted to drying conditions tightly close their shells when out of the water to retain a marine environment around their fleshy internal parts. To varying degrees those species can survive for extended periods out of water and can be traded for human consumption as live animals. Oysters, mussels, manila and hard shell clams are suitable for such trade. Other species such as cockles can be suitable for live trade if carefully handled. Scallops and other species not adapted to drying conditions, soon die out of water and are best handled as chilled fishery products, or processed. Fortunately, scallops have a relatively long storage life as fresh products. Cockles deteriorate more rapidly after death and, in the UK, are normally cooked to preserve them. With the notable exception of oysters, bivalve molluscs are normally cooked before being eaten, although they may have been traded as live animals.

The consumption of contaminated bivalve molluscs is a significant cause of food poisoning. The risks are from sewage contamination of the inshore waters preferred by many species and

from the occurrence of toxin producing algae. Because of their feeding method, these molluscs accumulate any bacteria and viruses from sewage contamination and any toxins from algae and their cysts if present in the water. Gastro-enteritis and other serious diseases such as hepatitis can result from sewage contamination, whilst algal toxins can result in various forms of poisoning including paralytic shellfish poisoning (PSP) and diarrhoetic shellfish poisoning (DSP).

To control the risk of food poisoning, bivalve molluscs must not be taken from heavily contaminated waters or areas in which there is a toxic algal bloom or residues of toxins that exceed safe levels. Bivalve molluscs from waters subject only to relatively low levels of sewage contamination can be made safe by a controlled cleansing process to purge them of bacteria and of viruses, if the process is continued for long enough, or by controlled heat treatment to destroy those pathogens. The cleansing process, which is suitable only for robust species capable of being handled without dying, consists of placing the animals in suitable conditions of clean seawater for a period of time sufficient for the pathogens to be purged by the normal activity of the animals. The seawater conditions required, particularly the temperature, vary according to species and must encourage the animals to be active. Cleansing can be in man-made purification tanks or by relaying in naturally clean areas. Purification is a short-term process commonly used to remove low levels of bacteriological contamination, but long-term relaying or heat treatment are required if there is greater risk of viral contamination.

Deep water stocks of wild scallops of the type trawled commercially are not considered prone to sewage contamination but can be subject to algal toxins.

Bivalve molluscs appear robust but all are perishable and sensitive animals, including those that can survive out of water. In the live state they are prone to temperature stress and physical shocks. If overheated, whether in or out of water, they will die. Overheating in water can induce spawning and then death. If they are physically dropped or otherwise damaged they are likely to die within a day or two. The effects on the animals of all these forms of stress are cumulative and repeated incidents of relatively minor mishandling can result in the death of the animal.

It is particularly important that bivalve molluscs to be purified are handled carefully and are not held at too high a temperature or for too long, otherwise they may die or not function during cleansing and their safety cannot be guaranteed. There is somewhat less concern when the molluscs are to be heat treated within a short period after harvesting.

Even when bivalve molluscs are well handled and remain alive, their eating quality deteriorates when held out of water, to the extent that their flavours can become sour and undesirable to the consumer well before their lack of any physical response indicates death.

The robustness of bivalve molluscs varies not only with species but also with growing conditions and season. Species that survive in the intertidal zone will be less robust if grown in deep water. All species that spawn in our waters become weak as their spawning season approaches and it becomes undesirable and in many instances impractical to trade in them as live animals. They remain in poor condition for a period after spawning.

When out of water, live bivalve molluscs are best held in cool, moist conditions that slow their metabolism and prevent them from drying out. In these conditions they will survive and

maintain acceptable flavours for the longest period. However, storage temperatures as low as $0^{o}C$ can cause thermal shock resulting in their early death, particularly when the molluscs are in weak intrinsic condition. Blue mussels are an exception to this rule and keep best when directly iced. For any immersed storage of live bivalve molluscs, at any stage from the fisherman to the consumer, the seawater conditions must suit the species concerned and great care must be taken over the cleanliness of the water to avoid any possibility of the animals ingesting contaminants.

Dead or dying bivalve molluscs held as fresh fishery products, such as fresh scallops, are best well iced or otherwise chilled to maintain acceptable flavours for the longest period.

Depending upon growing conditions and harvesting method, some species such as cockles are prone to a high grit content which detracts from their eating quality. A period of natural activity immersed in a clean area or in controlled conditions in a de-gritting tank, or in the purification process, purges them to reduce this grittiness. Purging generally results in a product of better eating quality.

Animals such as periwinkles and whelks are classified as marine gastropods. They are not bivalve molluscs. Gastropods have different feeding patterns and are somewhat less prone to contamination from the marine environment.

A summary of the characteristics and handling requirements of the major species of bivalve molluscs traded in the UK is given in Appendix II.

3. Summary of Food Safety and Other Relevant Legal Requirements and of Product Quality Recommendations

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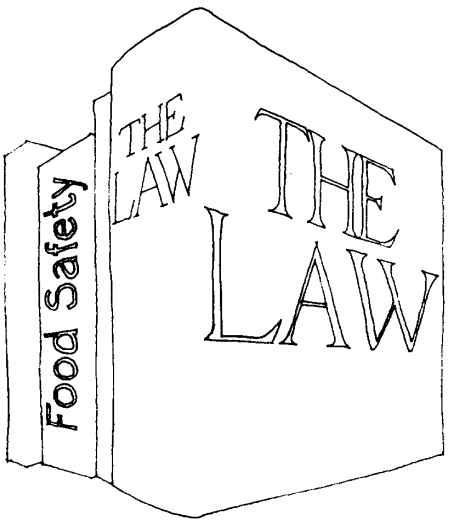


3. Summary of Food Safety and Other Relevant Legal Requirements and of Product Quality Recommendations

3.1 Legal Requirements for Food Safety

3.1.1 The Food Safety Act, 1990

This is the central Act of Food Safety Legislation. It establishes the essential principles of food safety, it gives powers to the Food Authorities to enforce food safety and it provides a means of enacting subsidiary Regulations on more detailed aspects of food safety.

The essential principles can be summarised as:

- that the Act applies extensively to persons involved with food for human consumption (although under the Act itself, 'food' does not include live animals unless they are eaten live)
- that any person who renders food injurious to health is guilty of an offence
- that any person who deals in food that does not satisfy food safety requirements is guilty of an offence
- that any person who deals in food that is not of the nature or substance or quality demanded by the purchaser is guilty of an offence
- that any person who deals in food that is falsely or misleadingly described as to its nature or substance or quality is guilty of an offence
- that where the offence is due to an act or default of another person that other person is also guilty of an offence
- and that it shall be a defence for a person to prove that he took all reasonable precautions and exercised all due diligence to avoid himself or a person under his control committing the offence.

The principles concerning the nature or substance or quality of food are more correctly categorised as 'consumer protection' rather than 'food safety'.

The Act establishes Local Authorities and Port Health Authorities as the 'Food Authorities' and gives extensive powers to their officers who are usually Environmental Health Officers for 'food safety' matters and Trading Standards Officers for 'consumer protection' matters. For 'food safety' these powers include the rights of entry, inspection, seizure of suspect food and documents, the serving of 'improvement notices', the application to a court for 'prohibition orders' and in emergencies the taking of direct prohibition action.

Subsidiary Regulations under the Act include the UK enactments of EU hygiene Directives which provide the bulk of the detailed food safety requirements for the fish industry. These Directives include the so-called 'vertical' Directives on products of

animal origin, including those on Live bivalve Molluscs and on Fishery Products, and the so-called 'horizontal' Directive on the Hygiene of Foodstuffs.

3.1.2 The Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations, 1992 and Associated Regulations

Associated Regulations include:

- The Food Safety (Live Bivalve Molluscs) (Derogations) Regulations, 1992
- The Food Safety (Live Bivalve Molluscs and Other Shellfish) (Import Conditions and Miscellaneous Amendments) Regulations, 1994
- The Food Safety (Fishery Products and Live Bivalve Molluscs and Other Shellfish) (Miscellaneous Amendments) Regulations, 1996.

These are the detailed Regulations concerning the harvesting of bivalve molluscs and their handling and trading as live animals for human consumption. The Regulations apply to all bivalve molluscs and to 'other shellfish' (echinoderms, tunicates and marine gastropods) and for the purposes of the Regulations designate these live animals to be considered as 'food' under the Act although they may not be eaten live.

The Regulations require that all bivalve mollusc 'production areas' (harvesting areas) are designated and categorised by the relevant Ministry (MAFF, SOAEFD or DHSS in Northern Ireland) as either 'A', 'B', or 'C' depending upon the degree of contamination of the area. Areas can also be designated 'prohibited'. Microbiological standards are laid down for the categorisation of areas as 'A', 'B' or 'C' and are based on monitoring faecal bacteria in the molluscs as an indication of sewage contamination. Bivalve molluscs for human consumption must originate from, and fishermen are permitted to harvest these molluscs only from, officially designated 'A', 'B', or 'C' areas and from no other area. However, these 'production area' requirements do not apply to wild (i.e. not farmed) scallops and to 'other shellfish'.

Although less clear, it is accepted that the Regulations do not prohibit or apply to the movement and handling of molluscs for cultivation purposes (such as the seeding of production areas and on-growing) prior to those molluscs eventually being harvested for human consumption, provided that this does not compromise the requirements for the molluscs to originate from designated production areas and the categorisation of microbiological cleanliness of the molluscs ('A', 'B' or 'C') when eventually harvested for human consumption. It is accepted that 'seed' molluscs can be taken from areas not designated as production areas and be transferred to designated 'production areas' for on-growing, provided that the on-growing period is at least 6 months before they are harvested for human consumption. Care must be taken to avoid contamination of designated 'production areas' by the transfer of molluscs. Fishermen should inform the local Food Authority of any such transfers.

Molluscs from category 'A' areas can be placed on the market for direct human consumption without cleansing or treatment. Molluscs from category 'B' areas which are subject to low levels of bacterial contamination, must be purified or relayed for the relatively short period of time necessary to purge them of bacteria, or be heat treated by an approved process and at a place approved under the Fishery Products Regulations, before being placed on the market .

Molluscs from category ‘C’ areas which are subject to higher levels of bacterial contamination (and hence with a greater possibility of viral contamination), must be relayed for at least 2 months or be heat treated by the approved means. Relaying must be into marked out ‘relaying areas’ that have been designated for the purpose by the local Food Authority and categorised ‘A’ or ‘B’, and which are used exclusively for the natural purification of bivalve molluscs. Relaying in a category ‘B’ area must be followed by purification or further relaying in a category ‘A’ area or by heat treatment by the approved means. However, these requirements for purification and relaying do not apply to ‘other shellfish’.

The Regulations refer to 'intensive purification' as an alternative process for cleansing molluscs from category 'C' areas. This reflects the wording of the original EU Directive but, to date, there is no known, scientifically proven or EU approved means of ‘intensive purification’ and so it is not considered a practical option.

When placed on the market for human consumption, after cleansing if necessary, all live bivalve molluscs and ‘other shellfish’ must meet a product specification that includes signs of life, bacterial counts and safe levels of toxins (including PSP and DSP).

The specifications for ‘production’ and ‘relaying areas’ and for live bivalve molluscs and ‘other shellfish’ to be placed on the market for direct human consumption, are given in Appendix III of these Guidelines.

Purification or approved heat treatment must take place in a ‘purification centre’ or ‘processing plant’ approved by the local Food Authority. In addition, before live (rather than processed) bivalve molluscs and ‘other shellfish’ are placed on the market for human consumption, after cleansing if necessary, they must pass through a ‘dispatch centre’ also approved by the local Food Authority. A ‘dispatch centre’ is a place for the reception, ‘conditioning’, washing, cleaning, grading or wrapping of live bivalve molluscs or ‘other shellfish’. ‘Conditioning’ is the purging process commonly known as ‘degritting’. Live bivalve molluscs and ‘other shellfish’ must be wrapped and labelled in the ‘dispatch centre’ and must remain so until offered for sale to consumer, retailer or caterer. Persons must not operate a ‘purification’ or ‘dispatch centre’ unless it has been granted approval and allocated a unique approval number and it must be operated according to the Regulations and to any ‘conditions of approval’ specified by the Food Authority including limitations of use. ‘Purification’ and ‘ dispatch centres’ may be combined on the same premises, in which case they may be allocated a single approval number.

Basic requirements are laid down in the Regulations for the conditions of harvesting, handling and transporting the bivalve mollusc raw material, for the operation of ‘relaying areas’, for wrapping and labelling the product, for preservation and storage and for transporting the product. More detailed requirements are laid down for the premises, equipment and operating practices of ‘purification’ and ‘dispatch centres’ and these requirements are supplemented by the specific ‘conditions of approval’ for each centre.

The Regulations establish a monitoring and control system to ensure that the requirements are met. The Ministries and local Food Authorities must monitor ‘production’ and ‘relaying areas’, taking samples of bivalve molluscs to check for toxins and microbiological contamination. The Food Authorities have powers to make temporary prohibition orders closing particular areas if there is a risk to public health. The local Food Authorities must

monitor compliance of industry with the requirements of the Regulations and this includes the inspection of 'purification' and 'dispatch centres'. The operators of those centres must take samples of the shellfish for microbiological analysis in a laboratory recognised by the local Food Authority and keep records of sampling and analysis, including the sources of the animals.

An essential part of the Regulations is the establishment of a document 'paper trail' from harvesting to retailing of live bivalve molluscs. This is to assist in monitoring and to enable tracing back to source if problems arise. For 'other shellfish' this applies from 'dispatch centre' to retailing. The 'gatherers' of bivalve molluscs must obtain official 'movement documents' from the Food Authority before harvesting molluscs. A completed 'movement document' must accompany each batch of molluscs from the 'production area' to the 'relaying area', 'purification' or 'dispatch centre' or 'processing plant'. The 'movement document' gives details of the 'gatherer', source and destination of the molluscs and must be retained by the person receiving the batch. A 'permanent transport authorisation' may be granted by the local Food Authority to replace the 'movement documents' where the 'gatherer' and the receiver of the molluscs are part of the same business. Records of batches of live bivalve molluscs received and dispatched (including sources and destinations) must be kept by the operators of 'relaying areas', 'purification' and 'dispatch centres'. Operators of 'dispatch centres' must keep dispatch records for 'other shellfish'. The labelling of packages of live bivalve molluscs and 'other shellfish' dispatched must incorporate an official 'health mark' detailing country of dispatch, approval number of 'dispatch centre', species of mollusc, date of wrapping and a date of durability or a warning "these animals must be alive when sold".

Any person who breaks down batches of raw material for new destinations must provide equivalent documentation, to enable tracing, and must keep records. Any person who breaks down and re-packages products must retain the original health mark or health certificate (for imports) and provide a new health mark, giving both the original and new information, and must keep records. Shellfish from different sources must not be mixed. Retailers who break down packages for final sale must retain the health mark or import certificate.

In specified circumstances, fishermen harvesting small quantities and trading all their catch locally are exempt from parts of the Regulations. These circumstances are that the bivalve molluscs come only from category 'A' areas, that the bivalve molluscs or 'other shellfish' are transferred directly by the fishermen to retailers, caterers or consumers in the UK (and not via a merchant), that in any one year the total quantity involved does not exceed 25 tonnes and that within that total the quantities of particular species do not exceed the following:

cockles	25 tonnes
oysters	5 tonnes
king scallops	5 tonnes
queen scallops	10 tonnes
mussels	20 tonnes
marine gastropods	20 tonnes
other live bivalve molluscs	10 tonnes.

For bivalve molluscs and 'other shellfish', these fishermen are exempted from the conditions of harvesting, handling and transport of the raw material (including the requirement for 'movement documents') and from the 'dispatch centre', wrapping and health mark

requirements. They remain subject to a general requirement for hygienic handling, to the product specification and to the preservation, storage and transport requirements. To claim these exemptions, the fishermen concerned must first notify the local Food Authority and provide specified details of their business.

The Amendment Regulations establish requirements for the importation of live bivalve molluscs and 'other shellfish'. All countries within the 'European Economic Area' (EEA) are subject to the same 'food safety' requirements and so trade between these countries is unhindered. EEA countries are all the EU Member States plus Norway and Iceland (for trade in live bivalve molluscs and 'other shellfish' and fishery products only). Importation from 'third countries' outside of that area is based on 'equivalence' to European standards, with the additional requirement that each consignment imported must be accompanied by a 'health certificate' from the country of dispatch. Certain 'third countries' have been inspected and approved by the European Commission and for these countries there are approved 'dispatch centres', 'health marks' and specified health certificates satisfying the requirements for distribution of the shellfish within Europe. From July 1997, imports of bivalve molluscs and 'other shellfish', in whatever form except for wild scallop meats, are permitted only from that limited number of approved countries. Further legislation concerning trade in 'products of animal origin' requires that imports from outside of the EU enter the EU only via approved 'border inspection posts' and establishes detailed requirements for those posts and for inspection and importation procedures.

3.1.3 The Food Safety (Fishery Products) Regulations, 1992 and Associated Regulations

Associated Regulations include:

- The Food Safety (Fisheries Products) (Derogations) Regulations, 1992
- The Food Safety (Fishery Products on Fishing Vessels) Regulations, 1992
- The Food Safety (Fishery Products) (Import Conditions and Miscellaneous Amendments) Regulations, 1994
- The Food Safety (Fishery Products and Live Bivalve Molluscs and Other Shellfish) (Miscellaneous Amendments) Regulations, 1996.

These are the detailed Regulations dealing with fresh (chilled), frozen and processed fish and also with live fish with the exception of live bivalve molluscs and 'other shellfish'. The raw materials and products covered are all described as 'fishery products'.

These Fishery Products Regulations apply to bivalve molluscs and 'other shellfish' only when they are handled in these fresh, frozen or processed forms and not as live animals. The heat treatment of live bivalve molluscs and 'other shellfish' referred to in the Live Bivalve Molluscs Regulations and their handling after heat treatment is dealt with by the Fishery Products Regulations; whereas their harvesting and handling as live animals prior to heat treatment is dealt with by the Live Bivalve Molluscs Regulations.

The demarcation between the two sets of Regulations with regard to species of bivalve molluscs such as scallops, which are commonly handled as fresh or frozen (not necessarily processed) products, is less clear. In interpretation of the legislation it is accepted that wild

caught scallops for the fresh, frozen or processed trade and which are handled as such rather than as live animals from capture onwards, are covered almost completely by the Fishery Products Regulations although the requirements of the Live Bivalve Mollusc Regulations for safe levels of toxins must still apply. Other species of bivalve molluscs and farmed scallops for such trade must meet the relevant requirements of both the Live Bivalve Molluscs Regulations and the Fishery Products Regulations. The relevant requirements of the Live Bivalve Molluscs Regulations are considered to be those for 'production areas' and any consequent requirements for relaying, purification or heat treatment, together with the product specification regarding bacterial counts and safe levels of toxins and the requirement for 'movement documents'. If relaying or purification is required, then these molluscs must be physically handled as live animals under the Live Bivalve Mollusc Regulations at least until cleansed. Otherwise they can be physically handled as fresh products under the Fishery Products Regulations from capture onwards.

'Fishery products' must pass through an 'establishment' (or a 'factory vessel') approved by the local Food Authority before being placed on the market for human consumption. An 'establishment' is a place where 'fishery products' are prepared, 'processed', chilled, frozen, packaged or stored. 'Processing' includes heat treatment. 'Fishery products' must be packaged and documented in the 'establishment' (or 'factory vessel') prior to being placed on the market for human consumption. Persons must not operate an 'establishment' (or 'factory vessel') unless it has been granted approval and allocated a unique approval number and it must be operated according to the Regulations and to any specific 'conditions of approval'. 'Auction' and 'wholesale markets' are subject to a less stringent system of 'registration' and numbering by the local Food Authority.

A 'factory vessel' is a vessel on which various operations **and** 'packaging' of the product are carried out (i.e. the product would then be suitable for placing on the market for human consumption). Vessels on which shellfish are cooked but are not finally packaged (and hence the shellfish must later pass through an 'establishment' before being placed on the market for human consumption) must be registered with the local Food Authority. Persons must not operate such a shellfish cooking vessel unless it has been registered and is operated according to the Regulations.

The approved heat treatment of molluscs from category 'B' or 'C' areas, required by the Live Bivalve Molluscs Regulations, can be carried out only in an approved 'establishment' or on an approved 'factory vessel'.

The Fishery Products Regulations lay down basic requirements for the operation of fishing vessels, for landing and the operation of markets, for packaging and documenting products and for storage and transport. These basic requirements include the chilling of 'fresh fishery products' to the 'temperature of melting ice'. Basic standards are also established for the minimum quality of 'fishery products', for freedom from parasites and from naturally occurring toxins and for safe levels of any marine contaminants. More detailed requirements are laid down for the premises, equipment and operation of 'establishments' (and 'factory vessels') and for certain handling, treatment and processing operations. The latter includes detailed requirements for the heat treatment of bivalve molluscs, including the approved process required by the Live Bivalve Molluscs Regulations and a specification for the microbiological quality of cooked shellfish products. This specification is given in Appendix III of these Guidelines.

The Fishery Products Regulations establish a monitoring and control system. The local Food Authorities must monitor compliance of industry with the Regulations and this includes the inspection of 'establishments'. The operators of 'establishments' (and 'factory vessels') must identify points critical to the safety of their products and establish and implement methods for monitoring and checking these points. For live bivalve molluscs this must include the retention of 'movement documents' and the keeping of records of heat treatment and of microbiological analysis of the cooked products. Documents accompanying the products or labelling on the packaging must identify the country of dispatch and the 'establishment' (or 'factory vessel') number. From July 1997, for packaged products, this information will have to be on the packaging.

Fishermen selling all their catch directly to caterers or consumers in the UK (but not via merchants), or all their catch up to a maximum of 25 tonnes per annum of fishery products direct to retailers, caterers or consumers in the UK (but not via merchants), are exempt from the Fishery Products Regulations. The maximum quantity of each species of dead bivalve molluscs and 'other shellfish' allowed to be sold within the 25 tonne limit is the same as for the exempt transfer of live bivalve molluscs under the Live Bivalve Molluscs Regulations.

The Amendment Regulations establish requirements for the importation of 'fishery products'. These are broadly similar to those for live bivalve molluscs and 'other shellfish', although direct landings by 'third country' fishing or 'factory vessels' are permitted under the Fishery Products Regulations. Twenty-four hours notice of landing has to be given to the food authority by third country factory vessels.

3.1.4 Possible Changes to the Live Bivalve Molluscs and Fishery Products Regulations

It should be noted that at the time of writing, the EU Directives and the various UK Regulations on Live Bivalve Molluscs and Fishery Products are being reviewed and consolidated. This is likely to result in some changes in detail to the current legal requirements described in this document.

3.1.5 The Food Safety (General Food Hygiene) Regulations, 1995

These Regulations enact the EU 'horizontal' Directive on the Hygiene of Foodstuffs and supercede the UK's previous Food Hygiene Regulations.
These Regulations establish basic hygiene requirements for most foods, in all sectors of the food industry except 'primary production' but, in general, they do not apply where the 'vertical' Regulations, such as the Live Bivalve Molluscs and Fishery Products Regulations, already apply. In addition, they apply only to 'food' as defined in the Food Safety Act and hence apply to live bivalve molluscs only if they are to be eaten live. They do apply to fresh, frozen or processed molluscs in the retail and catering sectors, as the Fishery Products Regulations do not extend to those sectors. The particular requirement of the General Regulations concerning 'training' does apply to businesses already covered by the 'vertical' Regulations where the vertical legislation has no training requirement, although only to 'food' businesses and not to 'primary production'. This is a fundamental requirement for the proprietors of food businesses to ensure the supervision and instruction and/or training of food handlers in relation to the 'food safety' aspects of the work they do. 'Primary production' is considered to be activity such as farming or harvesting.

There may be 'grey areas' of interaction between the various Regulations. In time, this should be clarified.

3.1.6 The Food Safety (Temperature Control) Regulations, 1995

These regulations establish basic temperature control requirements for most foods, in all sectors of the food industry except 'primary production' but, in general, they do not apply where the 'vertical' Regulations already apply. However, they do apply to situations covered by the various Fishery Products Regulations unless those Regulations apply a further or alternative requirement. In addition, they apply only to 'food' as defined in the Food Safety Act and hence apply to live bivalve molluscs only if they are to be eaten live. They do apply to fresh, frozen or processed molluscs in the retail and catering sectors, as the Fishery Product Regulations do not extend to those sectors.

The Temperature Control Regulations require that foods likely to support the growth of pathogenic micro-organisms or the formation of toxins, are held at a safe temperature. With a number of exemptions, variations and tolerances, a chill temperature of 8^{o}C or less is specified. However, the various Fishery Products Regulations usually require chilling to the 'temperature approaching that of melting ice'. The Temperature Control Regulations also establish 'hot holding' and rapid cooling requirements. The requirements of the Temperature Control Regulations are somewhat different for Scotland, where a chill storage temperature is not specified.

3.2 Other Relevant Legal Requirements

The Materials and Articles in Contact with Food Regulations 1987 (as amended) and their associated Regulations establish particular requirements for materials, such as packaging materials, that are intended or are likely to come into contact with ‘food’ as defined in the Food Safety Act. These particular requirements will apply to materials in contact with the edible parts of molluscs handled as fishery products, e.g. shucked scallop meats or cooked cockle meats, but are not considered to apply to the in-shell raw material or to live animals (even if to be eaten live) as the edible parts are protected by the shell.

The Food and Environment Protection Act 1985 (as amended) gives Ministers extensive powers to make emergency orders to deal with risks to human health from the consumption of food. These powers are used, for example, to close fisheries where toxic algal blooms or serious pollution incidents have occurred and to prohibit trade in fish from those areas whilst the order is in force.

European and national fishery control and fish marketing legislation places restrictions on fishing activities and establishes certain marketing requirements, including the minimum quality standards for ‘fishery products’. Sea Fisheries Committee bye-laws establish local rules for fishing activity which may include fishing methods, minimum landing sizes and closed seasons.

Legislation concerning animal health and welfare places restrictions on the movement of live animals in order to prevent the transmission of animal disease. This includes some restrictions on the movement and reimmersion of bivalve molluscs, depending upon the animal health status of the areas and animals concerned. There are documentation requirements in association with this.

Legislation concerning human health, safety and welfare requires the provision of facilities such as toilets, washing and changing rooms as necessary and safe facilities and practices.

Weights and measures legislation establishes requirements for quantity measurement in relation to trade.

Food labelling legislation establishes general requirements for the format and content of labelling including restrictions on the claims that can be made.

Legislation concerning water resources places restrictions on the taking of water supplies from estuaries and boreholes, etc.

Legislation concerning the environment and the disposal of waste places restrictions on the means of disposal of both solid and liquid waste.

3.3 Recommendations for Product Quality

The essential requirements of the various Food Safety Regulations concerning the avoidance of contamination, careful handling and temperature control are also fundamental to the maintenance of quality.

Although the product specifications in the Regulations establish minimum standards for product quality, this does not guarantee that the products will satisfy the commercial standards of quality demanded by the market, which can be far higher.

In addition to the requirements of the Food Safety Regulations, it is recommended that:

- **the products are supplied to the consumer whilst their eating qualities remain desirable and before 'off' flavours develop (which is likely to be some time before the apparent death of live bivalve molluscs)**

- **the molluscs are in a satisfactory seasonal condition, being of acceptable intrinsic quality and live bivalve molluscs being sufficiently robust to survive the conditions of handling and distribution in order to remain of acceptable eating quality on reaching the consumer**

- **appropriate species of sub-littoral and hence 'fragile' live bivalve molluscs are moved to intertidal areas for a period of 'hardening' prior to harvesting for human consumption, if necessary for them to survive the circumstances of marketing and to remain acceptable**

- **live bivalve molluscs are purged ('conditioned') if necessary to remove distasteful or gritty contents**

- **where practicable, shells are cleared of marine growth such as barnacles**

- **the products are well sorted to remove any extraneous items and damaged shellfish and are size graded to suit market requirements.**

There is little difference between the requirements of the Food Safety Regulations for vessels, premises, equipment and working practices and those that are required to maintain product quality.

Market requirements vary but they should be determined by the producer and then production should be tailored to suit those requirements. The broad recommendations given in this document are based on general experience of the market.

In general, consumers start to reject products when 'off' flavours develop. The storage life of live bivalve molluscs depends on their species, the season and growing conditions, their handling history prior to dispatch and the conditions of distribution and storage after dispatch. Some data on storage lives in typical situations is given in Appendix II. The Food Safety Regulations require only that live molluscs retain signs of life but typically the useful storage life before 'off' flavours develop is only about one half of the storage period until their apparent death.

Suppliers of live bivalve molluscs should have due regard for the likely circumstances of handling and distribution of the molluscs and the required storage life. Molluscs that are seasonally weak or otherwise 'fragile' should not be marketed if it is likely that they will not survive those conditions and remain acceptable. These molluscs may be suitable for other markets. Some species, such as oysters and mussels, can be significantly toughened by 'hardening' in an intertidal area.

Molluscs of seasonally poor eating quality should not be marketed.

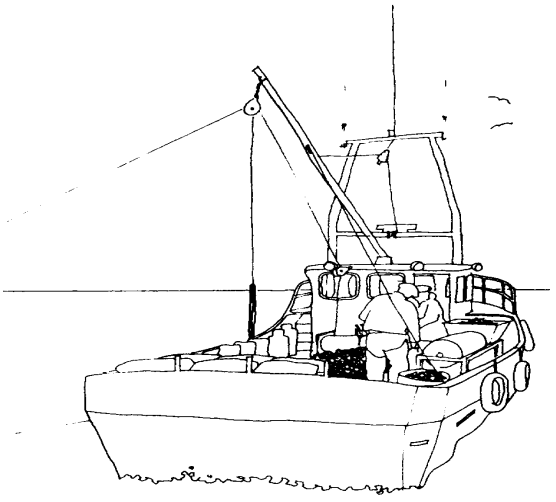
Purging live bivalve molluscs by 'conditioning' (or by purification) can greatly improve their eating quality. This is particularly so for species that bury themselves in the seabed and are harvested by suction dredging or other such techniques and which take up grit in that process, but there is also a general benefit to the keeping and eating quality of molluscs by purging their stomach contents.

Marine growth such as barnacles not only detracts from the appearance of the product but also these organisms can spoil rapidly and further detract from the product.

Sorting and grading the product should ensure that only healthy animals meeting the customer's requirements are marketed.

4. Harvesting, Handling and Transport of The Raw Material

Contents



4. Harvesting, Handling and Transport of the Raw Material

4.1 Legal Requirements

The Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations 1992 (as amended)

Restrictions on Marketing of Molluscs and Shellfish

11.-(1) Subject to paragraphs (2) to (5), no person shall place on the market for immediate human consumption any live bivalve molluscs or other shellfish, unless -

(a) they originate from a bivalve production area which -
- *(i) has been designated as a Class A area, a Class B area or a Class C area in accordance with regulation 3(1), and any condition or limitation specified in Schedule 3 in relation to that class of area has been complied with,*
- *(ii) has been designated as a Class A area, a Class B area or a Class C area in accordance with regulation 2(1) of the Northern Ireland Regulations, and any condition or limitation specified in Schedule 3 to those Regulations in relation to that class of area has been complied with,*
- *(iii) has been identified, pursuant to any law passed by the legislature of any of the Channel Islands or of the Isle of Man which is intended to give effect to the results to be achieved by Chapter I, in so far as it applies to those islands, as an area from which bivalve molluscs may be collected, and any condition or limitation derived from that Chapter which relates to that production area has been complied with, or*
- *(iv) if they are imported for relaying, was of at least the same standard as an area designated as a Class B area or a Class C area in accordance with regulation 3(1)(b) or (c), and any condition or limitation specified in Schedule 3 in relation to the class of area which would be applicable for that production area has been complied with;*

(b) they have been harvested, kept and transported to any approved dispatch centre, approved purification centre or approved relaying area to which they are thereafter transferred, in accordance with the requirements of -
- *(i) Schedule 2,*
- *(ii) Schedule 2 to the Northern Ireland Regulations, or*
- *(iii) any law passed by the legislature of any of the Channel Islands or of the Isle of Man which is intended to give effect to the results to be achieved by Chapter II , in so far as it applies to those islands, and they are accompanied by a valid movement document or a valid permanent transport authorisation;*

(g) they have been stored and transported under satisfactory conditions of hygiene and in particular in accordance with the requirements specified in Schedule 7;

(i) they have been handled hygienically;

Exemptions for marketing molluscs and other shellfish within UK.

12.-(1) Subject to paragraph (2) and (3), during any calendar year, a coastal fisherman who has notified the food authority as specified in paragraph (2) may directly transfer to retailers or final consumers within the United Kingdom for immediate human consumption a small quantity of any species of live bivalve molluscs gathered from a Class A area or of other shellfish, and where he does so, in the case of live bivalve molluscs regulation 11(1)(b),

(c), (f) and (h) and, in the case of other shellfish, regulation 11 (1)(b), (f) and (h) shall not apply to him.

Schedule 2. Requirements For Harvesting and Transportation

1. Harvesting techniques must not cause excessive damage to the shells or tissues of live bivalve molluscs.

2. Live bivalve molluscs or other shellfish must be adequately protected from crushing, abrasion or vibration after harvesting and must not be exposed to extremes of hot or cold temperature.

3. Techniques for harvesting, transporting, landing and handling live bivalve molluscs or other shellfish must not result in additional contamination of the product, nor in a significant reduction in the quality of the product, nor in any changes significantly affecting their ability to be treated by purification, processing or relaying.

4. Live bivalve molluscs or other shellfish must not be re-immersed in water which could cause additional contamination between harvesting and landing.

5.-(1) The means of transport used for transporting live bivalve molluscs or other shellfish must be used under conditions which protect the latter from additional contamination and crushing of shells, and must permit adequate drainage and cleaning.

(2) In the event of bulk transport over long distances of live bivalve molluscs to a dispatch centre, purification centre, relaying area or processing plant, the means of transport must be equipped in such a way as to ensure the best survival conditions possible, and in particular must comply with the requirements laid down in paragraph 2 of Part 2 of Schedule 7.

Schedule 7

Part 1 - Preservation and Storage

1. In any storing rooms, live bivalve molluscs and other shellfish or both must be kept at a temperature which does not adversely affect their quality and viability; the wrapping must not come into contact with the floor of the store room, but must be placed on a clean, raised surface except in the circumstances provided in paragraph 3 of Schedule 6.

Part 2 - Transport from the Dispatch Centre

2 .The means of transport used for consignments of live bivalve molluscs or other shellfish or both must have the following characteristics:

(a) their interior walls and any other parts which might come into contact with the live bivalve mollusc must be made of corrosion-resistant materials; the walls must be smooth and easy to clean;

(b) they must be suitably equipped to provide efficient protection of the live bivalve molluscs or other shellfish against extremes of heat and cold, contamination with dirt or dust, and damage to the shells from vibration and abrasion;

(c) the live bivalve molluscs or other shellfish must not be transported with other products which might contaminate them.

In addition, there may be local Sea Fisheries Committee bye-laws restricting harvesting methods and equipment, establishing minimum landing sizes and sorting practices and creating closed seasons. Further local bye-laws and planning and usage restrictions can also restrict activity at sea and ashore. Environmental legislation restricts the disposal of waste

and local bye-laws may prohibit the contamination of public places by leakage of waste water from transport vehicles.

Health and Safety legislation requires workplaces and equipment to be safe, including the avoidance where practicable of slippery surfaces and the provision of adequate lighting and of necessary safety equipment. The recommendations given in the Health and Safety Executive publications "Recommended Code of Safety for Fishermen" and "A Guide to the Loading and Unloading of Fishing Vessels Regulations, 1988", are of particular relevance.

The Weights and Measures Act, 1985 requires that for transactions in which a quantity of goods is stated or implied, only weighing or measuring equipment that has been approved and stamped by Trading Standards Officers may be used.

The Water Resources Act, 1991 requires that a licence be obtained to abstract water direct from 'inland waters' (which include channels, creeks, bays, estuaries and arms of the sea as well as rivers and lakes) and from underground strata. A licence is not usually required for taking seawater from an area of open coast. Charges may be levied for abstraction. The abstraction of water by vessels for use on those vessels and the abstraction of only small quantities of water are exempt. These matters are dealt with by the Environment Agency in England and Wales, the Scottish Environmental Protection Agency and DoE in Northern Ireland.

The Food and Environmental Protection Act, 1985 prohibits the deposit of articles on the seabed unless a licence to do so has been obtained and this applies to seawater pipelines on or under the seabed supplying premises ashore. These matters are dealt with by MAFF in England and Wales, SOAEFD in Scotland and DoE in Northern Ireland.

The Live Bivalve Molluscs Regulations need interpretation in respect of the status of premises used for the intermediate handling and storage of molluscs prior to their being taken for relaying, purification, dispatch or processing. It is accepted that premises used only for basic handling and storage of raw material that will subsequently pass through and be packaged and labelled in an approved dispatch centre or processing establishment, do not have to be approved establishments although similar standards of hygiene should apply. The decision on whether or not particular premises require to be approved establishments, depends upon the totality of operations carried out.

4.2 Recommendations

4.2.1 General Requirements

Live bivalve molluscs must be protected against stress, damage and contamination and must not be exposed to extremes of temperature.

It is recommended that bivalve molluscs are separated from any debris, sorted if necessary, washed, containerised and placed in a protected environment as soon as possible after harvesting and that they are taken for relaying, purification, dispatch or processing with the minimum of delay.

To maintain their separate identification, batches of molluscs from different production areas must not be mixed together.

The protected storage/transport environment should provide protection from vermin and other sources of contamination and sufficient protection from the elements to maintain cool, moist conditions.

Non-immersed storage is recommended for most short-term storage situations. Guidance on immersed storage is given separately in Section 6.

For the usually short periods of storage and transport of the raw material, a mollusc temperature range of 2° C to 10° C is generally recommended for most species, although a range of 2ºC to 5ºC is preferable for longer periods of storage. However, it is recommended that native oysters and live scallops are held at no lower than 4ºC and it is beneficial to ice blue mussels.

Although small-scale trade in molluscs from Class A areas from fisherman direct to retailer or final consumer in the UK is exempt from the particular requirements of the Regulations for harvesting and transportation, on a basis of good practice the practical guidance given in this document is still recommended for that trade.

There may be further requirements to provide waste storage and disposal facilities, toilet, washing and cloakroom facilities for personnel and facilities for the supply and storage of ice. These requirements are dealt with separately in Sections 10.0,11.00 and 12.0 respectively.

Bivalve molluscs can be harvested, handled and transported to the relaying area, purification centre, dispatch centre or processing establishment in a wide variety of circumstances. These can range from small-scale hand picking on the foreshore with no mechanical handling and only local transport, through to large-scale dredging on vessels with mechanised handling and operation from port facilities and with long distance transport. There are many variations inbetween, including mollusc farming activities. The molluscs can be handled or stored at sea or ashore. However, the basic conditions of hygiene and handling should apply in all circumstances.

The basic post-harvest handling operations such as sorting, washing and containerisation can be carried out in the open air on a suitable harvesting unit, landing place or other suitable place. Small-scale operations carried out on a clean beach washed by the tide are considered acceptable.

Sorting and washing the raw material immediately after harvesting and before residues have dried on the molluscs, removes potential contaminants. It also enables more efficient operation thereafter as only the useful raw material remains to be further handled, stored and transported. However, care must be taken to ensure that these operations do not unduly damage or stress the molluscs, particularly those to be relayed or purified.

Containerising the molluscs reduces the likelihood of further damage during handling, storage and transport and assists in protection from contamination. In many circumstances it also enables more efficient operation. However, the large-scale bulk handling of bivalve molluscs is carried out at some places and can be effective with purpose designed vessels and handling equipment, particularly in the less critical situation where the molluscs are to be heat treated within a short period.

Depending upon the time periods and circumstances involved, there may be a need for a protected storage environment on the harvesting unit, at the landing place, at an intermediate handling and storage place or on a transport vehicle. The protected storage environment should be covered and in hot weather the provision of chilling is recommended, as necessary, to maintain the required temperature. If ice is used, particular care must be taken to ensure the drainage of melt water. Further guidance on ice supply and handling is given in Section 12.

A pragmatic approach to temperature control is required in order to maintain suitable conditions for the molluscs. This will depend upon their species, the season, the environmental conditions prevailing at the time of harvest and the likely storage period, transportation, relaying, purification or processing, etc, after harvesting. Taking sensitive molluscs from warm waters (to which they have acclimatized) and subjecting them to temperature shock by rapid chilling can be more harmful than a short period of unchilled storage, particularly if the molluscs are then to be purified. Further information on the temperature sensitivity of the various species of molluscs is given in Appendix II.

Immersed storage involves further risk of contamination and must be carried out only in controlled conditions.

Any delay out of water, particularly in adverse conditions, will stress the molluscs. Molluscs intended for heat treatment that have been subjected to bulk handling operations, may die and spoil if subjected to delay or warm conditions and this will result in a poor quality product.

4.2.2 Harvesting Methods and Equipment

Harvesting methods and equipment should cause only the minimum of damage and stress to the bivalve molluscs.

The methods and equipment appropriate depend on the species of mollusc, the environment and circumstances in which they are growing, the type of product for which they are intended and the scale of operation.

Harvesting methods and equipment for molluscs buried in a soft sea bed should cause only the minimum of grit uptake.

In general, manual harvesting methods such as hand picking or raking are suitable for the small-scale harvesting of all species and result in little stress and damage to the molluscs.

Species such as cockles and manila clams that bury themselves in the sea bed are prone to grit uptake during harvesting. In general, there is less grit uptake when these species are harvested by raking when uncovered by the tide than when harvested by dredging when covered. Raking also causes little damage to these relatively fragile species and so is recommended when they are harvested for live trade. Purpose designed mechanised raking vehicles are used in some places for large-scale harvesting. Care needs to be taken in the design of these vehicles so that the mechanical handling involved does not damage the molluscs.

Simple towed dredges are recommended for the harvesting of species such as mussels, oysters and hard-shell clams that grow on the surface of a reasonably flat sea bed. These dredges cause relatively little damage to the molluscs. Their efficiency of operation varies

considerably with their detail design and rigging.

Where molluscs are cultivated by growing on lines, posts, trays or in bags or by similar means, then the harvesting of the intact cultivation units followed by the stripping of the molluscs from the units is likely to be efficient and result in the minimum of stress and damage to the molluscs. Equipment is available for mechanically harvesting and stripping certain types of cultivation unit. Again, care needs to be taken in the design of this mechanical equipment to avoid damaging the molluscs.

Towed hydraulic suction dredges can rapidly harvest molluscs buried in the sea bed but they result in significant damage and stress to the molluscs and are not recommended for the live trade. They can be suitable for molluscs intended as fresh fishery products or if the molluscs are to be heat treated within a short period. These dredges vary considerably in design and effectiveness. The early jet-pump type used for harvesting cockles caused more damage and stress to the molluscs and a higher uptake of grit than the later designs employing solids handling pumps. The later designs are also more efficient. The dredges can be designed and rigged to dredge to varying depths for deep buried species such as razor clams, although in so doing they cause considerable disturbance to the sea bed and hence their use is banned in some areas.

Other specialised harvesting systems, such as water lifts and hybrids of hydraulic dredge/mechanical elevator, are used in some places for easily damaged species such as clams.

The ‘blowing out’ method of harvesting buried species, in which the vessel circles around an anchor using its propeller wash to pile up the molluscs which are then collected at low tide, is not recommended as it causes considerable damage and stress to the molluscs and can be wasteful. ‘Blowing out’ also causes considerable disturbance to the sea bed and grit uptake by the molluscs.

Care must be taken in handling system design to ensure that molluscs are not thrown or dropped at exit from the harvesting equipment, to the extent that they are damaged.

4.2.3 Harvesting Units (Vessels, Rafts or Vehicles, Etc)

Parts of the harvesting unit in which bivalve molluscs are handled or stored and in which associated equipment and materials such as containers and ice are handled or stored, should be designed and constructed to be easily cleaned. These parts should be constructed of durable, hard-wearing materials that are capable of being cleaned frequently.

These parts must be separated from sections of the harvesting unit such as propulsion machinery spaces and fuel stores which could cause contamination.

The design of these parts should be simple and unadorned, where possible without complicated structural sections and without inaccessible places and cracks and crevices, to avoid the lodging of debris and the harbouring of vermin and to facilitate cleaning.

These parts must be well drained to avoid the possibility of contaminating the molluscs by immersion in dirty water and to facilitate cleaning. Where necessary, a bilge pumping system must be provided.

To provide protection against contamination and to help maintain the required temperature conditions, it is recommended that covers or covered facilities are provided, as necessary, for any molluscs held on the harvesting unit following harvesting and handling operations.

Adequate lighting must be provided if the harvesting unit is to be used beyond the hours of daylight.

Smooth surfaced, non-absorbent, rot and corrosion resistant construction materials such as GRP or marine grade aluminium are recommended but are not always practicable in this usage. Wood or steel construction is adequate, provided that it is adequately treated and remains in good condition. Any treatment or paint must be non-toxic. Decks must be non-slip.

Separation from machinery spaces, etc, can be achieved on small units by boxing in engines and by not storing fuel and lubricants, etc, in the areas required to be kept clean.

To facilitate drainage, decks should be cambered to freeing ports and with limber holes in structural sections and in internal dividers.

The provision of tarpaulins or lidded containers may provide adequate protection for the short-term storage of molluscs on the harvesting unit. In hot summer conditions, some form of cooling is required to achieve the recommended temperature range. Simple evaporative cooling, employing wet absorbent covers, may help avoid excesses of temperature. Insulated covers, of the type used on some soft sided refrigerated vehicles, and insulated containers can be effective. Should longer term storage be required, particularly overnight in frosty winter conditions or throughout a hot summer day, then the provision of an insulated storage room is recommended together with the use of refrigeration in hot conditions (or ice for blue mussels). Any insulation materials used should be non-absorbent, such as closed-cell plastic foam. Further guidance on the refrigeration of storage rooms is given in Section 7.2.3.

4.2.4 Landing Places

It is recommended that wherever possible, a quay or an area is designated and dedicated to bivalve mollusc (and other fish) unloading, handling, storage and associated activities. Where possible, it is recommended that there is physical separation by means of fencing or walls and gates, to exclude the public and dogs, etc., from this area. Where this is not possible, it is recommended that a bye-law be sought to restrict the exercising of dogs and other animals on the area.

There should be sufficient space for landing, handling, storage and associated activities including equipment washing and storage, transport vehicle access and safe parking. General traffic should be routed around the handling area.

It is recommended that where possible, separate areas are provided for vessel fuelling, maintenance, waste storage and other potentially contaminating activities, away from mollusc handling or storage areas and from other areas required to be kept clean.

To minimise exposure of the bivalve molluscs, it is recommended that where possible, vehicle loading points or any mollusc handling or storage facilities are located adjacent to the landing point.

To provide protection against contamination and help maintain the required temperature conditions, it is recommended that covers or covered storage facilities are provided, as necessary, for any molluscs held at the landing place prior to being taken for relaying, purification, dispatch or processing.

The ground surfaces of landing quays and other site areas for mollusc handling or storage should be hard wearing, non-slip and easy to clean. They should be even, without cracks or crevices or hollows that cause puddles and be sloped to drainage channels or gullies. Drainage channels or gullies should be covered and drains should be trapped to prevent the entry of vermin. These recommendations do not apply to clean beaches washed naturally by the tide and over which molluscs are landed and handled.

The design of quays, jetties, barriers, bollards, fendering and other features should be simple and unadorned to avoid the lodging of debris, the harbouring of vermin and to facilitate cleaning.

Any premises for the intermediate handling or storage of molluscs prior to their being taken for relaying, purification, dispatch or processing, should be designed and constructed to be easily cleaned and to prevent the entry of vermin. They should be constructed of durable, hard wearing materials capable of being cleaned frequently.

Although such premises may not have to be approved establishments and hence may not be subject to the further requirements of the Regulations for purification and dispatch centres, similar standards of hygiene should apply.

On a basis of good practice, it is recommended that the practical guidance given in Section 7.2 for the design, construction and equipment of purification and dispatch centres is followed where relevant to these raw material handling and storage premises.

Areas for the washing and storage of mollusc handling equipment should be easy to clean and be well drained. Covered storage is recommended where practicable.

Adequate lighting must be provided if the facilities are to be used beyond the hours of daylight.

Bivalve molluscs can be landed at any suitable place, on beaches or in ports, provided that the necessary conditions of hygiene are satisfied and that it is not in contravention of Environmental or Health and Safety legislation or local bye-laws or planning and usage restrictions.

Detailed recommendations for the layout, design and construction of landing places for fresh fish are given in the Seafish Guidelines for those places. On a basis of good practice, the detailed recommendations given in that publication for landing quays and associated site areas are broadly applicable to the handling of bivalve molluscs, although the legal

requirements of the Fishery Products Regulations referred to in that publication do not apply to live bivalve molluscs.

Where it is not possible to provide the recommended physical segregation and conditions, for example on busy public beaches or quays, then the scale and nature of mollusc landing and any handling operations or storage should be limited accordingly, so that the molluscs are not exposed to risk of con-tamination. In particular, molluscs should not be placed directly on the ground at such places. It is recommended that containers or pallets or other suitable surfaces are provided or that the molluscs are loaded directly onto transport vehicles.

Further guidance on the need for mollusc storage facilities is given in Section 4.2.3 dealing with harvesting units, and this also applies to landing places. The parking of a suitable transport vehicle at the landing place may provide the necessary storage.

In general, concrete ground surfaces with a roughened surface finish and drainage slopes of about 1 in 70-80 are recommended for quaysides and similar site areas.

In respect of the guidance given in Section 7.2 on the design and construction of purification and dispatch centres, intermediate handling and storage premises should be considered as being equivalent to the raw material handling and storage areas of purification and dispatch centres.

Tarpaulins may be adequate for covering stored equipment. On unprotected sites such as busy public beaches or quays, a secure area should be provided for any storage of equipment.

4.2.5 Other Places Where The Raw Material is Handled or Stored

It is recommended that where possible, any mollusc handling operations such as sorting and washing and mollusc storage, are carried out in controlled conditions on the harvesting unit or at the landing place or at the purification or dispatch centre or processing establishment. Where it is necessary to carry out intermediate handling or storage of the raw material at other places, then similar conditions should be provided.

The detailed recommendations for landing places, given in Section 4.2.4, are broadly applicable to other places where the raw material is handled or stored prior to being taken for relaying, purification, dispatch or processing. In particular, it is recommended that those other places are designated and dedicated for their purpose. They must provide the necessary protection from contamination, temperature control and cleanliness.

4.2.6 Mollusc Handling Equipment

The methods and equipment used should enable the rapid handling of the bivalve molluscs, with the minimum of exposure to contamination, whilst causing the minimum of stress and damage to the molluscs. Any throwing or dropping or any other form of impacting, crushing or shaking of the molluscs must be minimised.

Handling systems should be designed so that the molluscs do not accumulate for extended periods in exposed situations at the landing place or elsewhere.

The methods and equipment appropriate depend on the species of mollusc, the type of product for which they are intended and the scale of operation. In particular, the

methods and equipment used must not unduly stress or damage molluscs to be relayed or purified.

Other than for small-scale manual operations, the use of mechanical handling with the molluscs held in containers is generally recommended.

The equipment must be easy to clean. Where possible, the surfaces of the equipment should be smooth and rounded and free from crevices and corners in which debris can accumulate. Where necessary, equipment should dismantle readily for cleaning. Where practicable, large items of fixed equipment should be positioned at least 0.5 metres from walls so that they can be cleaned on all sides. If necessary, they must be set on raised supports to clean beneath them. Their supports should be sealed to the floor. Alternatively, equipment used ashore can be mounted on wheels.

The equipment should be made of durable, hard wearing materials capable of being cleaned frequently. Materials should be non-absorbent and resistant to rot and corrosion. It is further recommended that parts of the equipment that come into contact with bivalve molluscs are made of food grade materials such as stainless steel or plastic.

Safety devices and guards must be fitted to equipment as necessary. All electrical equipment used in wet areas must be hose-proof. Electrical equipment conforming to IP66 classification (dust and hose proof) is recommended.

All live bivalve molluscs are sensitive to being dropped onto hard surfaces or to other such impact damage, this sensitivity varying with the species and condition of the molluscs. Further details are given in Appendix II. Some species, such as manila and hard shell clams, readily suffer terminal shell damage and for these species direct handling operations are best done manually rather than mechanically. Other species, such as mussels, suffer less damage and are suitable for mechanised declumping, sorting, etc, in well designed machines. However, even for these more robust species, stress and minor damage (such as a chipped shell lip leading to loss of intravalvular fluid) can result in the death of the molluscs within a day or two. Similarly, the rapid shaking or vibration of molluscs is thought to harm them. The effects of a number of small impacts or other mishandling are known to be cumulative.

Cockles are sensitive to physical damage and require particularly careful handling if to be relayed, purified or marketed alive but this is of less concern when these or other species are to be heat treated soon after harvesting.

In all but the very smallest scale of manual handling operations, some dropping or shaking or other potentially harmful action is inevitable but by careful design and good practice, the harm can be minimised. For example, heights of dropping on exit from dredges, conveyors or other equipment can be reduced and soft or angled surfaces can be provided to reduce impacts. Containerising the molluscs and handling those containers by barrow, fork lift or crane, etc, results in considerably less stress or damage to the molluscs than by shovelling or conveying the unprotected molluscs or by manually throwing small bags of molluscs around. It can also be more efficient.

In the presence of salt water, a marine grade of stainless steel such as type 316 is preferable to the more usual grades for food use.

Ancillary parts of equipment that do not come into contact with molluscs, for example support frames, can be constructed of low cost materials such as painted steel although long-term maintenance costs will be higher. Galvanised surfaces on parts of machinery in contact with molluscs are likely to wear through rapidly.

It is recommended that mollusc handling equipment is purpose designed and built by specialist manufacturers serving the food industry, who are experienced in design for cleaning and the use of suitable materials. Normal agricultural and materials handling equipment such as riddles and conveyors are relatively inexpensive but are generally unsuitable as they can subject the molluscs to stress and damage, can be difficult to clean and can be susceptible to corrosion.

Equipment which uses large volumes of water should be sited over a drainage channel or gully, or the waste water should be flumed to an adjacent channel or gully.

The fitting of emergency stop buttons is recommended for conveyors, particularly sorting conveyors, and for similar equipment.

Great care must be taken to ensure the safety of mains voltage electrical supplies in the wet environment of shellfish handling. Salt water mist is particularly pervasive. In wet areas, power sockets, plugs and other electrical equipment must be hose-proof. Ordinary electrical equipment is unsafe in the wet. Sockets should not be placed at low level and cables to fixed equipment should not run along the floor. Electrical isolators must be provided for machinery and be conveniently located. Residual current circuit breakers are highly recommended and must be provided for high pressure washers and steam cleaners. The installation of electrical equipment should be carried out by competent engineers.

4.2.6.1 Mollusc Containers

Containers must not transfer harmful substances to the molluscs. Food grade materials are recommended. Mollusc containers must have drainholes.

Containers must be of adequate strength and provide the protection required for their purpose. Robust re-usable containers are recommended where practicable.

All re-usable containers must be made of durable materials and be easily cleaned. Wooden boxes and wicker baskets are not considered suitable for re-use.

Containers can be flexible bags or sacks, or rigid boxes or bins. In general, rigid containers are recommended as they can provide greater protection against damage and contamination, are more easily cleaned and can have mechanical handling advantages.

Containers must be clean when they are used. The use of second-hand fertiliser bags, etc, is not recommended unless they have been extremely well cleaned and can be guaranteed to be free of harmful substances. Any dirty water must be able to drain freely from the containers to avoid the ingestion of contaminants by the molluscs.

The type of container appropriate depends on its usage. Where there is dependence on the containers to provide protection against the environment then they should be enclosed; and

netting sacks or unlidded or mesh sided boxes or bins would not be adequate. Containers with feet and raised bases are recommended where it is necessary to place them directly on the ground in unprotected areas. Where rigid containers are stacked, they must be strong enough to bear the load and should be designed to interlock in a secure stack.
Rigid containers take up more space than flexible containers such as sacks and are also more expensive but, in practice, provide significantly greater protection to the bivalve molluscs. Sacks are commonly thrown around when they are manhandled and the molluscs take the load when they are thrown and also when they are stacked. Stack/nest type fish boxes and larger tote bins are recommended. Both types are available lidded. The tote bins have feet and raised bases. Insulated bins are readily available. Large tote bags, which cannot be thrown about, may be suitable but are more difficult to clean.

However, it may not be practicable to send relatively expensive re-usable rigid containers to distant destinations from which they may not return, in which case the conditions of handling, storage and transport must account for the less effective sacks or similar containers used.

In general, plastic such as high density polyethylene is preferred to metal for boxes and similar containers. The design and material of these containers should be compatible with any cleaning and disinfection chemicals and any washing machinery used. For efficient handling, these containers should have hand holds or strong points for sling attachment as appropriate. Large containers should be designed for fork lifting. Boxes that will stack on a standard pallet are preferred.

4.2.6.2 Mechanical Handling Equipment

The use of simple mechanical handling aids for discharging containers from vessels and for handling them ashore is recommended.

For operation inside buildings or vehicles, electric fork lift trucks are recommended in preference to diesel trucks. Gas powered trucks may be suitable.

The use of powered equipment, such as mechanical grabs and mechanical shovels, for directly handling loose molluscs in bulk is not recommended. Any conveyors or other such equipment used for handling loose molluscs in bulk, should be purpose designed to minimise stress and damage to the molluscs.

The use of simple equipment such as discharge derricks, pallets and fork lift trucks, enables speedy and efficient operation. Manually carrying containers is appropriate for small-scale operations. Containers should not be dragged along the ground as this not only risks contamination but also causes costly container damage.

Plastic pallets are preferred to wooden pallets but are more expensive and their use may not be practical when they leave the area and losses are high.
Trucks powered by internal combustion engines are suitable for use in the open air and have advantages of power and endurance but most emit toxic fumes, particularly diesels, and are not recommended for use in enclosed situations where the molluscs may become tainted. Gas powered trucks fitted with high performance catalytic converters are suitable for mixed cycle indoor/outdoor operations. All trucks must be well maintained to prevent oil leakage.

Equipment such as mechanical grabs and mechanical shovels is likely to cause unacceptable levels of stress and damage to molluscs intended for relaying, purification or marketing alive.

Critical design points for other bulk handling equipment include the entry to and exit from conveyors and the tipping of large containers.

4.2.6.3 Mollusc Washing Equipment

The need for washing equipment and the type of equipment required is dependent upon the species of bivalve mollusc and the circumstances of growing, harvesting and handling.

Molluscs should be washed by spraying or scrubbing with water. They must not be left immersed in washing water after harvesting.

Most species are readily washed but mussels have to be declumped to enable effective washing and pacific oysters are particularly difficult to clean because of their convolutions. Where the molluscs are grown off the bottom in clear water the requirement for washing may be minimal, whereas molluscs grown on a muddy sea bed need to be thoroughly washed before the mud dries. When the molluscs have been harvested by suction dredging, they may have received adequate washing in that process. When harvesting by simple towed dredges, towing the dredge off the bottom for a few minutes can give some cleaning action.

When the molluscs are subjected to a mechanised declumping, sorting, barnacle removal or similar operation, it is recommended that washing is best achieved by jets of pressurised water from spray bars in the machinery. The rubbing and tumbling of the molluscs in the machinery assists in cleaning.

In small-scale operations where there is no such machinery, it is recommended that the molluscs are spread out in a shallow layer on a grid and hosed down with pressurised water. The use of a standard high pressure washer, with a fan jet to avoid damaging the molluscs, is recommended but the molluscs must be constrained, for example in a tray with a perforated bottom, to avoid throwing them about with the jet. The area in which this is done must be well drained. Spray from these operations must not cause cross-contamination of clean molluscs or of clean equipment or materials in storage.

Molluscs cannot be effectively washed in bags, even if constructed of wide mesh netting. The molluscs in the centre of the bag remain poorly washed.

Molluscs must not be immersed in washing water, as they may open and ingest contaminants. Washing should be a brief and active process which discourages the molluscs from opening.

4.2.6.4 Declumping, Sorting and Barnacle Removal Equipment, Etc.

The need for equipment and the type of equipment required is dependent upon the species of bivalve mollusc and the circumstances of its growing and harvesting.

In general, the equipment may subject the molluscs to rubbing, scrubbing and mild tumbling but should not subject the molluscs to dropping, impacting or harsh vibration that cause stress and damage to the molluscs.

Mussels, particularly bottom grown mussels, usually require declumping prior to further operations. Oysters may require separating.

The extent of barnacle encrustation and fouling, the amount and nature of rubbish harvested with the molluscs and the extent of sorting required, depend upon the growing conditions and harvesting method. Molluscs cultivated off the bottom in clear water may require little handling.

When handling dredged molluscs, particularly those that tend to be clumped together, it is recommended that prior to mechanised declumping, sorting, etc, the molluscs are subjected to a visual inspection so that any rocks, unexploded munitions, etc, that could damage equipment and persons can be removed. In this respect, it is advisable to have a reception area where the molluscs are deposited by the dredge and from which the molluscs are transferred in a controlled fashion to the machinery.

For declumping mussels, purpose built machines with rotating cylinders and knives or with stiff brushes over bars, are recommended. Conveniently, these are often combination declumping/sorting machines. Manual methods are recommended for separating oysters to avoid damage to their shells. Molluscs should not be declumped by treading on them as considerable damage results.

For mechanical sorting and separation of debris, purpose built riddles or similar grading machines are recommended. For the common rotating drum type riddles, care must be taken to ensure that the molluscs are not carried up around the drum to the extent that they are stressed and damaged when they drop back. Machines with fixed drums and rotating internal augers can cause less stress and damage but are prone to drum surface blockage by debris. For declumping/sorting mussels, a machine with a contra-rotating auger and drum is available that operates efficiently and causes little stress and damage. Typical agricultural and materials handling type riddles or graders, that have been in widespread use for molluscs, are harsh in action and generally cause considerable stress and damage.

Manual sorting may be required for easily damaged species such as oysters and clams although purpose built sorting equipment is available for these species.

The removal of barnacles and other fouling may be achieved in the equipment described above, particularly in declumping machinery with a rubbing/
scrubbing action, provided that the molluscs are sufficiently robust.

For the debearding of mussels, if required after declumping/sorting, purpose built machines are available with contra-rotating knurled bars which pinch the threads and pull them off. This, together with mild declumping, should be done after purification and not before as it stresses the mussels and, in addition, further embyssment occurs during purification.

For all of the machinery described above, the speed of its action is critical to the amount of damage and stress caused to the molluscs. The machinery should be run as slowly as possible commensurate with adequate functioning.

4.2.6.5 Mollusc Quantity Measurement
Weight, volume or counting measures are permissable.

Quantity measurement equipment (e.g. scales) used for the purpose of trade, must be approved and stamped by Trading Standards Officers.

Simple volumetric measurement of quantity is often appropriate during raw material harvesting and handling operations. The use of a measuring bucket or similar is recommended rather than depending upon judgement of sack or box filling.

Trading Standards Officers can advise on the suitability of weighing equipment, etc. Robust, hose-proof electronic scales are now readily available and their use is recommended.

4.2.7 Raw Material Transport Vehicles

Parts of vehicles in which molluscs are held or with which they may come into contact, should be designed and constructed to be easily cleaned. These parts should be constructed of durable, hardwearing materials capable of being cleaned frequently. For transport of loose molluscs in bulk over long distances, these parts must have smooth, corrosion resistant surfaces.

The design of these parts should be simple and unadorned, where necessary with smooth linings, to avoid the lodging of debris, the harbouring of vermin and to facilitate cleaning.

These parts must be well drained to avoid the possibility of contaminating the molluscs by immersion in dirty water and to facilitate cleaning.

To provide the necessary protection against contamination and to help maintain the required temperature conditions, it is recommended that covers or covered vehicles are provided for all transport.

Fully enclosed vehicles with separate driving cabs are recommended for most purposes. For immediate local journeys, the use of tarpaulins on open vehicles may be adequate.

For extended journeys, the use of insulated, refrigerated vehicles is recommended.

However, where the molluscs are held in suitable containers that provide protection from contamination and maintain cool conditions, there may be no need for the vehicle to provide further protection.

The transport of loose molluscs in bulk is not generally recommended.

Smooth surfaced, non-absorbent, rot and corrosion resistant construction materials such as GRP or aluminium are recommended for all load compartments wherever practicable. GRP linings can be moulded into vehicles. However, wood or steel construction is considered adequate for local use provided that it is adequately treated and is maintained in good condition. Any treatment or paint must be non-toxic. Insulation materials should be non-absorbent, such as closed-cell plastic foam.
Separation of the driving cab enables thorough washing down of the load compartment.

It is recommended that load compartments have a roof vent to remove hot air, unless they are refrigerated, that they have no windows or translucent panels and that they are finished in a light colour inside to facilitate cleaning and outside to reduce heat absorption. Any vents should be screened.

Further guidance on storage conditions is given in Section 4.2.3 dealing with harvesting units,

and this also applies to transport vehicles.

If large vehicles use ice chilling in hot weather and produce significant amounts of contaminated waste water, then environmental regulations and local byelaws may require the fitting of waste water collection tanks to these vehicles.

Detailed recommendations for such tanks are given in the Seafish Guidelines for Fish Landing Places.

The transport of loose molluscs in bulk may subject the molluscs to stress and damage during loading and unloading but may be effective where the molluscs are to be processed within a short period.

Facilities are required for washing vehicles and for safe parking when not in use.

4.2.8 Water Supplies and Equipment and Materials for Cleaning Purposes

Ample supplies of suitably clean water must be provided, as necessary, for washing bivalve molluscs, harvesting units, landing places, other places where the raw material is handled or stored, mollusc handling equipment, transport vehicles and all other facilities required to be kept clean and for the operation of mollusc handling equipment. The water must be adequately pressurised to enable effective washing and equipment operation.

Whilst operating in the 'production area' or in an area of similar water quality, seawater taken from that area is considered to be of adequate cleanliness for these purposes. However, seawater should not be used at places where it may be subject to further contamination, for example at busy landing places.

The use of public mains supplied fresh water is generally recommended for premises ashore although the use of seawater or of alternative supplies of fresh water is acceptable, provided that the water is of adequate cleanliness.

For the abstraction of water supplies for use ashore from 'inland waters' or from underground strata, a licence must be obtained from the Environment Agency or the equivalent body and charges may be levied. A licence must be obtained from MAFF or the equivalent Ministry for a pipeline running out to sea.

A "clean as you go" policy is recommended, physically cleaning and washing down with cold water before residues have dried, rather than reliance on detergents, disinfectants and other chemical means.

It is recommended that hoses are provided to reach all parts of facilities.

The provision of a high pressure washer is recommended for the universal cleaning of facilities and equipment.

Adequate stocks of cleaning materials such as buckets, brushes and cloths must be provided and of suitable detergents and disinfectants as necessary. Sodium hypochlorite is generally recommended as a suitable chemical cleansing agent.

A secure, lockable place must be provided for the storage of any potentially harmful substances such as disinfectants and insecticides.

For general washing purposes, a pressure sufficient to enable effective hosing down is considered adequate. For the smallest scale of manual operations on harvesting units, a bucket dipped into the sea may be adequate. The effective operation of mollusc handling equipment, such as sorting and declumping machines, is often dependent on a pressurised water supply.

Care must be taken when drawing sea water to ensure that the water inlet is positioned such that it does not attract sediment or run-off or other contaminants, and that the plumbing system is clean. The pump and plumbing system used for clean seawater supply should not be used for other purposes. Bilge pumping and engine cooling systems can become highly contaminated and should be separate from the clean water supply system, although for vessel safety purposes it may be necessary to provide a means of interconnection for use in emergencies.

Away from the 'production area' and particularly at busy landing places subject to oil and other contamination, the cleanliness of the water may be uncertain. The use of sand filters or similar can be effective in improving the quality of seawater drawn from coastal sites but cannot be relied upon to remove contamination by oil and sewage, etc.

Whilst seawater may be suitable for washing down quaysides, its use is not generally recommended for cleaning purposes in premises ashore and its use leads to the more rapid corrosion of equipment. Any supplies of non-potable water should be clearly identified and have notices at their outlets prohibiting their general use.

Public mains water should satisfy statutory requirements for cleanliness. The Water Company or equivalent Authority should be consulted when planning installations and their bye-laws may require the provision of a water storage tank. Alternative supplies of water will suffice if it can be shown that the water is of adequate quality, having been treated if necessary. The Environment Agency or the equivalent body should be consulted on the abstraction of water, including seawater. Charges are normally levied for licensing and abstraction but no annual charge is made if the water is of high salinity.

Detergents, disinfectants and other such chemicals are harmful to live bivalve molluscs. When used for cleaning the facilities and equipment, they must be followed by thorough rinsing to ensure that no residues remain. It is inadvisable for these substances to be flushed into mollusc growing or holding areas.

Advice on particular chemical product suitability is available from manufacturers. Some products, such as phenolic and pine oil disinfectants, have strong odours which cause taints and these products should be avoided. Sodium hypochlorite (bleach) is an effective disinfectant that degrades rapidly in the natural environment.

Hot water may not be required for equipment cleaning purposes (some modern detergents are effective at low temperatures) and at disinfection temperatures of 82°C or above it is dangerous, expensive and tends to burn fish protein onto surfaces. If used, a temperature of 50-60°C should be adequate.

It is recommended that hoses are fitted with adjustable spray nozzles to conserve water and to assist in washing down. The provision of hose reels is recommended to keep hoses tidy and in good order.

Equipment and utensils used for cleaning should be resistant to the temperatures and to any detergents and disinfectants used. Plastic sponges, brushes and buckets are recommended in preference to natural products such as cotton mops and bristle brushes.

5. Purification Systems

Contents

5.1 Legal Requirements

The Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations 1992 (as amended)

Interpretation

2.- (1) In these Regulations, unless the context otherwise requires-
"clean sea water" means sea water or brackish water which is to be used under the conditions laid down in these Regulations and which is free from microbiological contamination and toxic and objectionable substances occurring naturally or after discharge in the environment, including those listed in the Annex to Directive 79/923/EEC (quality required of shellfish waters), in such quantities as may adversely affect the health quality of bivalve molluscs or other shellfish or impair their taste;
"potable water" has the same meaning as in the Food Safety (General Food Hygiene) Regulations 1995;
"purification centre" means an establishment with tanks fed by naturally clean sea water or sea water that has been cleaned by an appropriate treatment, in which live bivalve molluscs are placed for the time necessary to remove microbiological contamination, so making them fit for human consumption;

Approval of dispatch centres and purification centres

7.-(1) Subject to the provisions of these Regulations any person who intends to operate a dispatch centre or a purification centre on or after 15th January 1993 shall before doing so apply to the food authority in whose area the dispatch centre or purification centre is situated for approval of that centre.
(4) An approval in respect of a dispatch centre may only be granted if the food authority is satisfied that it meets such of the conditions set out in Sections II and IV of the Schedule to the Derogations Regulations as apply to it, save in so far as -
(a) there is in force in respect of that centre a derogation; and
(b) the terms on which that derogation was granted are complied with.
(4A) An approval in respect of a purification centre may only be granted if the food authority is satisfied that it meets such of the conditions specified in Sections II and III of the Schedule to the Derogations Regulations as apply to it, save in so far as -
(a) there is in force in respect of that centre any derogation; and
(b) the terms on which that derogation was granted are complied with, and that it meets any additional conditions of which the food authority has been notified by the Ministers pursuant to paragraph (5).
(5) An approval for the purposes of this regulation may be granted subject to limitations as to the particular activities approved and the intensity of use, and, where the Ministers have notified the food authority that specified conditions for the operation of a purification centre relating to the matters mentioned in Section III of the Schedule to the Derogations Regulations should be complied with, the food authority shall give their approval subject to those conditions.

Restriction on the operation of dispatch and purification centres.

10.-(1) No person shall operate any dispatch or purification centre unless it has been approved by the food authority and the requirements of the approval and the applicable provisions of the Schedule to the Derogations Regulations (allowing for any applicable derogations) are complied with.

The Food Safety (Live Bivalve Molluscs) (Derogations) Regulations 1992 (as amended)

Schedule

Section III - Requirements for purification centres

1. the floors and walls of the purification tanks and any water storage containers must have a smooth, hard and impermeable surface and be easy to clean by scrubbing or use of pressurized

water. The base of the purification tanks must be sufficiently sloped and be equipped with drainage sufficient for the volume of work;

3. the purification tanks must be supplied with sufficient flow of seawater per hour and per tonne of live bivalve molluscs treated;

4. clean sea water or sea water cleaned by treatment must be used for purifying live bivalve molluscs; the distance between the sea water intake point and the waste water outlets must be sufficient to avoid contamination; if treatment of the sea water is necessary, the process shall be authorized once its effectiveness has been verified by the competent authority; fresh water used to prepare sea water from its major constituent chemicals must be potable water ;

5. operation of the purification system must allow live bivalve molluscs to rapidly resume filter feeding activity, remove sewage contamination, not to become contaminated and be able to remain alive in a suitable condition after purification for wrapping, storage and transport before being placed on the market;

6. the quantity of live bivalve molluscs to be purified must not exceed the capacity of the purification centre; the live bivalve molluscs must be continuously purified for a period sufficient to allow the microbiological standards laid down in Chapter V to be met. This period starts from the moment at which the live bivalve molluscs in the purification tanks are adequately covered by the water until the moment when they are removed. The purification centre must take account of the data relating to the raw material (the type of bivalve mollusc, its area of origin, microbe content etc) in case it is necessary to extend the purification periods so as to ensure that the live bivalve molluscs meet the bacteriological requirements of Chapter V.

7. should a purification tank contain several batches of molluscs, they must be of the same species and come from the same production area or different areas conforming to the same health conditions. The length of the treatment must be based on the time required by the batch needing the longest period of purification.

8. containers used to hold live bivalve molluscs in purification systems must have a construction which allows sea water to flow through; the depth of layers of live bivalve molluscs should not impede the opening of shells during purification.

The bacteriological requirements specified in the legislation are shown in Appendix III of this document.

The definition of 'potable water' in the Food Hygiene General Regulations is extensive but public mains water should satisfy the requirements.

Purification systems must be at a purification centre. An approval number must be granted by the local Food Authority before the purification centre operates.

Before this number can be issued, the Food Authority must be satisfied that the centre meets the requirements of the food safety legislation and also satisfies the technical requirements of the relevant UK Government Fisheries/Health Department. A 'conditions of approval' document is issued for each purification system, which outlines the manner in which the system must be operated and any limitations of use.

In England and Wales, MAFF (Centre for Environment, Fisheries and Aquaculture Science (CEFAS), Weymouth) is the Government Department responsible for these technical matters. MAFF require that purification systems are designed and operated in accordance with basic rules and that there is sufficient evidence to demonstrate that each system will purify bivalve molluscs satisfactorily. In Scotland, SOAEFD (Marine Laboratory, Aberdeen) and in Northern Ireland DHSS are the Government Departments responsible and they have adopted the same basic rules. To simplify the text of the recommendations given in this document, these technical rules are referred to simply as MAFF requirements.

The technical rules are based upon established criteria including requirements for seawater quality and flow, temperature, system loading and methods of operation. The rules can be

changed or added to, depending upon the scientific evidence available and in the interests of food safety. The Government Department usually makes a site visit before approval, carrying out a technical inspection to ensure that the rules have been complied with and may require bacteriological or other tests to be carried out.

Seafish have no statutory responsibility for the technical approval of purification systems but are able to give advice on their design and operation to industry, Food Authorities and Government Departments and to assist in the testing of systems.

5.2 Recommendations

5.2.1 The Principles of Purification

Purification is suitable for cleansing bacteria from live bivalve molluscs harvested from lightly contaminated production areas (Category B) but purification alone is not suitable for cleansing molluscs harvested from more highly contaminated areas or areas subject to contamination by hydrocarbons, heavy metals, pesticides, etc or by marine toxins.

For purification to be effective, the molluscs must be placed for a period of time in suitable conditions of clean seawater such that they naturally function and purge themselves of contaminants (which they discharge as faeces).

The time period of purification and the conditions of dissolved oxygen, temperature, flow and quality of the seawater and the loading density of molluscs, must be controlled.

The required conditions vary according to the species of mollusc and to the design of the purification system.

Molluscs must not be constrained within bags which restrict their opening and functioning during purification.

The purification system must not be disturbed whilst the molluscs are immersed as this can cause re-suspension of the contaminants and their re-ingestion by the molluscs.

For natural functioning and therefore purification to occur, it is essential that the molluscs have not been over-stressed or damaged during harvesting or handling prior to purification and are not in a seasonally weak or spawning condition.

Mussels, oysters, manila and hard shell clams are considered suitable for purification. Cockles can be purified provided they are carefully handled and there is only a short delay between harvesting and purification but scallops may not be suitable for purification.

For other species of bivalve mollusc, advice should be sought from the relevant UK Fisheries/Health Department or Seafish.

The Regulations prohibit the purification together of molluscs from different categories of production area or of different species.

During purification there must be no possibility of cross-contamination via the seawater between molluscs at different stages of purification.

After draining the seawater at the end of purification, detritus remaining on the shells of the molluscs or that has settled within the purification system, must be washed away.

There are several types of purification system. Conditions of water flow, mollusc loading and any re-use of seawater are specific to each type of system and are usually specified in the 'conditions of approval'.

Purification systems must be carefully designed to permit detritus to settle out of the water onto the base of the tank or containers. Whilst the molluscs are immersed, any disturbance to water flow or movement of the tank or the removal of molluscs may re-suspend contaminants which may then be re-ingested by the natural filtration activity of the molluscs. The system must be designed such that the water is drained clear of the molluscs before they are removed.

Stressed or damaged molluscs may not be sufficiently active during immersion and hence may not purify. They may also spawn or die in the purification system which can spoil the water quality. Physical stress is caused by poor handling practices, thermal stress by exposing molluscs to extremes or sudden changes of temperature (often on immersion). At certain times of the year, thermal shock can cause molluscs to spawn. Spent molluscs are too weak to purify and if left in the system will die.

Work by Seafish has shown that cockles can be purified if handled carefully. Cockles are unable to seal their shells completely once harvested and gradually lose intervalvular liquor, which reduces the time that they remain in good condition out of water. In addition to specifying their harvesting and handling methods, it is recommended that the time between harvest and re-immersion is limited to six hours. When they are in good condition they are very active and care must be taken in design of the purification system to ensure that dissolved oxygen levels are maintained. However, they are also liable to exhaust themselves and die if left immersed for extended periods in conditions that stimulate activity.

Scallops have no shell seal and do not retain intervalvular liquor, so any delay between harvest and re-immersion must be short. In addition, they can be very active when immersed and may re-suspend contaminants in the water.

Purification is a batch process. It commences when the contaminated molluscs are immersed and continues until the seawater is drained at the end of the cleansing process. The molluscs interact with the seawater throughout the period of immersion. The purification batch can be made up of several batches of raw material from different production areas, provided that they are kept separate within the purification system (in order to maintain their separate identification), that they all come from the same category of production area (and so all need the same treatment and should not cross-contaminate one another) and that the purification conditions suit all the molluscs. It would be harmful to purify different species together if those species required different purification conditions.

It is normal to recirculate treated seawater around the molluscs but there must be no transfer of water between different purification batches during purification unless the treatment

during transfer guarantees that the water is clean. The usual level of water treatment during circulation does not guarantee this.

Recommendations for any immersed storage that may follow purification are given in Section 6.

5.2.1.1 Period of Purification

MAFF require a minimum immersion period of 42 hours.

Purification does not start until the molluscs are immersed and the system is operating at the required temperature. Systems that require draining and water replacement part-way through the cycle must provide a total immersion time of 42 hours. Similar allowance must be made for any time lost due to mechanical breakdown.

Although careful handling of the raw material is recommended, it is inevitable that some molluscs may be stressed by the time they are re-immersed in a purification system. The required 42 hour period allows some time for molluscs to recover before effective purification takes place.

The 42 hour period corresponds to a typical system cycle time of 2 days when allowance is made for emptying, cleaning and refilling the system.

5.2.1.2 Dissolved Oxygen

The design of the purification system must ensure an adequate level of dissolved oxygen in the seawater around the molluscs during purification. This generally corresponds to a dissolved oxygen level of at least 50% saturation, although significantly higher levels are achievable in practice and are recommended as an aid to purification.

The rate of activity of molluscs is inhibited by low levels of dissolved oxygen. Some species (e.g. mussels and cockles) are more active than others and consume more oxygen.

As seawater temperature increases, its ability to retain dissolved oxygen reduces, whilst the level of mollusc activity and hence oxygen demand, increases.

To maintain dissolved oxygen levels, it is necessary to limit the loading and temperature of each purification system. This will also depend on the species, water flow and method of aeration.

A well designed and operated system should maintain dissolved oxygen levels well above 50% saturation.

During the first few hours of purification, molluscs (particularly mussels) may exhibit an initial surge of activity and oxygen levels may be allowed to dip for a short period.

5.2.1.3. Seawater Temperature

MAFF require the seawater temperature to be at or above the following minimum levels during purification:-

Species	Minimum Seawater Temperature
Mussels	5°C
Native Oysters	5°C
Pacific Oysters	8°C
Hard Shell Clams	12°C
Cockles	7°C

For other species of mollusc, advice should be sought from the relevant UK Fisheries/Health Department or Seafish.

In addition, maximum seawater temperatures are recommended to avoid stressing the molluscs, inducing spawning or resulting in low oxygen levels.

Large temperature differentials between molluscs and seawater when filling a purification system should be avoided.

Molluscs immersed in seawater at temperatures below those prescribed have a reduced level of activity and may not purify effectively within the 42 hour period.

Recommended maximum seawater temperatures are 15°C for mussels and native oysters, 16° C for cockles, 18°C for pacific oysters and 20°C for hard shell clams. The limitations of the purification system (particularly dissolved oxygen levels) and the natural conditions prevailing in the harvesting area must be considered and may limit practical operating temperatures to lower levels.

Thermal shock, resulting from sudden temperature change when immersed, may reduce mollusc activity, induce spawning or even cause mortality. To avoid this, the molluscs should be allowed to reach the required temperature slowly. The period of purification does not start until the minimum temperature is reached.

To meet these requirements it may be necessary to control water temperature by installing heating or chilling.

5.2.1.4 Seawater Flow and Aeration

A flow of seawater is necessary in most purification systems to carry sufficient oxygen to the molluscs.

Aeration is usually necessary to maintain adequate levels of dissolved oxygen in the seawater, particularly if the water is re-circulated back through the purification system.

However, the flow and aeration must not result in excessively high water velocities or turbulence sufficient to re-suspend contaminants which may be re-ingested by the molluscs.

Aeration may be by a cascade or water jet, by direct air injection or by other means. This must not be directly onto the molluscs.

In the UK it is normal practice to maintain levels of dissolved oxygen in a purification system by circulating a controlled flow of seawater past the molluscs. This is done by cascading or jetting water evenly into the tank across one end and drawing if off at the other. Some tanks require perforated flow-screens at either end to create an even flow of water.

High water flows have the advantage of reducing the risk of dead spots occurring and may stimulate mollusc activity. Flow is limited, however, by the need to ensure that turbulence is not created which could re-suspend contaminants or which could disturb the molluscs and impede filtration activity. Purification systems have proven effective with average water speeds of up to 12.5 metres/hour through the working section (tank length in metres multiplied by the number of water exchanges per hour). Higher speeds may be possible but the limits have not been determined.

Historically, for systems operating with water circulation, MAFF have required a water flow equating to at least one exchange of all the seawater in the system per hour. This was generally adequate for the traditional UK shallow tank systems but the more modern multi-layer and bulk bin purification systems require a greater water flow. The flow is best expressed in terms of litres of water per kilogram of molluscs per hour. Typically the flow required in these systems is 20 l/kg/hr for mussels at a seawater temperature of 15°C. Clams and oysters do not require such high flows. Further advice on suitable water flow can be sought from the relevant UK Fisheries/Health Department or Seafish.

Pumping at high flow rates can generate excessive heat. During winter months this may be advantageous in maintaining minimum temperatures but it can necessitate seawater chilling in hot weather.

Cascades or water jets must not disturb the molluscs or any detritus and so should not be directly over the molluscs. Similarly, direct air injection or other means of aeration should not be directly under or adjacent to the molluscs. Curtains of bubbles from air injection can disrupt the path of water flow through a tank.

Where an adequate supply of clean and naturally oxygenated seawater is readily available, it is possible to pump the water only once past the molluscs and then to waste and hence possibly to eliminate the need for additional aeration.

It is possible for a low density purification system to operate without water circulation, maintaining dissolved oxygen levels simply by utilising a high ratio of water to molluscs, possibly combined with a water change part way through the purification cycle.

5.2.1.5. Mollusc Loading Density
The maximum permissible total loading of molluscs in a purification system depends upon the species of mollusc and the design and operation of the system.

MAFF normally require the maximum depth of bivalve molluscs in a purification container to be limited as follows:-

Mussels and cockles to a depth of 80 mm (nominal 50 kg/m^2)
Hard shell clams to a depth of 80 mm (nominal 70 kg/m^2)
Native Oysters to a single overlapping layer (nominally up to 530 animals/m^2)
Pacific Oysters to a double layer (nominally up to 530 animals/m^2)

It is normally required to have a minimum height of water above each layer of molluscs of 30 mm for hard shell clams and oysters and 80 mm for mussels.

For the traditional shallow tank systems, MAFF normally permit containers to be stacked in only a single layer for mussels and up to 3 layers for oysters or hard shell clams. However, for purpose-designed high density multi-layer systems, up to 6 layers of containers of mussels have been accepted.

For other species of mollusc, advice should be sought from the relevant UK Fisheries/Health Department or Seafish.

The maximum total system loading permissible (i.e. the total quantity of molluscs rather than the depth within each container or the number of layers) depends upon the oxygen consumption of the molluscs (which will depend upon species and seawater temperature) and the physical design of the purification system.

Bivalve molluscs must open their shells to filter effectively and this can be impaired or even prevented in a layer of molluscs if the pressure of molluscs on top of them is greater than that which they would normally experience in their natural growing conditions.

Mussels are able to survive in a deeper layer than the maximum specified but in traditional types of purification system the layer depth is limited to 80 mm because of concern about maintaining adequate levels of dissolved oxygen. In the purpose designed, high flow rate, multi-layer and bulk bin purification systems, mussel depths of 100mm and 350mm respectively, have been permitted.

Space must be provided above the layers to allow for expansion and movement of molluscs after immersion and, in most systems, to facilitate water flow.

The restrictions on numbers of layers are based largely on the limitations of total system loading of traditional tanks. There is also concern about the settlement of detritus. However, where the system is specifically designed and proven for the purpose, more layers can be utilised. Experience of multi-layer systems has been largely with mussels but it is expected that other species could be layered similarly.

5.2.1.6 Seawater Quality, Treatment and Re-use
Seawater used for purification must be free from contamination and harmful substances in quantities that may adversely affect the molluscs.

Treatment of the water to destroy microbiological organisms is required unless the water can be guaranteed clean initially and is passed only once through the purification system (i.e. is not recirculated or re-used). Treatment by ultra violet light (UV) is recommended.

The water should not have high initial levels of turbidity. This may require the use of settlement tanks or filters for water supply.

Either natural or artificial seawater (made from fresh water and salts) can be used.

The salinity of the seawater must suit the needs of the bivalve molluscs purified. MAFF require that the salinity does not fall below the following levels:-

Species	Minimum Salinity ‰ (parts per thousand)
Native Oysters	**25.0‰**
Pacific Oysters	**20.5‰**
Hard Shell Clams	**20.5‰**
Mussels	**19.0‰**
Cockles	**20.0‰**

For other species of bivalve mollusc, advice should be sought from the relevant UK Fisheries/Health Department or Seafish.

Dissolved waste products from the molluscs must not be permitted to rise to harmful levels in the seawater. Although seawater is normally recirculated during purification, it can be re-used for successive purification cycles only if prescribed in the 'conditions of approval' for each system. Where seawater re-use is permitted, a maximum allowable period of re-use will be prescribed.

Seawater with a high level of turbidity not only reduces the efficiency of UV treatment but may also cause clogging of the gills of molluscs and inhibit their normal filtration activity. Slight turbidity may occur when filling a purification system with seawater as a result of disturbing material mixed with the molluscs. This should settle out within the first few hours of purification, often accelerated by the mollusc activity itself.

There have been several methods used to treat seawater. These include the use of UV, chlorine and ozone. UV systems are easy to install, use and maintain. They provide continuous on-line treatment of the water flowing through the purification system. Residual chlorine is harmful to bivalve molluscs and so the use of chlorination is now rare. Residual ozone is also harmful to the molluscs but electronically controlled ozone systems can provide continuous on-line treatment, although generally at greater cost than UV systems.

Estuarine shellfish species are generally tolerant of some variation in salinity but to minimise the time taken for acclimatization, purification water should ideally be in the range of ± 20% of the salinity of the area from which the molluscs have been taken. Levels must not fall below the specified minima as the molluscs may not function below those levels.

When bivalve molluscs are immersed, they release ammonia based compounds into the water which can accumulate and inhibit their functioning and which can also reduce their subsequent storage life. Trials have shown levels of ammonia above about 40ppm to be harmful. Production of these compounds depends on the quantity of molluscs in the purification system and their level of activity, which in turn depends upon their species and intrinsic condition and the seawater temperature. The accumulation of the compounds in the

seawater depends on the ratio of seawater to molluscs in the system, on dilution by drainage of water to waste and make-up with new seawater after each purification cycle and on the overall period of re-use. In time, the action of benign bacteria that may be present in the system can assist in removing these compounds. Trials of purification systems with a water to mollusc ratio of 6:1 by weight and with a 10% make-up of new water after each purification cycle, have demonstrated extended water re-use (for a period of over 1 month) when using artificial seawater and purifying either mussels or pacific oysters. Conversely, trials with a purification system with a lower water to mollusc ratio of 3.5:1 and only a 5% make-up, indicated an effective re-use limit of only 3 purification cycles when using artificial seawater and purifying mussels.

Ammonia can be removed by the use of purpose designed bacteriological filter systems. These are in common use in marine holding systems but can be sensitive in operation and require stable conditions which may not be provided by the often intermittent use of purification systems. However, if a purification system is used also for storage purposes, the use of a suitable bacteriological filter system may be feasible. Advice on this should be sought from the relevant UK Fisheries/Health Department or Seafish.

5.2.2 Types and Approval Requirements of Purification Systems

There are various types of purification system, all of which must satisfy the basic principles of purification described in Section 5.2.1. Choice of system depends upon the species to be purified, the throughput required, the availability and quality of seawater, the space available on the site and any further usage of the system for immersed storage.

Prior to their commercial operation, all purification systems must be approved by the authorities. Inspection, bacteriological testing and any other testing required must be carried out and 'conditions of approval' issued.

The use of recognised standard designs of purification systems with proven performance is recommended but is not mandatory. Non-standard systems are subject to more extensive individual inspection and trial to prove their effectiveness before approval is granted and to determine their 'conditions of approval'.

It is recommended that purification systems are housed within buildings to provide further control over hygiene and temperature conditions.

Where practicable, it is recommended that multiple purification units are installed, rather than a single large unit, in order to maintain a more regular product flow and better utilisation of personnel and equipment.

The main types of purification system currently in use in the UK are shallow tank, multi-layer tank, vertical stack and bulk bin systems.

With the exception of the bulk bin system, which is designed to accommodate a deep layer of mussels, these systems should be suitable for all species of bivalve mollusc. In practice, however, the shallow tank, multi-layer and bulk bin systems are readily scaled up to suit the needs of high volume mussel fisheries, whereas the generally smaller vertical stack systems tend to be used for lower volume oyster and clam fisheries and particularly where there is a need for the purification system to serve also for immersed storage after purification.

Large shallow tank and small vertical stack systems of an early design used to be in common use but the advantages of the more recently developed high density multi-layer and bulk bin systems and of an improved design of vertical stack system have led to the increasing use of the new systems. These advantages include operating efficiency, small size which enables them to be housed in buildings and their suitability for artificial seawater.

The local Food Authority and the relevant UK Fisheries/Health Department must be convinced of the effectiveness of the purification system and be knowledgeable of any limitations of use, before approval is granted and 'conditions of approval' issued. Bacteriological and any special testing of the system required for this is normally the responsibility of the proprietor of the food business.

Purification systems do not have to be based on existing types but as each system is subject to individual approval, the difficulty, timescale and cost incurred by the proprietor in demonstrating the effective operation of a new type of system can be considerable. Depending on the type of system and the extent of deviation from the 'norms', the testing of new designs can involve their operation at full loading and in a range of temperature and flow conditions combined with bacteriological sampling and measurement of dissolved oxygen levels, in order to establish the 'conditions of approval'. Bacteriological testing involves loading the system with sufficiently contaminated molluscs which must then reduce from high initial counts of *E. coli* to acceptable levels during purification. Often the initial bacterial counts in molluscs from natural sources are insufficient and the test has to be repeated. High levels of *E. coli* can be induced by an artificial dosing technique but this requires specialist facilities.

With the assistance of Seafish, multi-layer systems (medium or large size), the bulk bin system, the improved vertical stack system and a small shallow tank system have been developed as standard designs. These systems have been extensively tested in a wide range of conditions. They are manufactured to a specification and can be purchased ready-made as a complete package of tank, UV and plumbing. For these systems, the uncertainty, timescale and cost of the approval procedures are minimal.

In most areas in the UK where purification systems are located, adequate supplies of clean seawater cannot be guaranteed at all times and so treatment and recirculation of seawater are the normal practice and are incorporated into all the standard designs. Where the local water is heavily contaminated or tainted, for example by oil, it may be necessary to produce artificial seawater. The cost burden of this can be reduced considerably by adopting a system capable of water re-use.

Housing the systems within a building provides protection against contamination by animals, particularly birds, and from the elements. The advantages of temperature control are commercially significant and can enable indoor systems to function whilst outdoor systems cannot because their water is too cold in winter or too hot in summer.

Where practicable, it is recommended that at least two purification units are provided rather than a single large one. Multiple units can be loaded and unloaded in a staged sequence to provide a more even product flow. Where water storage reservoirs, settling tanks and similar facilities are provided they can be used to serve several purification units. However, during each purification cycle the water in each purification unit should be kept separate to avoid

any possibility of cross contamination.

Further details of the types, installation and operation of purification systems are given in the following Seafish documents:-

Reference	Title
95/31/FT	Seafish Standard Design Purification Systems - Operating Manual for the Medium Scale Multi-Layer System.
95/32/FT	Seafish Standard Design Purification Systems - Operating Manual for the Vertical Stack System.
95/33/FT	Seafish Standard Design Purification Systems - Operating Manual for the Large Scale Multi-Layer System.
95/34/FT	Seafish Standard Design Purification Systems - Operating Manual for the Small Scale Shallow Tank System.
95/35/FT	Seafish Standard Design Purification Systems - Operating Manual for the Bulk Bin System for Mussels.
95/36/FT	Non-Standard Design Purification Systems - Operating Manual for Purification Systems of Non-Standard Design.

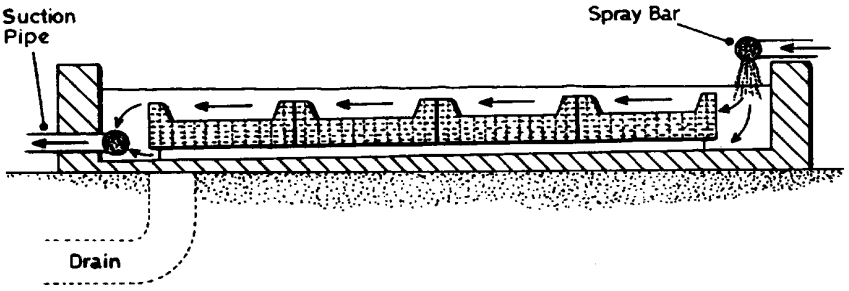
5.2.2.1. Shallow Tank Systems
The molluscs are held in mesh type containers placed on the bottom of a shallow tank. Seawater flows from a water cascade or jets at one end of the tank to a suction pipe or weir at the other end.

The simple arrangement and plumbing of these systems is not normally adequate to ensure a sufficient supply of dissolved oxygen to a dense bulk of molluscs and so the layering of containers is restricted. The maximum length of the tanks is similarly restricted.

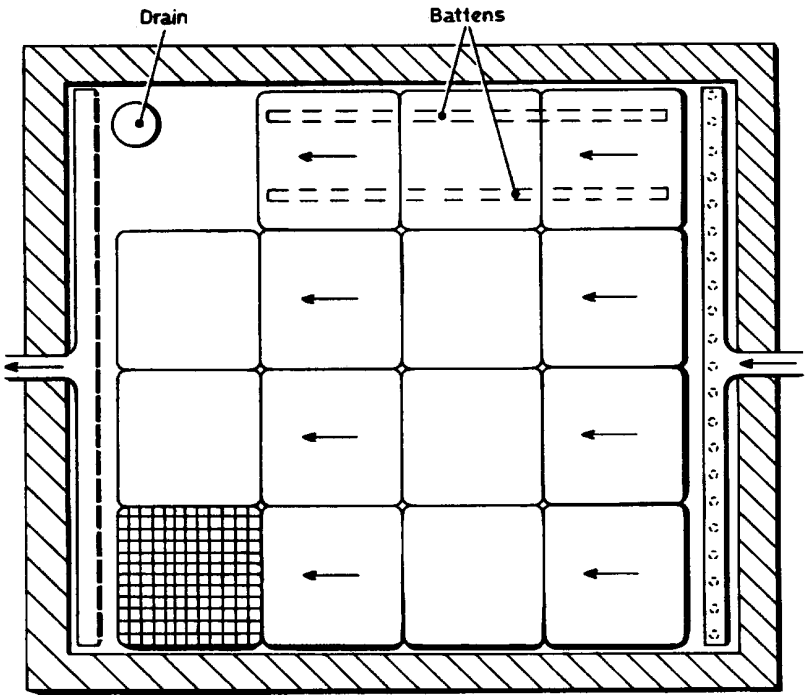
The constructing of the traditional type of large outdoor shallow tanks is not now recommended.

Shallow tanks that have been used in the UK, range in size from a small standard design with a capacity of 90kg of mussels to large outdoor multi-tank systems of over 40 tonnes capacity.

The construction of shallow tank systems is relatively easy and inexpensive. Large units are readily built but because of their limited container stacking, which is only a single layer for mussels, they require a considerable land area. That land may be costly or unavailable. In addition, the operating cost of large systems can be relatively high as their mollusc handling is not readily mechanised.



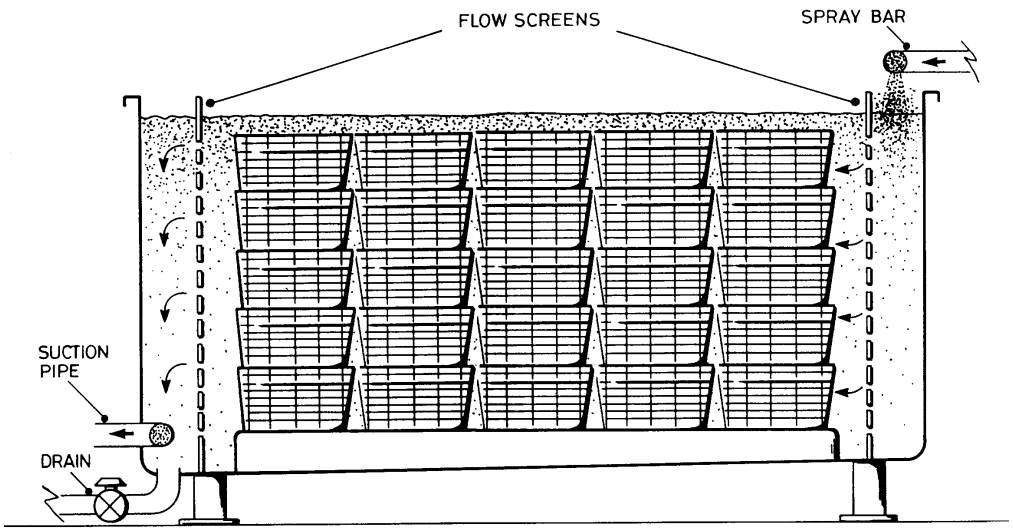
Side view of tank



Plan view of tank

Because of the large area they cover, large shallow tanks are usually sited outdoors where they are particularly prone to sea bird contamination, wind-blown debris, rainfall which reduces the salinity and to wide temperature variations. They act as large solar panels when loaded with dark coloured mussels. These significant and often unpredictable, weather related effects can greatly restrict their safe operation. At further cost these problems can be alleviated by fitting covers over the tanks, as detailed in Section 5.2.3.10.

5.2.2.2. Multi-Layer Systems



Side view of tank

The molluscs are held in mesh type containers stacked up to 6 high in a deep tank. Seawater input is by cascade or jets at one end of the tank. The water passes through a flow-screen to the centre section of the tank containing the molluscs and then passes through a further flow-screen before exiting via a suction pipe.

The design of these high density systems is more critical than the less sophisticated shallow tanks and necessitates thorough testing of new designs before approval is granted.

Currently there are two types of standard design multi-layer systems in use in the UK, with capacities of 750kg or 1500kg of mussels per tank and with multiple tank systems of up to 12 tonnes capacity. These are high density systems. For the 750kg tank the re-use of artificial seawater should be limited to only three purification cycles for mussels because of its particularly low water to mollusc ratio. The 1500kg tank is permitted artificial seawater re-use for a period of one month, under prescribed conditions.

These systems were developed originally for mussels. The smaller tank has been used subsequently for oysters and cockles but use has not yet been demonstrated for other species, although it is expected that the tanks will prove suitable. Further advice for other species should be sought from the relevant UK Fisheries/Health Department or Seafish.

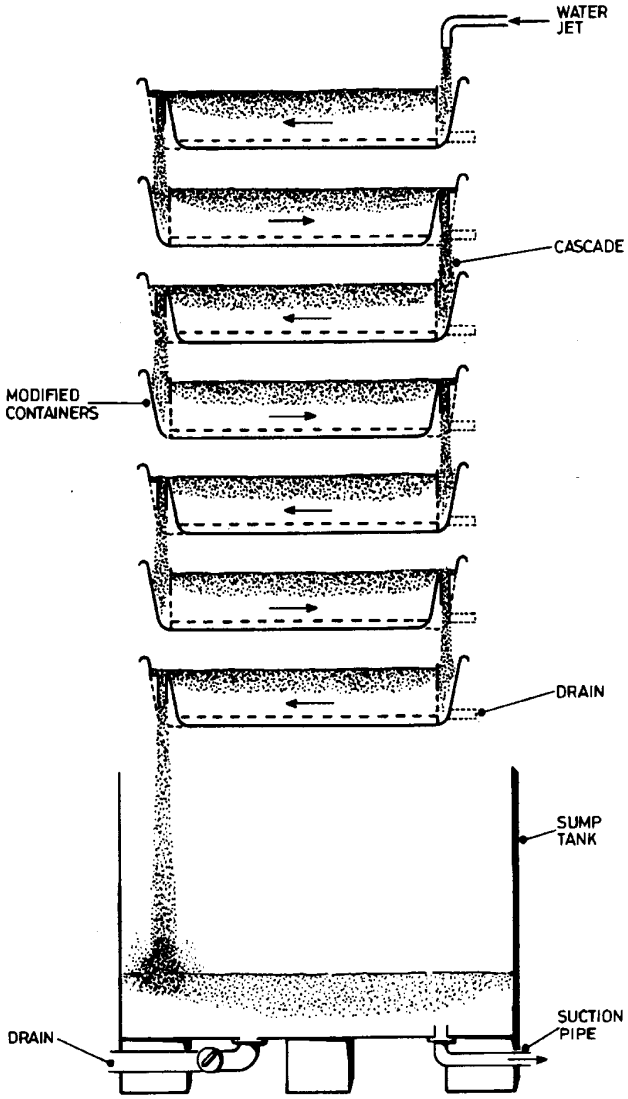
The main advantage of multi-layer systems over shallow tank systems is that they cover a much smaller floor area and can readily be housed within a building.

Multi-layer systems may be loaded and unloaded manually but large capacity systems are suitable for mechanisation by palletising the containers and using an overhead crane and pallet lifting device.

The details of design of these relatively high flow rate systems are critical. The flowscreens are necessary to ensure an even flow of water and supply of oxygen to the mass of molluscs. The disturbance created by high flow rate aeration is contained by the screen at the input end

of the tank. It may be possible to utilise more than 6 layers of molluscs but this is not proven and there are practical handling limitations.

5.2.2.3. Vertical Stack Systems



Side view of stack

The molluscs are held in purpose designed, solid sided containers which are either directly stacked or supported above one another in a frame over a sump tank. Seawater is drawn from the sump up to one end of the top container of the stack. It passes along the container and then cascades down from the other end into the container below and so on until it returns eventually to the sump.

The containers must be designed to provide a uniform flow of seawater through the molluscs and to incorporate a cascade system which is not directly onto the molluscs below. They must have a means of keeping the molluscs clear of the container bottom and a means of draining the seawater before removal of the container from the stack. In these systems, a minimum water depth of 30mm above the molluscs when loaded is considered adequate for all species.

A system of individual drainage for each container, which passes the water outside of the stack directly to the sump, is recommended.

Early designs of small-scale systems and an improved standard design vertical stack system developed by Seafish are in use in the UK. The standard design is a 2 stack system with a nominal capacity of 2,000 oysters and incorporating a specially developed container. Artificial seawater re-use for a period of one month under prescribed conditions is permitted.

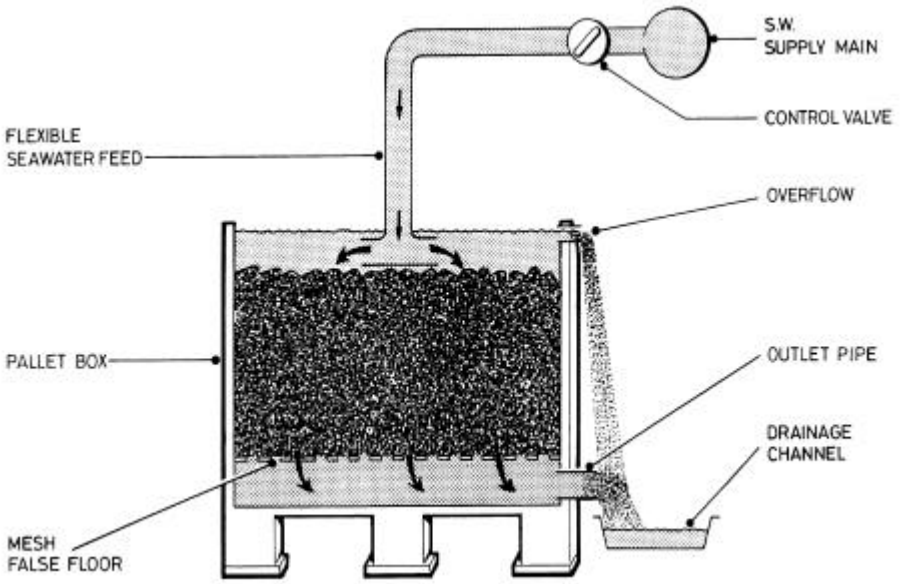
Vertical stack systems generally have a relatively high capital cost but require little floor area and often enable access to individual containers after purification without draining or disturbing the remainder of the system. Their use is usually limited to small capacity systems for high value molluscs and where the system is used for immersed storage and order picking after purification.

The height of stacking is normally limited by practical constraints of handling the containers and, if they are directly stacked, by container strength. These limits are normally within the range of 7 - 10 containers height. Frames must give adequate support to the containers which tend to deform when filled. A cascade fall of abou80mm is recommended to ensure a high level of aeration between containers. Further aeration occurs in the final fall into the sump. The
sump should have sufficient capacity for all the water in the system, including when the system is run without molluscs for cleaning purposes.

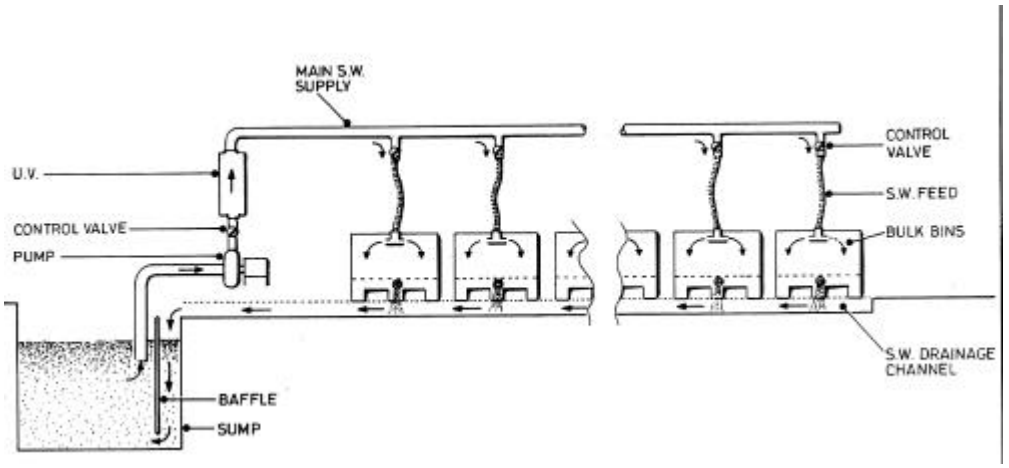
Draining individual containers outside of the stack avoids disturbing the remainder of the system and enables more flexible operation, for example when used as a storage unit and order picking after purification.

5.2.2.4. Bulk Bin Systems

This system has been developed for purifying mussels. They are held in a deep layer in a number of specially modified plastic pallet bins. Each bin is transportable and can be connected to a common seawater supply and return system. Seawater is pumped from a sump to the pallet bins, through the bins and then returned to the sump. The water flows downwards through the mussels in each bin and is re-oxygenated during its return to the sump.



SIDE VIEW OF BIN



LAYOUT OF SYSTEM

This is a high density system which can be housed indoors. For large capacities the system has potential advantages over other systems in terms of relatively low capital cost and also lower labour cost through mechanised handling of the mussels in the pallet bins. It also has the flexibility to be part used for smaller quantities without operating the complete system (which is not the case with some other large capacity systems). However, when used with water re-circulation, all pallet bins operated from a common sump are part of a single purification system and cannot be operated independently, unless the returning seawater is sufficiently treated to guarantee that cross contamination cannot occur (see Section 5.2.1).

The mussels are placed in bulk in a layer 350mm deep on a mesh false floor in the pallet bins. Water is pumped in above the mussels but below the water surface. It passes down through the mussels and exits below the false floor at the required flow rate. The simple plumbing system is designed to maintain the correct water level and flow through the mussels by incorporating

an overflow bypass from the top of the bin to the seawater return channel. This makes the use of a flowmeter unnecessary.

An adequate supply of dissolved oxygen to the mussels is ensured by a relatively high flow rate and by constraining the flow path of the water directly through the mass of mussels. As aeration is downstream from the containers, the water input directly above the mussels creates little turbulence. The downwelling flow carries detritus to the base of the container. The sump is designed to allow further settlement of any detritus carried over from the containers.

The system is not suitable for the bulk purification of species that do not naturally function in deep layers. However, although not yet proven, it may be possible to purify other species in containers stacked within the bins.

5.2.3. Details of Purification System Design and Construction

5.2.3.1 Construction Materials and Hygienic Design
Purification systems must be designed and constructed such that they are easily cleaned.

Purification tanks, containers and all equipment and plumbing in contact with the molluscs or purification water, must be constructed of non-toxic, impermeable materials which should also be resistant to rot and corrosion. The surfaces of purification tanks and water storage containers must be smooth and hard.

Purification systems should be designed such that they drain effectively and are easily flushed out, without inaccessible places and cracks and crevices, to avoid areas of stagnant water and the lodging of debris.

Stainless steel and GRP are recommended for tanks and plastics, such as HDPE, for containers. ABS plastic pipework and fittings are recommended. Copper or copper based alloys in contact with the purification water should be kept to a minimum.

Marine grade stainless steel, such as type 316, is recommended in preference to food grades as it is more corrosion resistant in seawater.

Epoxy or special water resistant polyester resins are better for GRP tank construction than standard polyester resins. The use of glassed-over wood stiffeners is acceptable.

Smooth surfaced (steel floated), crack free concrete tanks are acceptable, although care must be taken when using steel reinforcing that no salt is present in the sand which will corrode the steel causing expansion and cracking. High performance paint systems (e.g. epoxy) can be used to improve concrete surfaces. Paints must not contain toxic elements and preferably should be water based. Various types are available and recognised for food industry usage. Light colours are recommended to facilitate cleaning.

The use of galvanised steel is not recommended for surfaces in contact with seawater but may be suitable for support frames etc.

Care must be taken to ensure that any plastic materials used do not contain toxic plasticisers. Food grade materials should be suitable. Nylon materials tend to absorb water and distort in use.

Copper may be harmful to the molluscs.

Transparent or translucent plumbing is not generally recommended as it encourages algal growth.

Where possible, tank construction should be continuous, without open joints and with rounded corners to facilitate cleaning.

5.2.3.2 Plumbing and Water Flow Arrangements

The basic design principles are broadly common to all types of purification system.

The circulation pump should be located low down such that it self primes.

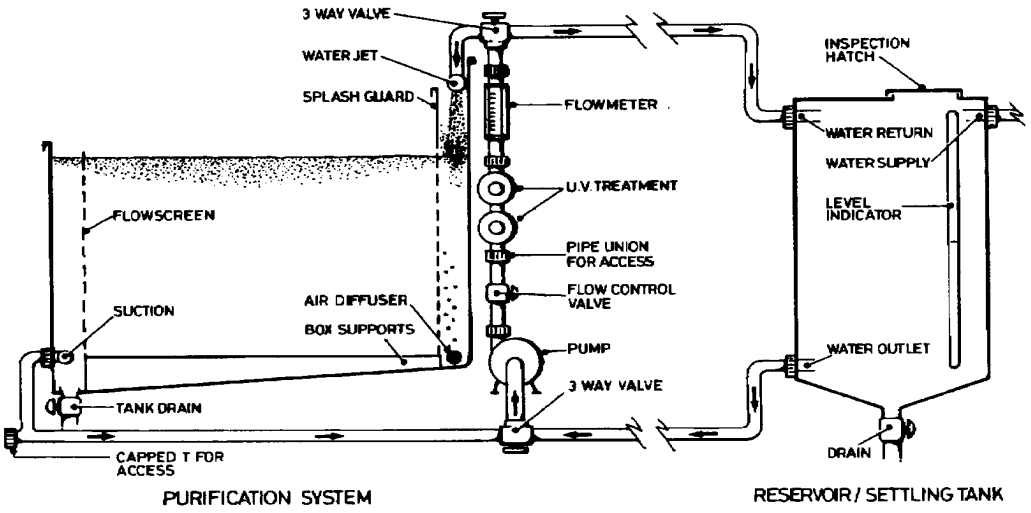
The water from the pump should pass through a flow control valve and a flowmeter to regulate the flow.

During circulation, water must pass through the UV treatment prior to passing over the molluscs.

The cascade or water jet input to the purification tank (or any direct air injection) should normally be at one end of the tank clear of the molluscs.

The aerated water then passes through the molluscs (via flow screens as necessary) and exits at the other end of the tank.

The molluscs must be raised clear of the tank bottom such that debris settles below them.



MAFF require mollusc containers in shallow tanks and multi-layer systems to be at least 50mm clear of the tank floor.

At the water output end of the tank, any suction pipe to return the water to the pump for recirculation must be located above the tank bottom to avoid the recirculation of detritus.

When filling the tank with water after loading the molluscs, it is recommended that the water enters through the circulation system (i.e. through the circulation pump, UV and cascade or water jets) via a 3 way valve.

The means of draining seawater from a purification system must avoid the risk of re-contaminating the bivalve molluscs by disturbing detritus as a result of changes in water flow.

For initial drainage of the tank prior to removing the molluscs, it is recommended that the water exits through the circulation system (i.e. through the suction pipe, pump and UV) to the storage reservoir or to waste via a 3 way valve. For this usage, the suction pipe location must also be below the level of the molluscs.

The base of large tanks must slope to a drain for finally flushing residual water and waste from the tank after use.

Similarly, tanks used for water storage, settlement or brine mixing must have a sloping base to a drain for flushing waste and an operating outlet pipe clear of the base. It is also recommended that inlet pipes to these tanks are at the top to assist in aeration and mixing and that the tanks are fitted with sight glasses or other level indicators. These tanks must be accessible to enable inspection and cleaning and, if outdoors, be covered to provide protection against the elements and vermin.

Sufficient detachable pipe connections and 'T' pieces must be provided in the plumbing system to facilitate the flushing through of pipework and the removal of major items for inspection, cleaning and maintenance.

The use of filters in circulation systems is not generally recommended except for coarse filters to protect pumps.

Although the physical arrangements of vertical stack and bulk bin purification systems are different from that shown, the basic design principles remain similar. The mollusc containers in these other systems are, in effect, individual purification tanks within a single purification system.

The successful operation of purification systems is dependent upon their specified water flow rate being maintained. Hence there is a need for a flowmeter in most systems and particularly in the high density multi-layer systems. Pump wear and other factors can reduce flow. In the bulk bin purification system, the overflow indicates that correct flow is being maintained.

The detail design of water input to and output from the purification tank and of flow screens and aeration, etc must be such that localised high water flows and turbulence do not re-suspend detritus or affect the functioning of the molluscs.

For shallow tanks, the cascades, water jets, suction pipes or weirs should be distributed across the full width of the tank to provide a uniform flow. For spray and suction bars this is made easier if the water connection is at the centre, rather than at an end. A degree of experimentation is required to establish uniform flow and to avoid excessive turbulence and foaming. It is recommended that suction pipes should be at least 25mm clear of the tank base

to avoid drawing in detritus. Holes should be at the bottom to allow the pipes to drain when the system is emptied. A working clearance of at least 150mm between mollusc containers and the tank wall is recommended at both inlet and outlet ends of these tanks.

For multi-layer systems, the flow screens usually consist of a sheet of material with a matrix of drilled holes (the holes usually being about 10mm diameter) sufficient to provide uniform flow. Again, a degree of experimentation is required to establish uniform flow. Flow screens should be removable to facilitate cleaning. A working clearance of at least 50mm is recommended between the screens and mollusc containers. The distribution of inlet and outlet plumbing is less critical when screens are used.

For both shallow and multi-layer systems, mollusc containers can be raised clear of the tank base by a support structure built into the tank or by placing plastic battens or similar on the tank floor. Plastic pipe is suitable for this with the ends left open to allow cleaning. Supports should be aligned with the water flow and any built in support structure must not inhibit draining and tank cleaning after purification. For vertical stack systems, raising the molluscs at least 15mm above the base of each container on plastic mesh matting is considered adequate. For the bulk bin system, the false floor maintains 50mm clearance.

By filling the tank via the circulation plumbing system, the water passes through the UV treatment and enters at an acceptable flow rate.

Similarly, by initial draining of the tank via the circulation plumbing system, the water passes through the UV (which is important if it is returned to the reservoir) and the direction and rate of flow in the tank are unchanged. The water must be drained below the level of the molluscs before they are moved. A separate, large diameter drain should not be used for initial draining as the high flow rates ensuing and different flow directions could re-suspend detritus which could be re-ingested by the molluscs whilst still immersed.

The use of 3-way valves in input and return lines ensures that when multiple tanks operate from a shared water storage reservoir, there can be no cross-connection between units. The 3-way valves can be replaced by pairs of 2-way valves but this is less ‘fool proof’ in use.

A minimum tank base slope of 1:100 is recommended. The drain must be sufficient to cope with the amount of shell and other residual detritus left in the tank after purification.

Where seawater is to be re-used with a 10% make-up, the slope of the tank base and the height of the suction outlet should be such that when suction is lost the 10% is left in the purification tank to be flushed to waste.

For vertical stack systems, which cannot be drained via the circulation system, a separate means of initial drainage must be provided in each container. These drains must again ensure that molluscs are not left partially immersed and that detritus is not disturbed and carried over. It is recommended that these drains return directly to the sump and are fitted clear of the container base, with the residual water and detritus being tipped to waste after removal of the containers from the stack and the molluscs from the containers. The direction of water flow during drainage in some containers will be different from that during circulation and so the drainage system must be sized such that the drainage flow rate is lower than the circulation rate. With the recommended separate drainage of each container outside of the stack, any risk of detritus carry-over to the containers below is avoided and drainage is more rapid than

sequentially draining through the containers below. This is particularly advantageous for systems used also for immersed storage and order picking.

For the bulk bin system, the main circulation water outlet is sited just clear of the base of the container leaving detritus and only a small quantity of water in the bin after draining down. Any detritus that may be carried over during circulation settles out in the separate, large sump. The sump is designed with a baffle plate or similar, to direct incoming water to a low level for settlement whilst water is drawn off at a higher level.

Where possible, pipe-work and equipment should be installed such that it drains itself when the system is emptied to avoid areas of stagnant water when the purification system is not in use. Where this is not possible, easy methods of draining down specific pipe-work or equipment should be included.

Fine filters are not considered necessary in circulation systems. They carry the risks of blocking flow and possibly transferring contamination between purification cycles.

5.2.3.3 Natural Seawater Supply

Advice should be sought from the relevant UK Fisheries/Health Department on the suitability of the local seawater.

Seawater must not be drawn from heavily contaminated areas. Low levels of turbidity, hydrocarbon or microbiological contamination should be removed before filling the purification system.

Seawater intakes must be located such that they cannot draw in waste discharged from the purification centre itself or from any other nearby facility.

It is recommended that seawater intakes are located well below the water surface to avoid collection of poor quality surface water, yet clear of the seabed to avoid intake of mud or fine sand.

Pumping at about the time of high water usually provides the best quality seawater.

Unfortunately, local inshore seawater is often contaminated by one source or another, particularly in estuaries and at landing places.

Turbidity can be removed by sand filter or settling tank. Carbon filters can remove low levels of hydrocarbons. UV treatment can negate low levels of microbiological contamination.

If tanks are to be used for the settlement of turbid water, this can take more than one day and may require at least two independent tanks.

Activated carbon filters must be replaced at regular intervals to ensure their efficiency. Any turbidity should be first removed by sand filter or settlement to prevent clogging of the carbon filter.

The UV treatment unit fitted to a purification system for recirculation may not have the capacity to clean incoming seawater in a single pass (see Section 5.2.3.5). If microbiological contamination of the seawater supply is a potential problem then a separate supply treatment

unit may be required to disinfect the seawater as it is pumped into the purification system. Although treatment of the water is usually required before it enters the purification system, it may be acceptable to treat the water in the purification system prior to loading the molluscs. To achieve this, the water is recirculated through the system UV for a period of time sufficient to destroy the microbiological contamination. The water is then pumped to a reservoir and the molluscs loaded into the system or, in the case of mechanically loaded systems, it may be possible to load the molluscs directly. Further advice on these matters should be sought from the relevant UK Fisheries/Health Department or Seafish.

Surface waters are more likely to be contaminated by hydrocarbons and by fresh water run-off from the land. In suitable (non-muddy) conditions, sand and gravel filters in the sea bed are effective.

Around high water, particularly in estuaries, the salinity, cleanliness and temperature of the seawater are normally at their most suitable. It may be necessary to provide storage tanks if suitable water is only available at high water.

If nearby water quality is unsatisfactory or long pipe runs and high pumping costs are involved, bringing clean seawater in containers from another area may be considered. Any such containers must be clean and of suitable design and construction to prevent contamination. However, the cost of this and possible uncertainty over supply and quality can make the use of artificial seawater a better option.

Seawater supplies must comply with the licensing requirements outlined in Section 4.2.8.

5.2.3.4 Artificial Seawater Supply

It is recommended that artificial seawater is made up from a standard mix of 5 basic salts to a salinity of 27 parts per thousand.

Fresh water used must be of potable quality. The use of public mains water is recommended in most cases. Extremely acid water, such as that from a peat catchment area, with a pH of less than 6.3 may not be suitable nor water that is heavily chlorinated.

A tank or sump separate from the tank in which the molluscs are purified is usually required for mixing artificial seawater.

Natural seawater contains many different salts but experience has shown that the MAFF recommended formulation of five basic salts produces an artificial seawater that will allow effective purification of bivalve molluscs. For a salinity of 27 parts per thousand in 1000 litres of water these are:-

Sodium chloride (NaCl)	-	21.1	kg
Magnesium sulphate ($MgSO_4 7H_2O$)	-	5.2	kg
Magnesium chloride ($MgCl_2 6H_2O$)	-	4.1	kg
Flake calcium chloride ($CaCl_2 2H_2O$)	-	1.1	kg
Potassium chloride (KCl)	-	0.5	kg

Expensive formulations containing more salts are available, usually for use in aquaria, but offer no advantage. Some mixtures sold as 'sea salts' may not contain the right proportions and thereby impair purification. The full names and chemical compositions shown above should be quoted when buying salts. Commercial or agricultural grades of salts are adequate. Pharmaceutical grades are not required.

Although salts can be mixed to any desired salinity, errors can occur if different mixes are used. In practice there is less likely to be any error if a single salinity is chosen that is suitable for all species purified. The salinity recommended includes a safety margin.

Public mains water should satisfy statutory requirements for cleanliness. Clean fresh water from a bore hole or similar source may suffice but should be treated before use unless it can be guaranteed to be of potable quality. Chlorination is not recommended for this usage. The water abstraction licensing requirements outlined in Section 4.2.8 must be complied with.

The salts must be dissolved in the water before it is used for purification. This usually requires a separate reservoir. Most purification systems utilising artificial seawater also re-use that water and hence there is already a suitable separate reservoir. Primary mixing of the salts can be by paddle, aeration or high pressure water jet. Extended and thorough mixing can help remove any residual chlorine in tap water. With the plumbing system shown in Section 5.2.3.2, it is recommended that further mixing is by circulation from the reservoir through the main circulation pump and UV back to the reservoir. For large systems, particularly where the reservoir is shared by several purification systems in sequence, it is recommended that an additional separate concentrated brine mixing tank is provided. This facilitates the dissolving of the salts and the uniform mixing of the brine. It is recommended that brine of 5 times the required strength is mixed in this smaller tank and is then diluted in the main reservoir when required. It is further recommended that all mixing tanks are clearly calibrated in units of water usage and that standardised measures of salts are made up (which can be by weight or volume) to avoid any possible mixing errors. This is particularly useful when a 10% water make-up is required after each purification cycle.

Further advice on the production and use of artificial seawater is given in Seafish Technical Information Service Sheet No. 1994/25/FT.

5.2.3.5 Ultra Violet Light (UV) Treatment

For recirculated water, MAFF usually require a minimum of a single water exchange per hour and a dosage of UV light per pass of 10 mw/cm^2/sec. As a rule of thumb, this

corresponds to a single 30 watt UV tube for each 2,200 litres of seawater in a traditional shallow tank system.

Totally enclosed lamp units that are plumbed into the seawater circulation system are recommended. These are available in a range of capacities as individual or multi tube units. Open units, where seawater flows under a lamp or series of lamps mounted above the water surface, are not recommended.

MAFF require that the UV tubes are replaced before they reach their rated life. It is recommended that there is visible indication that the UV tubes are lit when switched on.

UV light at a wavelength of 254 nanometres is effective in killing micro-organisms in water, provided the water is clear and not turbid. The kill rate is dependent on the dosage of UV light received. The minimum dosage specified for seawater circulation does not ensure a 100% kill in a single pass but should ensure a high kill in several passes. In purification systems with high water exchange rates, it may be possible to reduce the dosage per pass provided that in the increased number of passes the total dosage received, and hence the kill, is at least as high as that specified for a single exchange per hour. The standard design purification systems incorporate a UV dosage per hour well in excess of that specified. Where the treatment is required to give a very high kill rate in a single pass, for example when initially treating contaminated seawater supplies, a much higher dosage is required. Further advice on these matters should be sought from the relevant UK Fisheries/Health Department or Seafish.

Suitable UV units, constructed as package units, are now readily available. Germicidal efficiency decreases with use. The rated life of tubes, specified by manufacturers, varies but can be up to 8,000 operating hours. The 'conditions of approval' specify when the tubes must be changed. The fitting of a time recorder to the UV circuit is recommended to indicate when tube replacement is necessary.

UV units should be installed such that air is not trapped within them when filling the system and also such that they can be drained when the system is emptied. It may be necessary to install an air bleed in some systems. The installation must be accessible to replace tubes and at least one end cap of each tube should be clearly visible to monitor their operation.

UV light can damage the eyes if viewed directly. Manufacturers fitting and maintenance instructions must be followed.

5.2.3.6 Seawater Heating and Cooling

Temperature control is greatly assisted by housing the purification system within an enclosed building in which stable ambient conditions can be maintained.

Where seawater heating is required, it is recommended that this is by electrical heating elements immersed in the purification tank or sump.

Where seawater cooling is required, it is recommended that this is by mechanical refrigeration with cooling coils immersed in the purification tank or sump or with water led off through a separate chiller unit.

Seawater temperature indication and thermostatic control must be provided for such heating or cooling systems.

Electrical heating elements constructed of suitable materials are readily available. Separate cooling units designed as beer chillers are readily available and are recommended as they are constructed of suitable materials, are of hygienic design and are relatively inexpensive.

In recirculation systems, it is recommended that heating or cooling is applied to the mass of water at the outlet end of the purification tank or in the sump so that mixing and temperature stabilisation occurs in the plumbing system before the water is returned to the molluscs. It is recommended that the temperature sensor(s) for the indicator and thermostat are located within the tank to give a representative indication of seawater temperature.

Where a separate cooling unit is used, it is recommended that a separate pump and plumbing circuit is provided to circulate water from and back to the tank or sump. There will then be no possible interference with the purification water circulation system and the rate of flow through the chiller can be optimised to match its characteristics.

A float switch or similar can be fitted to ensure that heating or cooling systems are disabled when the water is drained.

Sealed bags of fresh water ice can be used to reduce seawater temperature in exceptional circumstances but their use is not generally recommended because of lack of control and of possible leakage reducing salinity. Freezer packs should not be used unless there is certainty that the material they contain can present no risk to the operation of the purification system.

5.2.3.7 Supplementary Aeration

It is recommended that primary aeration is by cascade or waterjet but supplementary aeration may be required in some systems for operation at high temperatures.

Supplementary aeration may be provided by installing air diffusers in the bottom of the purification tank or sump. The air supply to the diffusers must be clean and it should be controlled to prevent excessive foaming.

Surface mounted aerators are not recommended unless remote from the molluscs, such as in a separate sump tank.

Aeration by cascade or water jet is simple and requires no additional equipment or cost but may not be entirely adequate in some low flow rate or highly loaded systems at high temperatures.

Numerous means of supplementary aeration are possible. Bottom mounted diffusers producing fine bubbles that rise and dissolve into the water column are effective provided that they are installed as recommended in sections 5.2.1.4 and 5.2.3.2 and do not cause disturbance to the molluscs or to the flow of water or cause the re-suspension of detritus.

The air supplied from pumps must be oil free. Simple low pressure centrifugal fans are recommended.

Foaming can occur, particularly with mussels, and tends to increase as water is re-used. This can become a serious problem resulting in excessive overflow and water loss if the airflow to diffusers is not controlled by a valve and flow indicator or similar means.

Surface mounted aerators, including mechanical agitation types, may be effective in separate tanks where the disturbance created does not affect purification, provided that adequate mixing of the water occurs during circulation.

5.2.3.8 Mollusc Purification Containers

Containers used in purification systems must be rigid, durable and easy to clean. They should be suitable for manual or mechanical handling as appropriate.

The containers used in tank systems must have open mesh sides and base, allowing the free passage of water and detritus but without allowing the molluscs to fall out.

The containers used in vertical stack and bulk bin systems must have solid sides and be purpose designed or modified as recommended in sections 5.2.2.3, 5.2.2.4 and 5.2.3.2.

The containers must be deep enough to contain the molluscs, with the required free space above them and when used in high flow rate multi-layer systems must be sized to fit the tank cross-section to prevent the water by-passing the mass of molluscs.

Suitable plastic containers, both mesh sided and solid, originally designed for other food/materials handling purposes, are readily available.

Containers designed to stack and preferably to nest when empty, have considerable handling and storage advantages. There is also advantage in containers sized to stack on standard pallets. In addition, the tapered sides of stack/nest containers permit flow of water all around the molluscs when used in tank systems and their top rims provide convenient support points when used in vertical stack systems. Allowance must be made for the internal depth lost when these interlocking containers are stacked in tank systems.

5.2.3.9 Pumps, Valves and Flowmeters

It is recommended that circulation pumps are slightly oversized and that flow is reduced by a control valve, ensuring that the designed flow rate can be achieved over time.

Simple recessed impeller centrifugal pumps are recommended.

Diaphragm valves are recommended for flow control. Ball valves are adequate for on/off and flow diversion requirements. Doors, plugs, gate valves or similarly robust means are required for final drainage of purification tanks.

Simple gapmeter type flowmeters are recommended.

When specifying pumps, allowance must be made for the loss in flow caused by the height pumped, friction and energy losses in plumbing and water jets and reduction in performance with time.

Recessed impeller centrifugal pumps are virtually immune to the solid material that almost inevitably finds its way into the circulation system at some time. Positive displacement pumps are not recommended.

Stainless steel pump impellers are recommended although cast iron impellers are in use without apparent harmful effect on the molluscs. Cast iron impellers and shafts corrode and this can result in pump leakage and seizure, particularly if used intermittently. Phosphor bronze impellers, often recommended for seawater use, are not recommended for purification systems because of their copper content. Plastic impellers are suitable for small pumps. Magnetically coupled pumps are recommended for small systems as they have no shaft seals and are virtually maintenance free.

Submerged motor/pump units and close coupled motor/pump units with a direct heat path from the motor via the pump housing to the water are not recommended for use in hot conditions when their heating effect on the water can be a problem. Similarly, the pump capacity should not be greatly oversized as this creates heat and wastes energy.

Diaphragm valves provide accurate flow control with relatively little energy loss. The use of valves for the final drainage of large tanks is problematic because of the amount of shell and other detritus involved.

Gapmeters are simple, variable area, tapered tube flowmeters that measure the instantaneous rate of flow in a pipe. Any clogging of the transparent sight tube can be observed. Care must be taken to ensure that flowmeters are compatible with seawater. Their accuracy should be checked, for example by recording the time taken to fill a tank.

5.2.3.10 Covers For Outdoor Purification Systems

Covers for outdoor tanks are usually considered necessary in order to prevent unacceptable temperature variations, to prevent dilution by heavy rainfall and to prevent contamination from seabirds and other sources.

Molluscs are also generally more active in darkened conditions.

Covers may take a variety of forms, including hinged lids, removable covers on frames or a fixed roof.

They should provide protection from direct sunlight, animals and wind-blown debris.

Light colours are recommended to reflect sunlight.

Rainwater should drain from the covers and not enter the purification system.

Note: proposed changes to legislation may demand that purification tanks have a roof.

5.2.3.11 Electrical Installations

All electrical equipment used in wet areas must be hose-proof. Electrical equipment conforming to IP66 classification (dust and hoseproof) is recommended.

The electrical safety precautions recommended in section 4.2.6 should be followed.

It is recommended that electrical equipment is grouped together at one end or side of the purification system, where it remains accessible but is away from the mollusc loading/unloading and drainage/washing areas.

It is also recommended that for interconnected multiple tank systems, a master control panel is provided.

5.2.3.12 Monitoring Equipment

A thermometer, a hydrometer and a dissolved oxygen meter are the basic instruments necessary to monitor the physical performance of purification systems.

It is recommended that a thermometer and a hydrometer are provided for the operational monitoring of all purification systems. Access to a dissolved oxygen meter is required during the trial of new systems but may not be necessary for their operational monitoring after their operating characteristics and 'conditions of approval' have been established. However, where a system is dependent upon supplementary aeration, then the provision of a dissolved oxygen meter may be required for operational monitoring.

Consideration can also be given to the provision of resettable time recorders and alarms on the main power circuits to indicate that the full purification period has been completed successfully and to warn of any system failure which may have cost or risk consequences if left unattended. In addition, the fitting of a cumulative time recorder in the UV electrical circuit is recommended in section 5.2.3.5.

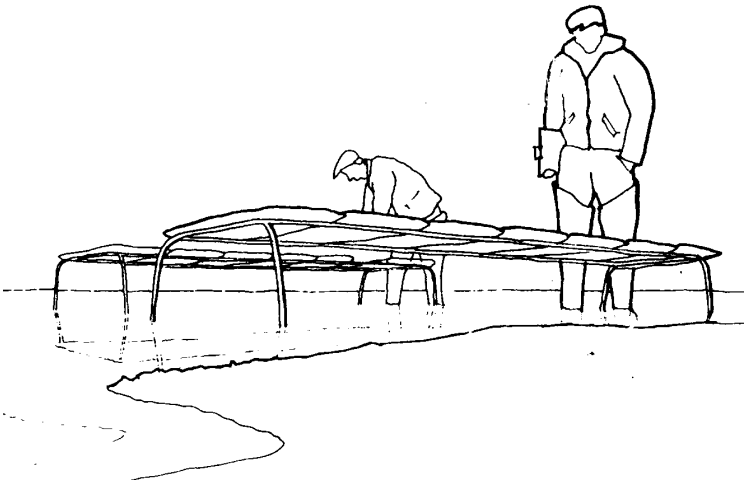
A hand held digital electronic probe thermometer is recommended for general temperature measurement. A robust and water resistant type should be selected and its calibration checked at intervals. Calibration can be by placing the probe in a container of clean, iced, fresh water. Glass thermometers are prone to breakage. Further recommendations for the monitoring and control of heating and cooling equipment are given in section 5.2.3.6.

A hydrometer suitable for use in seawater can give a reading of salinity or specific gravity, either being suitable. When measuring specific gravity, a conversion chart is used to convert to salinity. Both require seawater temperature to be measured. Hydrometers are usually made of glass and are therefore prone to breakage although plastic versions are available. Electronic salinity/conductivity meters with in-built temperature compensation are available and can be used but they must be suitably robust, water resistant and be checked regularly.

For general measurement of dissolved oxygen levels, a hand held digital electronic meter with a galvanic probe is recommended. These items of equipment are expensive and can be sensitive in use. Some types have a limited probe life. Their provision for monitoring commercial operation is recommended if there is uncertainty over the continued effectiveness of aeration or of the need for supplementary aeration.

6. Conditioning, Hardening and Immersed Storage

Contents



6.1 Legal Requirements

The Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations 1992 (as amended)

Interpretation

2-(1) In these Regulations, unless the context otherwise requires -
"clean sea water" means sea water or brackish water which is to be used under the conditions laid down in these Regulations and which is free from microbiological contamination and toxic and objectionable substances occurring naturally or after discharge in the environment, including those listed in the Annex to Directive 79/923/EEC (quality required of shellfish waters), in such quantities as may adversely affect the health quality of bivalve molluscs or other shellfish or impair their taste;
"conditioning" means storage in tanks or any other installation containing clean seawater or in natural sites to remove sand, mud or slime;
"dispatch centre" means any on-shore or off-shore installation for the reception, conditioning, washing, cleaning, grading or wrapping of either live bivalve molluscs or other shellfish, or both, for human consumption;
"purification centre" means an establishment with tanks fed by naturally clean sea water or sea water that has been cleaned by appropriate treatment, in which live bivalve molluscs are placed for the time necessary to remove microbiological contamination, so making them fit for human consumption;
"relaying" means a transfer or live molluscs to an area of sea, estuary or lagoon for the purpose of removing any contamination, for the time necessary to remove such contamination, but does not include transfers to areas more suitable for further growth or fattening;
"placing on the market" means, in relation to live bivalve molluscs or other shellfish for human consumption, whether raw or for the purpose of processing, the holding, exposure, displaying for sale, offering for sale, selling, consigning, delivering or any other associated activities of marketing.

Schedule 2. Requirements for Harvesting and Transportation

4. Live bivalve molluscs or other shellfish must not be re-immersed in water which could cause additional contamination between harvesting and landing.

Schedule 7

Part 1. Preservation and Storage

2. Re-immersion in or spraying with water of live bivalve molluscs or other shellfish must not take place after they have been wrapped and have left the dispatch centre except in the case of retail sale at the dispatch centre.

The Food Safety (Live Bivalve Molluscs) (Derogations) Regulations 1992 (as amended)

Section IV. Requirements for dispatch centres

1. In addition to the requirements under Sections I and II, the following conditions must be met:
(a) conditioning must not cause any contamination of the product, conditioning facilities must be used in accordance with procedures recognised by the competent authorities, with special regard to the bacteriological and chemical quality of the sea water used in those facilities;
(b) equipment and containers in the conditioning facilities must not constitute a source of contamination.

Although any immersion of live bivalve molluscs involves risk of contamination, the Mollusc Regulations are in many respects unclear on the requirements for ‘conditioning’, ‘hardening’ and ‘immersed’ storage and need interpretation.

‘Conditioning’ is defined in the Regulations and is the natural purging process more commonly known as ‘degritting’, in which live bivalve molluscs are immersed in clean seawater in natural sites or man-made installations to remove sand, mud or slime. This should not be confused with ‘purification’ and ‘relaying’ which are for the removal of microbiological contamination, although in practice ‘purification’ results also in effective ‘conditioning’. The Regulations establish requirements to avoid contamination when ‘conditioning’ in dispatch centres, although in practice, conditioning is also carried out at other places including both natural sites and man-made installations.

‘Hardening’ is not defined or referred to in the Regulations but is commonly understood to be the re-location of sub-littoral grown molluscs into intertidal areas or drying conditions for a period of time to toughen them for subsequent handling and storage. This widespread practice is sometimes known locally as ‘conditioning’ (or ‘training’) but should not be confused with the term ‘conditioning’ defined in the legislation. In practice, ‘hardening’ is carried out in both natural sites and in man-made installations.

‘Immersed storage’ is not defined or referred to as such in the Regulations but is a widespread practice carried out in both natural sites and in man-made installations, not only to provide good long-term storage conditions but also to refresh molluscs that have been held out of water for a period of time. However, between harvesting and landing, any immersion of the raw material (for whatever purpose) in water that may cause contamination is prohibited by the Regulations. In addition, any immersion of the product (regardless of water quality) is prohibited after it has been wrapped and has left the dispatch centre.

It is accepted that the Mollusc Regulations do not prohibit or apply to the movement of molluscs in designated production areas and to the associated handling of those molluscs when for the purpose of on-growing prior to eventually being harvested for human consumption. However, it is considered that they do apply to movement to natural sites (which must be within appropriate designated production or relaying areas) for short term ‘conditioning’, ‘hardening’ or ‘immersed storage’, as part of the overall sequence of events involved in ‘placing on the market’. The few requirements of the Regulations relevant to this are those for the harvesting, handling and transport of the raw material. The Regulations apply also to transfer into man-made installations for ‘conditioning’, ‘hardening’ or ‘immersed storage’ but are largely silent on any requirements, except for those same requirements for harvesting, handling and transport of the raw material and the particular requirements for ‘conditioning’ when carried out in a dispatch centre and the prohibition on immersion after leaving the centre.

The Mollusc Regulations do not prevent the returning of live bivalve molluscs to an appropriate designated production area, even after leaving a dispatch centre, although the prescribed sequence of events for ‘placing on the market’ will have been broken and would have to start anew if these molluscs are later harvested for human consumption. Similarly, it is assumed that wrapped product can be unwrapped and immersed (in suitable conditions) in another dispatch centre, provided that the prescribed sequence of events including relabelling recommences after that. However, Fish Health Regulations may prohibit the re-immersion of molluscs depending upon the animal health status of the areas and animals concerned.

6.2 Recommendations

6.2.1 The Principles of Conditioning, Hardening and Immersed Storage

All these immersed operations carry risk of contamination of the molluscs and must be carried out either in natural sites in designated production or relaying areas or in carefully controlled conditions in man-made installations, such that the seawater is of appropriate cleanliness.

Because of the risks involved, it is strongly recommended that the local Food Authority is informed of any natural site or man-made installation to be used for these purposes and that their guidance is sought on the suitability of the site or installation.

Any limitations on the movement and re-immersion of live bivalve molluscs under the Fish Health Regulations must be complied with.

To maintain their separate identification, batches of molluscs from different production areas must not be mixed together during conditioning, hardening or immersed storage. Species requiring different conditions and batches of different categories of cleanliness must be kept separate and there must be no possibility of cross-contamination via the seawater.

Live bivalve molluscs must not be immersed after being packaged and leaving the dispatch centre. The extent of coverage of The Food Safety (Live Bivalve Molluscs) Regulations 1992 to the retail and catering sectors is unclear but it is strongly recommended that re-immersion is not carried out in those sectors.

For the molluscs to survive, it is essential that they have not been over-stressed or damaged during harvesting or handling prior to immersion and are not in a seasonally weak condition.

For conditioning to be effective, the molluscs must be placed for a period of time in suitable conditions of seawater such that they function naturally and purge themselves. Conditioning is not a suitable process for removing microbiological contamination.

For hardening to be effective, the molluscs must be placed in suitable conditions of seawater and dry periodically, for example in an intertidal zone, such that they survive and toughen.

For immersed storage to be effective, the molluscs must be placed in suitable conditions of seawater such that they survive and remain in good condition.

The conditions required depend on the purpose and on the species of molluscs.

The molluscs must be free to open and function whilst immersed.

Mussels, oysters and manila, native and hard shell clams are considered suitable for conditioning and for immersed storage. Mussels and oysters can benefit from hardening. Cockles and scallops can be conditioned provided that they are carefully handled and there is only a short delay between harvesting and re-immersion.

For the design, construction and operation of man-made conditioning, hardening or immersed storage installations, it is recommended that the general guidance given in Section 5 on purification systems is followed but with appropriate changes to the seawater conditions, time periods, etc. as necessary. It is recommended that molluscs are washed clean before placing in the installation and it must be ensured that the seawater used in the installation is of appropriate cleanliness to start with and remains so throughout the period of immersion.

Further guidance on the technical aspects of 'conditioning', 'hardening' and 'immersed storage' can be sought from the relevant UK Fisheries/Health Department or Seafish.

The potential for contamination of live bivalve molluscs is at its greatest when they are immersed in seawater. The cleanliness of the water must be appropriate to the category of microbiological cleanliness of the molluscs, e.g. raw material harvested from a category 'B' area can be conditioned, hardened or stored in a natural site in a category 'B' area (or perhaps in a category 'A' area if there is no risk of cross-contaminating category 'A' molluscs) but not in a category 'C' area without losing the category 'B' status of the molluscs. It is essential that man-made installations used for re-immersion are designed and operated such that the risk of contaminating the molluscs is minimised, whilst maintaining suitable seawater conditions. This applies to purification systems and therefore the same basic principles of design, construction and operation apply to installations for conditioning, hardening and immersed storage.

Although the requirements of the Mollusc Regulations are relatively few in respect of conditioning, hardening and immersed storage and require official approval only of purification and dispatch centres (and of production and relaying areas), it is in the interests of industry to inform the local Food Authority of these activities and to seek their guidance because of the risks to food safety that are involved.

The Fish Health Regulations are to protect local stocks from disease. If molluscs are to be sourced from other countries or areas where shellfish disease may be present, then advice must be sought from the relevant Ministry Department. The re-immersion of these molluscs at or near coastal sites may not be permitted.

Separate areas at natural sites, or within installations and possibly separate sites or installations are required, as necessary, to avoid the mixing of batches and to provide any different conditions necessary. Keeping batches separate is necessary for documentation purposes, including the tracing of batches should problems occur.

Stressed, damaged or seasonally weak molluscs may not function and may die or may spawn and then die whilst immersed, which can create the further problem of spoiling the water quality.

The conditions required for conditioning are broadly similar to those for purification in that they must stimulate activity of the molluscs to result in natural purging. However, somewhat higher water flow and system loadings may be permissable whilst still achieving effective conditioning and a relatively short period of immersion is usually adequate.

For hardening there is less need to stimulate activity but care should be taken to avoid extremes in conditions, in either immersed or drying phases, that could unduly stress the molluscs. The time periods required for effective hardening are generally much longer than for purification.

For immersed storage, particularly in man-made installations, the conditions should encourage a continuing but low level of activity to avoid exhausting the molluscs and the build-up of waste products in the water.

Holding molluscs in loosely filled mesh bags may be acceptable for hardening and for immersed storage but is not recommended for conditioning where a higher level of mollusc activity is required.

Experience, local knowledge and microbiological and seawater condition monitoring should guide selection of suitable natural sites. These sites must have an adequate seawater exchange to maintain the required conditions over time and must not be subject to contamination by run-off from agricultural land, etc. Particular care is necessary for small, semi-enclosed sites such as tidal ponds. It is necessary to purpose design and control man-made installations to achieve the required conditions.

Most species are suitable for conditioning although species not suited to intertidal conditions must be handled particularly carefully and with only the minimum of delay out of water. For cockles it is recommended that this delay is no longer than six hours and for scallops no longer than twelve hours. Obviously, species that do not survive in intertidal conditions cannot be hardened. Cockles (and possibly other burrowing species) do not survive well in tanks for extended storage as they tend to exhaust themselves.

6.2.1.1 Period of Immersion

The period required for effective conditioning depends on species and conditions. For mussels, cockles and scallops a period of 6-12 hours is usually adequate.

For the more gradual acclimatization process of hardening, a period of a few weeks is usually required.

For most species, immersed storage can extend over long periods provided suitable seawater conditions can be maintained, although cockles may not survive for more than a few days in man-made installations.

The periods required for conditioning and hardening can be determined by trial depending on the circumstances of operation and the degree of purging or toughening required.

Immersed storage in man-made installations can be limited by the accumulation of waste products in the seawater which inhibit and ultimately harm the molluscs. This can be mitigated by changing the seawater or treating it to remove these waste products. Over long periods, starvation of the molluscs may become a problem.

6.2.1.2 Dissolved Oxygen

For most species it is recommended that the dissolved oxygen level in the seawater exceeds 50% saturation.

For scallops it is recommended that the dissolved oxygen level exceeds 70% saturation.
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Molluscs become increasingly stressed if levels of dissolved oxygen are consistently low.

Scallops are generally not estuarine and are acclimatised to the relatively high levels of dissolved oxygen present at sea.

6.2.1.3 Seawater Temperature
For conditioning in man-made installations, it is recommended that the guidance for purification systems given in Section 5.2.1.3 is followed:-

Species	Seawater Temperature	
	Minimum	Maximum
Mussels	5°C	15°C
Native Oysters	5°C	15°C
Pacific Oysters	8°C	18°C
Clams	12°C	20°C
Cockles	7°C	16°C

For scallops a seawater temperature range of 10°C to 18°C is recommended.

In natural sites to which the molluscs are acclimatised, a somewhat broader range of temperature conditions may be suitable.

For hardening, where temperature variations are an essential part of the day/night, wet/dry cycle, it is recommended that temperatures correspond to natural variations for mollusc growing areas but avoiding extremes such as icy or heatwave conditions.
For short-term immersed storage, seawater temperatures can correspond to those for purification and conditioning but for longer term storage in man-made installations, it is recommended that temperatures are lower, say 5°C to 10°C, to reduce the activity of the molluscs.

The relatively high temperatures for conditioning and purification are to stimulate the activity of the molluscs.

Natural shallow water sites used for hardening or other purposes can be susceptible to extremes of temperature variation and their usage may have to be seasonal. Further information on the temperature tolerance of molluscs is given in Appendix II.

Most species can be stored for a few days in man-made conditioning or purification installations without harmful effect. Reducing the seawater temperature for long-term storage

causes less depletion of the molluscs' energy reserves and reduces their output of waste products into the water.

6.2.1.4 Seawater Flow and Aeration

A flow of seawater is usually required in man-made installations in order to provide sufficient oxygen to the molluscs.

In general it is recommended that the guidance given for purification systems in Section 5.2.1.4 is followed, although somewhat higher flows may be acceptable for conditioning and somewhat lower flows for low temperature storage.

There must be an adequate tidal or other exchange of seawater in semi-enclosed natural sites.

As conditioning is not intended to remove bacteriological contamination and is generally carried out on molluscs that are either from bacteriologically clean areas or which are to be subsequently heat treated (there is little point in conditioning molluscs that are subsequently to be relayed or purified), there is somewhat less concern than there is for purification systems about high water flow velocities disturbing possibly contaminated detritus which could be ingested by the molluscs. In a well designed conditioning installation, e.g. a down-welling bulk bin type system for mussels, a substantial flow rate can help carry away detritus.

Conversely, in low temperature storage installations the oxygen demand of the molluscs is reduced and hence a lower flow rate is acceptable, provided that the recommended dissolved oxygen levels are maintained.

In natural sites, a seawater exchange is required not only to maintain dissolved oxygen levels but also to maintain water quality.

6.2.1.5 Mollusc Loading Density

Mollusc loading is limited by the requirements that the molluscs must be free to open and function when immersed and that adequate dissolved oxygen levels and seawater quality are maintained. Acceptable loading depends upon the species of molluscs, the design of the installation or the nature of the site and usage.

For man-made installations, it is recommended that in general the guidance given in Section 5.2.1.5 on mollusc layer depth and total system loading for purification systems is followed, although somewhat higher loadings can be acceptable for conditioning, hardening or immersed storage. The restrictions on container stacking specified for purification systems do not necessarily apply, provided that the total system loading remains acceptable.

It is recommended that scallops are held in containers in a single overlapping layer, or in loose bags and that when stacked, the containers prevent the scallops from swimming free.

The recommended limitations on mollusc layer depths apply equally to immersion at natural sites.

The strict limitations on the loading of purification systems are necessitated by the critical role of the process in removing bacterial contamination and the need to ensure a high level of mollusc activity in limited flow rate conditions. However, conditioning, hardening and immersed storage are less critical and as conditioning can be carried out in somewhat higher flow rates and hardening and storage do not require such high levels of mollusc activity, mollusc loading can be somewhat higher whilst still maintaining the necessary seawater conditions and adequate levels of mollusc functioning. For example, Dutch practice is to condition mussels in a 1200mm deep layer in a high flow rate down-welling system but this has to be reduced to 600mm depth in summer to maintain dissolved oxygen levels. Obviously such depths are not appropriate to other species which do not naturally function in deep layers.

Scallops must be free to open but need to be contained or they tend to end up on the floor or the bed of the installation or site.

6.2.1.6 Seawater Quality, Treatment and Re-use
The seawater used must be free from contamination and harmful substances in quantities that may adversely affect the molluscs, as appropriate to the categorisation of microbiological cleanliness of the molluscs. In addition, it should not have excessive levels of turbidity and should be of suitable salinity and quality and it should remain suitable in all these respects throughout the period of immersion of the molluscs.

Immersion at a suitable natural site in a designated production or relaying area of appropriate microbiological categorisation should suffice. For man-made installations, it is recommended that the guidance on seawater quality, treatment and re-use given for purification systems in Section 5.2.1.6 is followed. That guidance is recommended also for the salinity of the seawater at natural sites unless the molluscs are acclimatised to the prevailing conditions.

Artificial seawater may be used for man-made installations or natural seawater may be drawn from an appropriate area. This water may be recirculated around the molluscs and be used for subsequent batches provided it remains of suitable quality. Treatment of this water to destroy microbiological organisms is recommended unless it can be guaranteed of appropriate quality initially and is passed only once through the installation (i.e. is not recirculated or re-used). UV treatment is recommended.

Acceptable periods of use and re-use of this seawater are limited by the deterioration of water quality through the accumulation of dissolved waste products. This depends on the design and loading of the installation, the species of molluscs and their level of activity. The seawater should be changed if mollusc activity becomes impaired.

The cleanliness of the seawater must be at least of equivalent microbiological status to that of the molluscs. It is essential that only clean seawater is used for molluscs that are for direct human consumption i.e. without relaying, purification or heat treatment.

For man-made installations, it is recommended that the further guidance on natural seawater supply, artificial seawater and UV treatment given for purification systems in Sections 5.2.3.3, 5.2.3.4 and 5.2.3.5 is followed.

Where mollusc loading and activity are relatively low, as may be the case in low temperature immersed storage, the acceptable period of water use and re-use may be longer than that prescribed for purification systems. Conversely, for highly loaded conditioning systems, the acceptable period is likely to be shorter. Erring on the side of caution is recommended as the effects of marginal water quality may not be immediately apparent in the observable activity of the molluscs. Similar caution is advised on the use of bacteriological filter systems to maintain water quality. These systems can be highly effective in applications such as immersed storage installations in constant use but are sensitive to a number of factors, such as irregular use, and can fail disastrously.

6.2.2 Types of System and Details of Construction

A wide variety of systems, based on natural sites or man-made installations, are capable of satisfying the basic principles described in Section 6.2.1. Choice of system depends on local circumstances and intended use.

There are no official approval requirements and 'conditions of approval' for conditioning, hardening and immersed storage systems (other than the general approval of the centre if located in a purification or dispatch centre) and there are no standard designs of system as such.

However, it is recommended that systems are based on known and proven types and that for man-made installations the detailed recommendations for purification system design and construction given in Section 5.2.3 are followed, with appropriate changes, as necessary, to suit the purposes of conditioning, hardening and immersed storage.

The wide variety of systems that are feasible range from laying out molluscs at natural sites (possibly in bags or trays on the sea bed or supported on racks or suspended from floats or rafts) to sophisticated man-made installations inland (possibly using recirculated artificial seawater and extensive water re-use and treatment). Tanks located on the shore and using directly pumped seawater lie
in-between.
For operations at natural sites, the guidance given in Section 4.1 on the harvesting and handling of the raw material is considered appropriate.

Man-made installations based on existing purification system designs are suitable for conditioning and immersed storage although may not be optimised for those purposes. Bulk bin type systems (Section 5.2.2.4) are particularly suited to conditioning and vertical stack type systems (Section 5.2.2.3) to immersed storage where order picking is required. These systems are best housed in buildings as discussed in Section 5.2.2.

7. Purification and Dispatch Centres

Contents

7. Purification and Dispatch Centres

7.1. Legal Requirements

The Food Safety (Live Bivalve Mollusc and Other Shellfish) Regulations 1992 (as amended)

Interpretation

2.-(1) In these Regulations, unless the context otherwise requires-
"clean sea water" means sea water or brackish water which is to be used under the conditions laid down in these Regulations and which is free from microbiological contamination and toxic and objectionable substances occurring naturally or after discharge in the environment, including those listed in the Annex to Directive 79/623/EEC (quality required of shellfish waters), in such quantities as may adversely affect the health quality of bivalve molluscs or other shellfish or impair their taste;
"dispatch centre" means any on-shore or off-shore installation for the reception, conditioning, washing, cleaning, grading or wrapping of either live bivalve molluscs or other shellfish, or both, for human consumption;
"potable water" has the same meaning as in the Food Safety (General Food Hygiene) Regulations 1995;
"purification centre" means an establishment with tanks fed by naturally clean sea water or seawater that has been cleaned by appropriate treatment, in which live bivalve molluscs are placed for the time necessary to remove microbiological contamination, so making them fit for human consumption;

Approval of dispatch centres and purification centres

7.-(1) Subject to the provisions of these Regulations any person who intends to operate a dispatch centre or a purification centre on or after 15th January 1993 shall before doing so apply to the food authority in whose area the dispatch centre or purification centre is situated for approval of that centre.
(4) An approval in respect of a dispatch centre may only be granted if the food authority is satisfied that it meets such of the conditions set out in Section I, II and IV of the Schedule to the Derogations Regulations as apply to it, save in so far as -
(a) there is in force in respect of that centre a derogation; and
(b) the terms on which that derogation was granted are complied with.
(4A) An approval in respect of a purification centre may only be granted if the food authority is satisfied that it meets such of the conditions specified in Sections I, II and III of the Schedule to the Derogations Regulations as apply to it, save in so far as -
(a) there is in force in respect of that centre any derogation; and
(b) the terms on which that derogation was granted are complied with,
and that it meets any additional conditions of which the food authority has been notified by the Ministers pursuant to paragraph (5).
(5) An approval for the purposes of this regulation may be granted subject to limitations as to the particular activities approved and the intensity of use, and, where the Ministers have notified the food authority that specified conditions for the operation of a purification centre relating to the matters mentioned in Section III of the Schedule to the Derogations Regulations should be complied with, the food authority shall give their approval subject to those conditions.

Restriction on the operation of dispatch and purification centres

***10.-(1) No person shall operate any dispatch centre or purification centre unless it has been approved by the food authority and the requirements of the approval and the applicable* provisions of the Schedule to the Derogations Regulations (allowing for any applicable derogations) are complied with.**

Restrictions on marketing of molluscs and shellfish

11.-(1) Subject to paragraphs (2) to (5), no person shall place on the market for immediate human consumption any live bivalve molluscs or other shellfish, unless -
(f) any wrapping is in accordance with Schedule 6;
(g) they have been stored and transported under satisfactory conditions of hygiene and in particular in accordance with the requirements specified in Schedule 7;
(h) they comprise or form part of a consignment which bears a healthmark -
(i) unless head (ii), (iii) or (iv) applies, which is in accordance with Schedule 1,
(i) they have been handled hygienically;

Schedule 1. Marking of Consignments

2-(1) The healthmark may be-
(a) printed on the wrapping material, or
(b) affixed as a separate label to the wrapping material or
(c) put inside the wrapping, or
(d) of a twist-tie or staple design.
(2) A self-adhesive healthmark must not be used, unless it is not detachable.
(3) All types of healthmark must be for single use only and are not transferable.

3. The healthmark must be durable and waterproof, and the information presented must be legible and in easily decipherable characters.

Schedule 6. Wrapping

1. -(1) Live bivalve molluscs and other shellfish must be wrapped under satisfactory conditions of hygiene.

(2) The wrapping material or container of such mollusc or shellfish shall-

(a) not impair the organoleptic characteristics of the live bivalve molluscs or shellfish,

(b) not be capable of transmitting substances harmful to human health to the live bivalve molluscs or shellfish,

(c) be strong enough to give adequate protection of the live bivalve mollusc or shellfish.

Schedule 7

Part 1 - Preservation and Storage

1. In any storing rooms, live bivalve molluscs and other shellfish or both must be kept at a temperature which does not adversely affect their quality and viability; the wrapping must not come into contact with the floor of the store room, but must be placed on a clean, raised surface.

The Food Safety (Live Bivalve Molluscs) (Derogations) Regulations 1992 (as amended)

Schedule

Conditions for the approval of dispatch or purification centres

Section I. General conditions relating to premises and equipment

Centres must not be located in areas which are close to objectionable odours, smoke, dust and other contaminants. The location must not be subject to flooding by ordinary high tides or run-off from surrounding areas.

Centres must have at least:

1. on premises where live bivalve molluscs are handled or stored:

(a) buildings or facilities of sound construction, designed and maintained adequately for the purpose of preventing contamination of live bivalve molluscs by any type of waste, dirty water, fumes, dirt or by the presence of rodents or other animals;

(b) flooring which is easy to keep clean and is laid in such a way as to facilitate drainage;

(c) adequate working space to allow for satisfactory performance of all operations;

(d) durable walls which are easy to clean;

(e) adequate natural or artificial lighting;

2. access to an appropriate number of changing rooms, wash basins and lavatories; there must be a sufficient number of wash basins close to the lavatories;

3. adequate equipment for washing tools, containers and equipment;

4. facilities for the supply and, where appropriate, storage of exclusively potable water or facilities for the supply of clean sea water;

Facilities supplying non-potable water may be authorised. The water concerned may not come into direct contact with live bivalve molluscs or be used for cleaning or disinfecting containers, plant or equipment which come into contact with live bivalve molluscs. Pipes and outlets carrying non-potable water must be clearly distinguished from those carrying potable water.

5. equipment and instruments or their surfaces which come into contact with live bivalve molluscs must be made of corrosion resistant material which is easy to wash and clean repeatedly.

Section II. General hygiene requirements

A high degree of cleanliness and hygiene must be required of staff, premises, equipment and working conditions:

3. any rodents, insects or other vermin found must be destroyed and further infestation prevented. Domestic animals must not enter the facilities;

4. premises, equipment and instruments used for handling live bivalve molluscs must be kept clean and in a good state of repair; equipment and instruments must be thoroughly cleaned at the end of the day's work and at such other times as may be appropriate;

5. premises, instruments and equipment must not be used for purposes other than the handling of live bivalve molluscs without authorisation by the competent authority;

6. waste products must be stored hygienically in a separate area and, where appropriate, in covered containers suitable for the purpose intended. Waste material must be removed from the vicinity of the establishment at appropriate intervals;

7. the finished products must be stored under cover and must be kept away from the areas where animals other than live bivalve molluscs such as crustaceans, are handled.

Section III. Requirements for purification centres

In addition to the requirements under Sections I and II, the following conditions must be met:

2. live bivalve molluscs must be washed free of mud with pressurised clean sea water or potable water before purification. The initial washing may also be carried out in the purification tanks before purification commences, the drainage pipes being kept open during the entire initial washing and sufficient time being allowed thereafter for the system to be flushed clean before the purification process begins;

10. after completion of purification, the shells of live bivalve molluscs must be washed thoroughly by hosing with potable water or clean sea water; this may take place in the purification tank if necessary; the washing water must not be recirculated;

11. purification centres must have their own laboratories or secure the services of a laboratory equipped with the necessary facilities for checking the efficiency of purification by use of microbiological specifications. Laboratory facilities outside the centres must be recognised by the competent authority;

Section IV. Requirements for Dispatch Centres

1. In addition to the requirements under Sections I and II, the following conditions must be met:

(a) conditioning must not cause any contamination of the product; conditioning facilities must be used in accordance with procedures recognized by the competent authorities, with special regard to the bacteriological and chemical quality of the sea water used in those facilities;

(b) equipment and containers in the conditioning facilities must not constitute a source of contamination;

(c) procedures for calibration of live bivalve molluscs must not result in additional contamination of the product or in any changes affecting the ability of the product to be transported and stored after wrapping:

(d) any washing or cleaning of live bivalve molluscs must be carried out using pressurised clean sea water or potable water; cleaning water may not be recycled.

2. Dispatch centres must accept only those batches of live bivalve molluscs which are accompanied by the registration document referred to in Chapter II, section 6 of this Annex and coming from an approved production area, relaying area or purification centre.

3. Dispatch centres must have their own laboratories or secure the services of a laboratory equipped with the necessary facilities for checking, inter alia, whether the molluscs comply with the microbiological standards of Chapter V. Laboratory facilities outside the centre must be recognised by the competent authority. However, these requirements do not apply to dispatch centres obtaining their molluscs exclusively and directly from a purification centre where they have been examined after purification.

5. Dispatch centres situated aboard vessels shall be subject to the conditions laid down in point 1(b), (c) and (d) and in points 3 and 4. The conditions laid down in Section I and II shall apply mutatis mutandis to such dispatch centres although special conditions may be laid own in accordance with the procedure laid down in Article 12 of the Council Directive.

In addition, Fish Health Regulations may limit the movement and re-immersion of bivalve molluscs depending upon the animal status of the areas and animals concerned. There are also health, safety and welfare regulations concerning the provision of toilet, washing and changing facilities for personnel and there are further regulations concerning water supplies, waste storage and disposal and the discharge of effluent to sewers or waterways.

The Weights and Measures Act 1985 and associated Regulations require prescribed quantity measurement and marking for packaged products. For transactions in which a quantity of goods is stated or implied, only weighing or measuring equipment that has been approved and stamped by Trading Standards Officers may be used.

The definition of ‘potable water’ in the Food Hygiene General Regulations is extensive but public mains supplied water should satisfy the requirements.

An approval number must be granted by the local Food Authority before a purification or dispatch centre or combined purification and dispatch centre operates. Before this number can be issued, the Food Authority must be satisfied that the centre meets the requirements of the food safety legislation.

Dispatch centres on vessels are permitted by the Regulations but the particular requirements given for them need some interpretation. These centres are waived the requirement for movement documents to accompany batches of raw material and also the requirements related to conditioning. The remaining requirements for the design, layout, construction, equipment and operation of dispatch centres apply *‘mutatis mutandis’* to these centres on ‘vessels’ (i.e. with due change of detail). ‘Vessels’ are not defined but it is assumed that they include rafts and similar offshore structures such as those used in fish farming activities. The legislation is silent on purification centres on vessels but purification on a moving vessel is not considered feasible (although immersed storage and possibly conditioning are considered feasible). If movement documents are not required, then the implication is that these ‘vessels’ must harvest the molluscs directly or be part of the same business as the gatherers of the molluscs. Also, if purification is

not involved then the molluscs must be harvested only from category 'A' production or relaying areas. If molluscs are supplied by independent gatherers, then it is assumed that movement documents would be required.

7.2 Recommendations

7.2.1 The Siting of Purification and Dispatch Centres

Dispatch Centres may be in premises ashore or on a vessel, raft or similar structure offshore. Purification is not recommended on floating structures as movement may disturb the cleansing process. Guidance on offshore dispatch centres is given in Section 7.2.12.

Centres must not be in places subject to general contamination or flooding that may result in harmful contamination of the molluscs.

Local planning regulations and any limitations on the movement and re-immersion of live bivalve molluscs under the Fish Health Regulations must be complied with.

In addition, the following should be considered:

- **the adequacy of space available and of access to the site**
- **the availability of water and power supplies and of staff**
- **disposal arrangements for both solid and liquid waste**
- **access to recognised laboratory facilities for microbiological testing**
- **proximity to harvesting areas and to markets and the provision of transport**.

Planning, usage, water supply and waste disposal requirements should be investigated at an early stage in case of objections or restrictions on design and operation of the centre.

The Fish Health Regulations are to protect local stocks from disease. If molluscs are to be sourced from other countries or areas where shellfish disease may be present, then advice must be sought from the relevant Ministry Department. The re-immersion of these molluscs at coastal sites may not be permitted.

Choice of location requires careful consideration and often involves compromise. A coastal location near to the production areas is desirable for purification centres in order to minimise delay in transporting the raw material, particularly if sensitive molluscs such as cockles are to be purified. However, many production areas have a low and variable output and are in remote locations with few facilities. Clean seawater for purification may be available at coastal sites but in many instances the seawater has to be filtered or settled or treated or taken only at certain times. The use of artificial seawater often enables the centre to be sited at a convenient location for operational purposes rather than at a more remote place where the seawater is clean.

The combining of purification and dispatch centres on single shared premises often has significant advantages of efficient utilisation of staff and facilities and of reducing intermediate handling, transportation, documentation and record keeping.

7.2.2 The Design and Layout of Premises

Centres must provide a suitably protected environment for working on and storing live bivalve molluscs. Protection is required against vermin and other sources of contamination and from the elements, to provide cool storage conditions. It is recommended that, where practicable, there is physical separation of the site from adjacent areas by means of fencing or walls and gates to provide security and to exclude the public and animals.

It is recommended that an enclosed building is provided for working on and storage of molluscs and for associated activities such as equipment and materials storage. It is also recommended that any installations for conditioning, purification and immersed storage are housed within a building.

Premises should be designed and constructed to be easy to clean and be well drained. Design should be simple and unadorned to avoid the lodging of debris, the harbouring of vermin and to facilitate cleaning. Construction should be of durable, hard wearing and corrosion resistant materials capable of being cleaned frequently.

Centres must be designed to cope with the quantities of molluscs handled and must provide adequate space to enable hygienic operations. To maintain their separate identification, batches of molluscs from different production areas must not be mixed together.

Centres should be designed as an operating system and take account, as necessary, the requirements for:-

raw material reception
raw material storage
raw material washing and any sorting, etc
purification, conditioning and immersed storage
post purification washing
product sorting, etc
product quantity measurement and packing
product storage
product dispatch.

The layout of the premises should provide for the 'flow' of molluscs through the system from the reception of the potentially 'dirty' raw material to the dispatch of the 'clean' product, with separation of the clean and dirty activities to avoid any cross-contamination or mixing of clean and dirty molluscs.
For combined purification and dispatch centres, these activities must be kept separate so that there can be no mixing of molluscs that are already safe to eat and those which require purification to make them safe.

In addition, there must be facilities for staff, for the storage of dry goods, for the cleaning and storage of equipment, for the storage and disposal of waste and for the parking of vehicles, as necessary.

There must be ready access to adequate toilet and washing facilities for all persons involved in the handling of bivalve molluscs and appropriate facilities for the changing of clothes.

Where retail sales are made directly from a dispatch centre, an area with access for the public should be provided for that purpose, separate from the other activities of the centre.

Purification and dispatch centres must provide a suitable environment for the handling and storage of bivalve molluscs as live animals. The detailed requirements appropriate for these premises and their equipment may differ from the often more stringent requirements for establishments handling prepared food products but the underlying principles of careful handling, protection from contamination and temperature control are similar.

An enclosed building provides a protected and controlled environment for all mollusc handling and storage activities, although it may be acceptable for the initial raw material handling operations to be carried out in the open air, in a suitable area. Similarly, it is recommended that all equipment and materials storage is in clean, dry areas within a building, although it may be acceptable to store equipment such as raw material containers under cover in suitable outdoor areas. The significant advantages of housing purification and other immersed holding operations within a building are discussed further in Sections 5.2.2 and 6.2.2.

Design, layout and construction to facilitate cleaning, contributes greatly to the ease of maintaining good standards of cleanliness. A durable and easily cleaned finish should be specified for all surfaces. In areas requiring frequent cleaning, surfaces should also be impervious and hard wearing. The use of wood is not recommended for surfaces that come into contact with bivalve molluscs as it is absorbent and can crack, split and harbour dirt. A light colour scheme is recommended for both the inside and the outside of buildings. Outside it helps

reflect heat and inside it helps show up dirt and makes cleaning easier.

Adequate space must be provided to handle and store the batches of bivalve molluscs, without the mixing of different batches and without the mixing or cross-contamination between molluscs at different stages of handling. Space must also be provided for equipment and materials storage, for access to equipment for cleaning and maintenance and for the manoeuvring of mechanical handling equipment such as fork lift or pallet trucks. Similarly, the provision of purification or other such facilities must be adequate to enable the different batches of molluscs to be kept separate.

Design and layout of centres as a through-flow operating system contributes greatly to the ease of maintaining hygiene standards and to efficient operation, although it may not always be practicable for small businesses and in restricted situations, in which case the operating practices must be more carefully controlled. Separation of activities can be by the allocation of separate areas and equipment or by walls, as appropriate, or when in more restricted situations it may be by carrying out the activities at different times in the same area or equipment with thorough cleaning between activities. Separation of purification and dispatch activities in combined centres can be by any of these means, as appropriate, but there must be no possibility of mixing or of cross-contamination between molluscs awaiting purification and those ready for dispatch.

There must be access for the reception and dispatch of molluscs at the centre and space for unloading and loading. Ideally this should be carried out under the cover of a canopy at a loading bay. For large centres, separate bays can be provided for reception and dispatch.

Product must be stored under cover in areas where there is no risk of contamination. Provision of rooms or designated storage areas within buildings is recommended for all mollusc storage, with separate spaces for raw material and product storage, although covered storage in a suitable outdoor area may suffice for short term storage of the raw material. Storage rooms are preferable to storage areas as they provide greater protection from contamination and better temperature control. However, the use of storage areas is considered adequate in small premises where storage is only for a few hours and the molluscs will be handled or dispatched that day and before the premises are washed down at the end of operations. Storage areas, particularly product storage areas, must not be subject to splash, spray or other contamination during normal working operations. For large centres, separate rooms can be provided for raw material and product storage.

Molluscs must be washed in clean water both before and after purification. It is recommended that this is done in separate areas or equipment and not in the purification tanks, as it is difficult to wash effectively within the constraints of the tanks. For large centres, separate areas and equipment can be provided for washing pre and post purification. The Food Authority may permit the pre-purification washing to be carried out as part of the harvesting operation if satisfied that the washing is adequate and that no intermediate contamination occurs. Molluscs should also be washed in dispatch centres prior to packaging. Washing areas and equipment must be sufficiently separated or enclosed to prevent the contamination of other areas by splash or spray.

Molluscs must be finally sorted to remove any extraneous materials and any dead or damaged animals and should be graded to suit market requirements, prior to being packaged in the dispatch centre.

The area for the quantity measurement and packaging of product must be sufficiently enclosed or separate to prevent contamination of the product or packaging materials. Packaging materials should be stored in a protected dry storage area.

7.2.3 Mollusc Storage

Non-immersed storage is recommended for most short-term storage situations in purification or dispatch centres, although in controlled conditions most species of live bivalve molluscs can be kept fresh by continued immersion in purification, conditioning or similar facilities. Guidance on immersed storage is given separately in Section 6.

Storage should be in cool, moist conditions. For the short-term storage of raw material, a mollusc temperature range of 2°C to 10°C is generally recommended for most species. For

longer term storage and for the storage of product, a mollusc temperature range of 2°C to 5°C is generally recommended. However, it is recommended that native oysters and live scallops are held at no lower than 4°C and it is beneficial to ice blue mussels.

Molluscs must be protected from contamination during storage. The product must be stored under cover and be kept clear of the floor. This is also recommended for raw material storage. The provision of refrigerated storage rooms is recommended wherever practicable. Storage rooms and storage areas must comply with the general requirements given for the construction of premises.

For refrigerated storage, the thermostat should be set to give a typical air temperature at the lower end of the recommended mollusc temperature range and, particularly for longer term storage, it is recommended that the air velocity over the molluscs does not exceed 0.3 m/sec. It is recommended that refrigerated stores are provided with a clearly visible air temperature indicator or recorder.

Immersed storage involves further risk of contamination and must be carried out only in controlled conditions.

Facilities for non-immersed storage must be well drained, particularly if ice is used for chilling, and the molluscs raised off the floor (for example on pallets) to avoid any risk of immersion in contaminated water. Further guidance on ice supply and handling is given in Section 12.

A pragmatic approach to temperature control is required in order to maintain suitable conditions for the molluscs. This will depend upon species, source, season, whether or not they are to be purified and their likely storage period and onward transportation, etc. Taking sensitive molluscs from warm conditions and subjecting them to temperature shock by rapid chilling for a short period of storage prior to purification, may be more harmful than a short period of unchilled storage. Further information on the temperature sensitivity of the various species of molluscs is given in Appendix II.

It is recommended that any outdoor storage of incoming raw material is limited to only a few hours and that the molluscs are protected by being in lidded containers, under covers or under a canopy. Molluscs should not be left outside throughout hot summer days or frosty winter nights.

Enclosed storage rooms give the maximum protection, although that provided by storage areas within buildings can be enhanced by the provision of screens or heavy duty plastic curtaining or by holding the molluscs in lidded containers.

Suitable insulated and refrigerated chill rooms are readily available as pre-fabricated units to be assembled on site. Insulation materials should be non-absorbent, such as closed cell plastic foam. Fan assisted evaporator units are commonly used and give a rapid pull-down in air temperature but often result in excessive air velocities which dry out the molluscs. The use of multiple evaporator units, instead of a single powerful unit, or of air diffusers is recommended to reduce air velocity over the molluscs. Automatic evaporator
defrost systems are recommended. There should be provision for the drainage of defrost water.

Setting air temperature thermostats to no lower than +2°C should minimise any risk of locally freezing molluscs close to the evaporator units. The sensors for air temperature indicators should be carefully located, away from evaporator units and from doors, so that they give an indication of typical air temperature.

Refrigeration compressor and condenser units need to be in a well ventilated area and are often located outside of the building where the noise and heat they generate can be less troublesome.

7.2.4 Outdoor Areas

Where practicable, it is recommended that fencing, walls and gates enclose all working and storage areas. This should be adequate to exclude the public and dogs, etc.

Surfaced hardstandings, roadways and paths should be provided for working and storage areas and for access and movement around the site.

These ground surfaces should be hard wearing, non-slip and cleanable. They should be even, without cracks, crevices or hollows that cause puddles and be well drained. Drains should be trapped to prevent the entry of vermin.

Artificial lighting must be provided if the site is to be used beyond the hours of daylight.

Where practicable, it is recommended that the secure area encompasses all the activities of the centre including vehicle unloading and loading, cleaning and parking. Where adequate protection and security cannot be provided, outdoor activities should be limited accordingly. There is less need to provide security in remote locations although animals may remain a problem.

Surfaced areas are recommended for all activities including working around any outdoor installations, equipment washing and storage and transport vehicle parking.

In general, concrete ground surfaces with a roughened surface finish and drainage slopes of about 1 in 70-80 are recommended. Drainage channels and gullies should have removable covers for cleaning and it is recommended that removable interceptor baskets are fitted to prevent blockage by shell debris etc.

Roof structures over installations and canopies, etc should be of tidy internal design to prevent bird roosting or nesting. Tarpaulins may be adequate for covering stored equipment.

Good lighting is necessary for security and safety, as well as for effective working. In working areas it is recommended that lights are distributed to create an even level of lighting without excessive glare or deep shadow. Lights that give a highly distorted colour rendition are not recommended for these areas. Lights should be weatherproof and be located and designed so that broken glass cannot fall onto mollusc handling or storage areas and equipment. Purification tanks should not be brightly lit when in use as this may inhibit the activity of the molluscs.

7.2.5 Buildings

These recommendations apply to the practical working and storage areas rather than to offices, etc.

7.2.5.1 Floors and Drainage

Floors must be easy to clean and be well drained. They should be hard wearing, non-slip and impervious to water. They should have an even surface without cracks, crevices or hollows that cause puddles and be sloped to drainage channels or gullies. Channels or gullies should be covered and drains trapped.

Drainage should be designed as part of the centre operating system to ensure that dirty water does not flow across the floors of clean areas.

Granolithic concrete with a roughened surface finish is recommended. It is hard wearing, relatively inexpensive and can be repaired. Smoothly finished steel floated concrete surfaces are slippery when wet. Grooved surfaces are acceptable but the grooves should run down the drainage slopes. Ordinary concrete is not recommended but can be covered by polymer screed incorporating non-slip fillers. Polymer surfaces can have advantages but great care is required in their preparation and laying. Ceramic and quarry tiles are not recommended as they have a tendency to crack and lift, allowing water to penetrate.

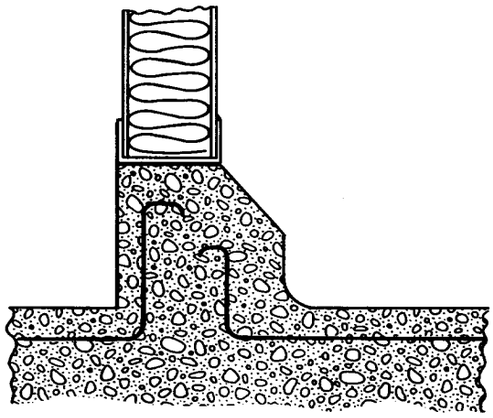
Drainage slopes of about 1 in 70-80 are recommended. Slopes of 1 in 50 are noticeably steep and slopes of 1 in 100 require a high standard of finish to avoid puddles.

The drainage system must be designed to cope with the volume of water used by items of equipment and in general washing down. The emptying of conditioning or purification systems is likely to require drainage dedicated for that purpose. Drainage slopes should take water away from clean areas and doorways etc.

Continuous interceptor drains (covered drainage channels) are recommended. They should be rounded in cross section to prevent the accumulation of debris in corners and be fitted with strong, removable covers for cleaning. Fine mesh holes in covers are not recommended as they are difficult to clean.

The trapping of drains prevents the entry of vermin and the emission of foul odours. In addition, it is recommended that removable interceptor baskets are fitted to reduce the chances of blockage by shell debris etc. Inspection chambers and rodding points should be provided. Soil drainage ventilation must be outside of buildings.

It is recommended that floor/wall junctions are coved. This facilitates cleaning and is particularly advantageous if the coving is extended upwards, as shown below, to form a kerb or upstand protecting the wall.



If extended high enough, the upstand protects the wall from impacts by truck forks, pallets, etc., and has the further advantage in storage areas of creating a gap between stacked boxes and the wall to permit the circulation of air.

7.2.5.2 Walls
Wall surfaces must be durable and be easy to clean. It is recommended that they are impact resistant, impervious to water and smoothly finished.

Recommended finishes include a smoothly finished steel-floated cement rendering coated with a hard two-pack epoxy paint, high build resin finishes, fibreglass and resin laminates laid up directly onto the wall structure, high grade wall cladding sheets and high grade prefabricated plastic coated metal/foam sandwich insulated panels. Coated steel panels may be adequate.
The basic cement rendered finish can be keyed to the wall structure if required and is easily repaired. Special purpose water-based epoxy wall paints are ecommended as they are relatively insensitive to application conditions and do not give off toxic fumes during extended curing periods. Special high build resin finishes can give a smooth skin to rougher structural surfaces, provided that the substrate is hard and dry.

Fibreglass lamination direct onto the wall surface creates a tough and joint-free skin that can be repaired but its application is a highly specialised task. Epoxy and other specialist resins have a higher performance than the basic polyesters.

Plastic wall cladding sheets vary considerably in durability. They have to be fitted by specialists and jointed with mastic. High grade claddings are relatively thick and rigid, but not brittle and can normally be bent under heat to form corners. They are normally adhesive strip bonded to closely spaced battens fitted to level the wall surface. High grade claddings, well fitted and jointed with mould resistant mastic, perform well but with a poor installation or a damaged surface there is concern about pests and fungal or bacterial growth in the void spaces. Stainless steel or aluminium cladding is more durable but again has to be sealed. Building and fire prevention regulations should be considered if large areas of plastic cladding are to be installed.

Prefabricated insulated wall panels again vary in quality, particularly in the durability of the plastic coating. Their broad and interlocking mastic sealed joints generally seal well and they do not create problems of voids.
Prefabricated, coated steel panels are suitable, provided they are kept in good condition, but they lack insulation and can result in high temperatures inside buildings when exposed to direct sunlight.

Soft plastered finishes are not suitable and ceramic tiles are not recommended as they are easily damaged.

It is particularly important that walls are resistant to impact damage where mechanical handling equipment is used. Around areas of heavy traffic, for example by doorways and around pillars, it is recommended that the walls are further protected by crash rails or posts.

To facilitate cleaning, it is recommended that pipes or conduits are chased into walls or boxed in or are bracketed sufficiently clear of the wall to enable cleaning behind them.

7.2.5.3 Ceilings or Roof Linings

Ceilings or roof linings should be so constructed and finished that they can be maintained in a clean condition and will not deposit contaminants onto the areas below. It is recommended that they are impervious to water and smoothly finished.

Exposed overhead pipework, ducting and beams should be kept to a minimum.

In general, high ceilings are preferable to low ceilings.

In buildings without complex internal roof structure, it is recommended that smoothly finished, preferably insulated roof linings are provided and that the roof space is left open instead of providing a ceiling. The height of the roof assists in natural ventilation and makes contamination of the inner surface by splash or spray, etc less likely.

Conventional built-in and painted ceilings may be adequate provided they remain in good condition.

Where exposed girders, pipes and ducts, etc. under an open roof structure make cleaning difficult or if the area is to be refrigerated, it may be considered necessary to install a ceiling. A ceiling can considerably reduce the volume of air to be chilled in a refrigerated area. A low ceiling is more likely to become contaminated during working operations or by splash from cleaning and should itself be easy to clean. In addition, it may have to provide a barrier between the working area and an uncontrolled roof space above. Suspended ceilings can provide insulation and facilitate the installation of lighting and other services but normal lightweight suspended ceilings with loose, separate and often permeable panels, are not recommended. Prefabricated, coated and insulated panels which can be sealed together, similar to those recommended for walls in Section 7.2.5.2, are recommended. They are available single sided for the less arduous ceiling applications and this also assists in lighting installation. Where the walls have laminated surfaces, these can be continued in a seamless fashion across the ceiling.

7.2.5.4 Doors and Windows

Doors and windows must provide protection against the entry of vermin and be durable and easy to clean.

It is recommended that doors and windows be kept to the minimum necessary.

Doors and windows should be a good fit to deter vermin, with the frames sealed to the walls. They should have smooth surfaces and any wood should be finished in a hard, waterproof paint. Doors can be further protected by metal kick plates. Window sills can be sloped at about 45° to prevent their use for storage and the accumulation of dirt.

Doors and windows are potentially easy access for vermin and can also result in loss of temperature control. Where large doorways are necessary for delivery and dispatch and for the occasional movement of equipment, it is recommended that smaller personnel access doors are also provided so that the large doors do not have to be left open. Even when shut, large uninsulated metal doors in direct sunlight can be a significant heat source. Insulated doors are readily available. In general, windows (particularly opening windows) in walls and translucent roof panels are not recommended although ‘north lights’ may be acceptable. Any such windows and panels should be of shatterproof plastic materials to prevent glass falling into the areas below.

7.2.5.5 Lighting
Adequate natural or artificial lighting must be provided.
Fluorescent lighting is generally recommended. It is more efficient and produces less heat and glare than tungsten filament bulbs. Care must be taken with any natural lighting to avoid 'greenhouse' heating, particularly over conditioning or purification systems.

Light fittings should be easy to clean and be splashproof, particularly when installed at a low level, and be fitted with shatterproof plastic diffusers to prevent the breakage and falling of glass. Waterproof switches should be used.

Good lighting is necessary for safety as well as for the maintenance of hygiene standards.

Light levels must be adequate for the tasks carried out. A locally high light level of 540 Lux is recommended where molluscs are being sorted but a much lower level is adequate for other work activities and for storage areas. Purification tanks should not be brightly lit when in use as this may inhibit the activity of the molluscs.

It is recommended that lights are distributed to create an even level of lighting, with high levels only over inspection areas and with the facility to switch the lights out over purification tanks.

For low ceilings, it is recommended that lights are flush fitted or are tight fitted and sealed to the ceiling. For safety, light fittings should conform at least to the classification IP34 (solid object and splashproof).

7.2.5.6 Ventilation
The provision of natural ventilation is generally recommended as being adequate, provided that the building is of sound design.

Ventilators should be screened to prevent the entry of vermin.

Ventilation helps remove any accumulation of warm air and odours and helps prevent rot and mould that can damage the fabric of the building, although uncontrolled draughts of air through the building can cause loss of temperature control. Ridge-vents in roofs are usually adequate but buildings with particular problems may require further ventilation.

Refrigerated areas do not normally require ventilation.

7.2.5.7 Dry Goods Storage
A clean, dry area should be provided for the protected storage of dry goods such as packaging materials and salts.

Where practicable, the provision of a separate and well ventilated dry storage room is recommended.

Materials that will come into contact with bivalve molluscs must themselves be protected. Other materials such as maintenance supplies (oils, acid, etc) and cleaning materials (disinfectants, etc) that may cause contamination should be stored in a separate place.

In small businesses and restricted situations it may not be practicable to provide a room for dry goods storage, in which case a suitable clean, dry area should be designated for that purpose. Typically this would be in an elevated position.

7.2.6 Mollusc Handling Equipment

General guidance on mollusc handling equipment including containers, mechanical handling, washing, declumping, sorting, barnacle removal, etc and quantity measurement is given in Section 4.2.6.

In addition, for purification and dispatch centres:

- **parts of equipment that come into contact with live bivalve molluscs must be made of corrosion resistant materials that are easy to wash and clean repeatedly**

- **facilities are required for finally sorting the product prior to wrapping in the dispatch centre.**

It is recommended that final sorting of the product is by visual inspection and manually removing any unwanted material after any mechanised declumping, debyssing, sorting and grading etc.

The guidance given in Section 4.2.6 on equipment for handling the raw material is equally applicable to the product, although the requirements of the Live Bivalve Molluscs Regulations for materials in contact with the molluscs are stricter for purification and dispatch centres than for the harvesting, handling and transport of the raw material.

For final sorting, it is recommended that the product is laid out in a single layer on a smooth surface, on a table for small-scale operations or on a sorting conveyor on a larger scale. Sorting conveyor feed should be regulated and preferably the conveyor speed should be adjustable to suit the working conditions.

7.2.7 Packaging and Labelling Materials

The type of packaging required will depend upon the species and quantities of molluscs, the circumstances of storage and distribution and customer requirements.

The packaging must be sealed to contain the product and provide adequate protection throughout storage and distribution, but should not be completely airtight.

Packaging materials must be clean and must not transfer harmful contaminants to the product or cause its deterioration.

The prescribed health mark (labelling) must be permanently attached or be inside the packaging and be durable, waterproof, visible and clearly legible.

The characteristics of the molluscs, the circumstances of storage and distribution and the requirements of the customers can vary enormously but should be taken into account in the choice of packaging.

In many situations the packaging may be the primary means of protecting the product. Specialised packing is required for particular applications such as airfreight or postal delivery, not only to give independent protection to the molluscs but also to prevent contamination of the transport system. For the more conventional storage and distribution in dedicated chill stores and refrigerated road vehicles, the packaging can be more basic.

Sensitive and fragile molluscs such as clams benefit from cushioned packaging and the protection given by boxes. The value of these molluscs and the perceptions of the customers may support this. For more robust species such as mussels, strong polythene bags may be adequate.

Bivalve molluscs can tend to gape a little during storage and distribution and this may cause loss of intervalvular fluid and reduced survival. This gaping can be reduced by packaging tightly. Particularly for large packages, a means of drainage or absorption of the fluid should be provided to prevent the immersion of some of the molluscs. Razor clams can be bound tightly together in bundles with elastic bands.

The sealing of the packages may be by a variety of means sufficient to prevent interference with the contents without breaking the seal. This is a mollusc identification control measure and does not prohibit the generally recommended provision of a few drainage or air holes in the packaging. Completely airtight and particularly vacuum packaging is not recommended as it may lead to premature death of the molluscs and potentially dangerous anaerobic spoilage conditions. It should not be considered without thorough bacteriological challenge testing, particularly for botulinum toxin development, over the storage periods and in the temperature conditions that may prevail.

Traditional packaging such as wooden punnets, is acceptable provided that it satisfies the basic

requirements for cleanliness, not transferring harmful contaminants and giving adequate protection. The use of food grade packaging materials is not mandatory but, where appropriate, is recommended as it should ensure that the materials cannot transfer harmful constituents. Molluscs are sometimes packed with seaweed or other natural materials to protect them and keep them moist. Particular care must be taken to ensure that these materials come from a clean area, are thoroughly washed, are hygienically handled and remain clean when used.

The material and attachment of the prescribed labelling may take a variety of forms, although self-adhesive labels are not permitted if they come off easily and paper or card labels may not survive the wet conditions and remain legible. Permanently printing or writing directly onto the packaging, stapling or twist tying on a label or placing a label inside a polythene bag where it remains visible are all acceptable. The use of staples has the potential disadvantage of loose staples lodging in the molluscs. It is recommended that further labelling on the packaging includes any particular requirements, for example clearly identifying that packages for specialist applications such as airfreight or postal delivery contain live bivalve molluscs and should be handled with care.

7.2.8 Water Supplies and Equipment and Materials for Cleaning Purposes

General guidance on water supplies for cleaning purposes and for mollusc handling equipment operation and on materials and equipment for cleaning purposes, is given in Section 4.2.8. Specific guidance on seawater supplies for purification systems, which in general also applies to conditioning and immersed storage systems, is given in Sections 5.2.3.3 and 5.2.3.4.

In addition, for purification and dispatch centres:

- **the water supplies must be of potable water or clean seawater**
- **the water used for washing the molluscs must not be recycled**
- **supplies of inferior quality water may be permitted but pipes and outlets carrying this water must be clearly distinguished from those carrying clean water. This water must not come into direct contact with the molluscs or with plant and equipment that come into contact with the molluscs.**

The guidance given in Section 4.2.8 for water supplies and for equipment and materials for cleaning purposes, which is given in relation to the handling of the raw material, is equally applicable to the handling of the product. However, the requirements of the Live Bivalve Molluscs Regulations for the cleanliness of the water used and for the identification of any non-potable water supplies, are stricter for purification and dispatch centres than for the harvesting, handling and transport of the raw material.

To ensure that any seawater used for cleaning or other purposes is clean, the relevant guidance given for purification system water supplies in Sections 5.2.1.6, 5.2.3.3 and 5.2.3.5 should be followed. It may be possible to remove low levels of contamination by following the guidance given.

Apart from the recommended notices on the outlets of non-potable water, it is recommended that the pipework for different water supplies is colour coded to aid identification.

7.2.9 Waste Storage and Disposal

General guidance on waste storage and disposal, for both solid and liquid wastes, is given in Section 10.

In addition, for purification and dispatch centres:

- **waste products must be stored in a separate area and, where appropriate, in covered containers**
- **waste must be removed from the vicinity of the centre at appropriate intervals**.

Waste must not be allowed to accumulate in working areas, particularly in areas where the product is handled, and must be disposed of before it becomes a risk to the hygiene of the centre.

The waste storage area must be separate from other storage and working areas. Preferably, the access to the waste storage area for the collection and disposal of waste should also be separate and not through those other working and storage areas, although this separate access may not be practicable in small businesses and restricted situations.
The waste storage area must be enclosed and covered or the waste held in lidded containers.

7.2.10 Toilets, Washing and Cloakroom Facilities

General guidance on toilets, washing and cloakroom facilities is given in Section 11.

In addition, for purification and dispatch centres:

- **there must be access to an appropriate number of toilets, wash basins and changing rooms**

- **there must be a sufficient number of wash basins close to the toilets.**

It is recommended that, where practicable, the appropriate facilities are provided on-site and under the control of the centre.

The provision of dedicated facilities for use by the centre staff and associated personnel should ensure that at all times they are readily accessible, in working order, fully equipped and clean.

7.2.11 Laboratory Facilities

For carrying out the prescribed microbiological testing, purification and dispatch centres must have their own suitable laboratory facilities or alternatively have access to the services of a suitable laboratory that is recognised by the local food authority. However, this does not apply to those dispatch centres which are supplied only and directly by purification centres that have already carried out the necessary testing and which therefore do not have to carry out further testing.

It is generally recommended that centres obtain the services of a recognised laboratory in their locality for this specialised microbiological testing.

Sophisticated and highly specialised facilities and equipment, qualified staff and controlled procedures are necessary to carry out the prescribed 5 tube, 3 dilution MPN method of microbiological testing. It is unlikely to be cost-effective to incorporate this into any but the largest of purification and dispatch centres.

Public health laboratories, public analyst's laboratories and many privately operated laboratories may be suitable. Environmental Health Officers can advise on the local availability of these services. Where available, a local laboratory is preferable to a distant laboratory as the samples of molluscs for testing must be handled carefully and be transported in controlled conditions and as delay before testing reduces the validity of the results.
The sample molluscs should be put into a clean plastic bag and be kept in cool conditions, ideally at $4^{o}C$ (an insulated picnic box containing freezer packs is the method normally used) and be delivered to the laboratory within 24 hours. The samples must not be frozen and must be labelled to enable identification.

Further guidance on microbiological testing is given in the Shellfish Association of Great Britain document “Guidance on the Frequency of Microbiological Sampling of Purified Molluscs by Operators of Purification Centres”.

7.2.12 Offshore Centres

Dispatch centres on vessels are permitted by the Regulations.

Vessels subject to wave motion or other movement are not considered suitable as purification centres because of the risk of disturbance during purification.

Dispatch centres on vessels (including rafts or similar marine structures) must comply with the general requirements for the construction, equipment and operations of dispatch centres on land but with due allowance in detail for their marine nature.

For these dispatch centres, the recommended details of construction and of water supply given in Sections 4.2.3 and 4.2.8 for harvesting units may be more appropriate than those which relate particularly to shore based facilities in Section 7.

Although the legal requirements concerning conditioning in dispatch centres do not apply to dispatch centres on vessels, it is recommended that the same standards are adopted.

Purification may be feasible on fixed marine structures but there is no relaxation in the legal requirements for purification centres on 'vessels'. Immersed storage and possibly conditioning are considered feasible on moving vessels.
The general principles of design, construction, equipment and operation of dispatch centres recommended in the remainder of Section 7 should apply to all dispatch centres but the appropriate details, particularly of construction, may differ in the light of practicality on 'vessels'. It may be necessary to accept wood or steel construction, provided that it is adequately treated and remains in good condition, and safety requirements such as watertight integrity may impinge upon design.

The use of clean seawater is acceptable for washing and for equipment operation on 'vessels'. That water must not transfer harmful substances to the molluscs. When operating in category 'A' production areas, water taken directly from the sea is considered adequate. Water must not be drawn from highly contaminated areas. It may be possible to remove low levels of contamination by adopting the guidance for cleaning purification water given in Sections 5.2.1.6, 5.2.3.3 and 5.2.3.5.

Further consideration must also be given to the disposal of waste, particularly from moored 'vessels', to avoid contamination of the vicinity by cleaning chemicals and sewage, etc. Such disposal must not be directly over mollusc growing sites. It is recommended, where practicable, that there is separation between moored dispatch centres and growing sites, that the use of potentially harmful chemicals is minimised and that, where necessary, facilities are provided for waste collection and disposal.

8. Distribution and Storage of the Packaged Product after Dispatch

Contents

8. Distribution and Storage of the Packaged Product After Dispatch

8.1 Legal Requirements

The Food Safety (Live Bivalve Mollusc and Other Shellfish) Regulations 1992 (as amended)

Interpretation

2.-(1) in these Regulations, unless the context otherwise requires -
"final consumer" means a person who buys live bivalve molluscs or other shellfish -
(a) for his own consumption or consumption by his partner, family or other person in solely domestic context;
(b) for direct transport to, and consumption on, premises either in his ownership or under his personal supervision or in the ownership or under the personal supervision of a person employed by him; or
(c) for cooking on premises either in his ownership or under his personal supervision or in the ownership or under the personal supervision of a person employed by him for sale as take-away food for consumption off those premises;

Splitting Consignments of Live Bivalve Molluscs or Other Shellfish

11A.-(1) A person other than the final consumer who splits the contents of a consignment of live bivalve molluscs or other shellfish which are not wrapped in individual consumer-sized parcels shall keep -
(a) any healthmark which was attached to the consignment; or
(b) a copy of any certificate required in accordance with regulation 4(2)(a) of the Import Conditions Regulations which accompanied that consignment,
for a period of not less than 60 days from the date of the splitting of the contents of that consignment.
(2) A person who repackages a consignment of live bivalve molluscs or other shellfish in accordance with paragraph 3 of Schedule 6 shall keep the original healthmark (if one was required) which was attached to the consignment for a period of not less than 60 days from the date of the splitting of the contents of that consignment.

Schedule 6. Wrapping

3. All wrappings of live bivalve molluscs must be sealed and remain sealed from the dispatch centre until delivery to the consumer or retailer but wrappings may be unwrapped and repackaged provided that -
(a) the person who unwraps the product keeps records of the origin of all live bivalve molluscs and other shellfish received and of the place of dispatch, and
(b) live bivalve molluscs and other shellfish from different dispatch centres are not mixed when repackaging, and
(c) a healthmark is provided on the new packaging which is in accordance with Schedule 1.

Schedule 7

Part 1 - Preservation and storage

1. In any storing rooms, live bivalve molluscs and other shellfish or both must be kept at a temperature which does not adversely affect their quality and viability; the wrapping must not come into contact with the floor of the store room, but must be placed on a clean, raised surface except in the circumstances provided in paragraph 3 of Schedule 6.
2. Re-immersion in or spraying with water of live bivalve molluscs or other shellfish must not take place after they have been wrapped and have left the dispatch centre except in the case of retail sale at the dispatch centre.

Part 2 - Transport from the dispatch centre

1. Except where paragraph 3 of Schedule 6 applies, consignments of live bivalve molluscs or other shellfish intended for human consumption must be transported wrapped in sealed parcels from the dispatch centre until offered for sale to the consumer or retailer.

2. The means of transport used for consignments of live bivalve molluscs or other shellfish or both must have the following characteristics:

(a) their interior walls and any other parts which might come into contact with the live bivalve mollusc or other shellfish must be made of corrosion-resistant materials; the walls must be smooth and easy to clean;

(b) they must be suitably equipped to provide efficient protection of the live bivalve molluscs or other shellfish against extremes of heat and cold, contamination with dirt or dust, and damage to the shells from vibration and abrasion;

(c) the live bivalve molluscs or other shellfish must not be transported with other products which might contaminate them.

3. Live bivalve molluscs or other shellfish must be transported and distributed using closed vehicles or containers which maintain the product at a temperature which does not adversely affect their quality and viability.

4. The parcels containing live bivalve molluscs or other shellfish must not be transported in direct contact with the floor of the vehicle or container but must be supported on raised surfaces or by some other means which prevents such contact.

5. Where ice is used in transporting consignments of live bivalve molluscs or other shellfish, it must have been made from potable water or clean sea water.

The Regulations need interpretation in respect of the status of premises used for the intermediate storage or for any repackaging of the product during distribution from the dispatch centre to the retailer, caterer or consumer. It is accepted that such premises (e.g. wholesale markets) need not necessarily be approved establishments, although similar standards of hygiene to those of dispatch centres should apply and the conditions for storage and repackaging must be met. The repackagers must retain the original health mark (label) and relabel the new packages. The decision on whether or not particular premises require to be approved establishments depends upon the totality of the operations carried out. Simple storage of intact packages or small-scale repackaging, alone, may not precipitate approved dispatch centre status.

The requirements concerning the sale of loose, unpackaged and unlabelled molluscs also require clarification. Wholesalers may break down bulk packs for direct sale of loose molluscs to retailers or caterers, provided that the wholesaler retains the health mark. Similarly, retailers may break down packs for sale of loose molluscs to the public, provided that the retailer retains the health mark. Where sale of loose molluscs to the final consumer is direct from the dispatch centre, there is no need for wrapping or health mark.

8.2 Recommendations

8.2.1 General Requirements

The product must be protected from contamination, stress and damage during distribution and storage and must not be exposed to extremes of temperature.

It is recommended that the product is distributed for sale with the minimum of delay and, wherever practicable, is held in the protected environment of a transport vehicle or a storage room in cool, moist conditions.

A mollusc temperature range of 2°C to 5°C is generally recommended for the transport and storage of most species. However, it is recommended that native oysters and live scallops are held at no lower than 4°C (and up to about 10°C) and it is beneficial to ice blue mussels. Any ice used must be made from clean water.

The product must remain packaged and sealed until offered for sale to the retailer, caterer or consumer although it may be repackaged. If repackaged, it must be relabelled.

The packaged product must not be re-immersed or sprayed with water once it has left the dispatch centre. In transport vehicles and storage rooms the packages must be supported on a clean raised surface so that they do not come into contact with the floor.

Other than for small-scale manual operations, the use of mechanical handling equipment is recommended to speed loading and unloading operations and to minimise exposure of the product.

It is particularly important that the finished product is protected from contamination and remains traceable back to source.

The molluscs must remain alive throughout distribution, storage and sale to the consumer. In addition, it is recommended that the molluscs are supplied to the consumer whilst their eating qualities remain desirable, before 'off' flavours develop. Further guidance on product quality is given in Section 3.3.

A pragmatic approach is required to temperature control and product storage life. The temperature conditions recommended are to give the optimum useful product life. Conditions somewhat beyond those recommended, but not extremes, may be acceptable provided that the product itself remains acceptable during its shorter useful life. Further information on the temperature sensitivity and storage lives of the various species of molluscs is given in Appendix II. Further guidance on ice supply and handling is given in Section 12.

The product should not be thrown around or be left lying around in exposed situations during dispatch, reception and other handling operations. Further guidance on mechanical handling aids such as fork lift trucks and pallets is given in Sections 4.2.6 and 4.2.6.2. The guidance given on handling the raw material is equally applicable to the handling of the product. The use of pallets has the further advantage of keeping the product off the ground at all times.

8.2.2 Product Transport Vehicles

Parts of vehicles in which molluscs are held or with which they may come in contact should be designed and constructed to be easily cleaned. They should be constructed of durable, hard wearing materials capable of being cleaned frequently. These parts must have smooth, corrosion resistant surfaces.

The design of these parts should be simple and unadorned, where necessary with smooth linings, to avoid the lodging of debris, the harbouring of vermin and to facilitate cleaning.

These parts must be well drained to avoid the accumulation of pools of water and to facilitate cleaning.

Vehicles must be enclosed and be suitably equipped to provide protection against contamination and to maintain the temperature conditions required.

Fully enclosed vehicles with separate driving cabs are recommended. Insulated, refrigerated vehicles are generally recommended for all but short, local journeys.

However, where the molluscs are held in suitable containers that provide protection from contamination and maintain cool conditions, there may be no need for the vehicle to provide further protection.

Non-absorbent, rot-resistant materials such as GRP or aluminium are recommended for the load compartments of vehicles. GRP linings can be moulded in-situ. Insulation materials should be non-absorbent, such as closed-cell plastic foam.

Separation of the driving cab enables thorough washing down of the load compartment.

It is recommended that load compartments have a roof vent to remove hot air if they are not refrigerated, that they have no windows or translucent panels and that they are finished in a light colour inside to facilitate cleaning and outside to reduce heat absorption. Any vents should be screened and doors should be a good fit.

Further guidance on refrigeration is given in Section 7.2.3 dealing with storage rooms, and this also applies to transport vehicles.

If large vehicles use ice chilling in hot weather and produce significant amounts of waste water, then environmental regulations and local bye-laws may require the fitting of waste water collection tanks to these vehicles. Detailed recommendations for such tanks are given in the Seafish Guidelines for Fish Landing Places.

Facilities are required for washing vehicles and for safe parking when not in use.

8.2.3 Places where the Product is Stored or Repackaged

Any premises used for the storage or repackaging of the product must provide a protected environment. They should consist of an enclosed building, designed and constructed to be easily cleaned and to prevent the entry of vermin. They should be constructed of durable, hard wearing materials capable of being cleaned frequently.

Although such premises may not have to be approved establishments and hence may not be subject to the further requirements of the Regulations concerning purification and dispatch centres, similar standards of hygiene should apply. On a basis of good practice, it is recommended that the practical guidance given in Section 7.2 for the design, construction and equipment of purification and dispatch centres is followed, where relevant, to these storage and repackaging premises. It is also recommended that the Local Food Authority is informed of any repackaging operations.

However, where the molluscs are held in suitable containers that provide protection from contamination and maintain cool conditions, there may be no need for the further protection of a storage room.

It is in the interests of industry to inform the local Food Authority of repackaging operations, to ensure that the correct procedures are being carried out and that there is no requirement for approved dispatch centre status.

In respect of the Guidance given in Section 7.2 on the design and construction of purification and dispatch centres, storage and repackaging premises should be considered as handling only ‘clean product’ and to be directly equivalent to product storage rooms and packaging areas in dispatch centres. Guidance on packaging and labelling materials and their storage is also given in Section 7.2.

9. Heat Processing

Contents

9. Heat Processing

9.1 Legal Requirements

The Food Safety (Live Bivalve Mollusc and Other Shellfish) Regulations 1992 (as amended)

Schedule 3. Conditions for production areas

Part 1. Class A areas

An area from which live bivalve molluscs can be gathered for direct human consumption provided such molluscs satisfy the requirements specified in Schedule 5.

Part 2. Class B Areas

An area from which bivalve molluscs may-
(a) be gathered but only placed on the market for human consumption after treatment in a purification centre or after relaying, or
(b) be used for relaying providing such relaying is followed by purification, or
(c) be heat treated by an approved process in an establishment approved for the purposes of the Food Safety (Fishery Products) Regulations 1992.

Part 3. Class C Areas

An area from which live bivalve molluscs can be gathered but placed on the market for human consumption only after -
(a) a relaying period of at least 2 months, whether or not such relaying is combined with purification, or
(b) intensive purification.
(c) heat treatment by an approved process in an establishment approved for the purposes of the Food Safety (Fishery Products) Regulations 1992.

The Food Safety (Fishery Products) Regulations 1992 (as amended)

Placing processed bivalve molluscs or other shellfish on the market

6.-(1) Subject to paragraphs (2) and (3), no person shall place fishery products which are processed bivalve molluscs or other shellfish on the market for human consumption unless prior to processing there were satisfied in relation to those processed bivalve molluscs or other shellfish those of the requirements set out in regulation 11 of the Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations 1992 to which those products would have been subject if, when they were processed, they had instead been placed on the market as live bivalve molluscs or other shellfish.
(2) For the purpose of paragraph (1), regulation 11 of the Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations 1992 shall apply as if, where reference is made in regulation 11(1)(b) and (4) of those Regulations to transportation to an approved dispatch centre, reference had also been made to transportation to an establishment or factory vessel which has been approved in accordance with
(a) regulation 9;
(b) regulation 8 of the Food Safety (Fishery Products) Regulations (Northern Ireland) 1993;
(c) any law passed by the legislature of any of the Channel Islands or of the Isle of Man which is intended to give effect to the results to be achieved in relation to the approval of establishments on land and factory vessels by the Council Directive, in so far as it applies to those islands;
and the requirements in relation to movement documents or permanent transport authorizations set out in regulation 11(1)(b) and Schedule 2 of the Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations 1992 shall apply as if modified accordingly.

Approval of factory vessels, and establishments

9.-(1) Subject to regulations 24(2) and any derogation no person shall operate any factory vessel or establishment unless it has been approved by the relevant food authority and no such vessel or establishment shall be so approved unless-
(a) the food authority is satisfied that it meets the requirements of these Regulations;

Registration of fishing vessels on which shrimps or molluscs are processed by cooking

12.-(1) A person operating a fishing vessel on board which shrimps or molluscs are, for the purpose of a food business, processed by cooking shall, unless such processing is to be supplemented subsequently by cooking, comply with paragraphs (2) to (4).
(2) The person operating the fishing vessel shall-
(a) prior to engaging for the first time in the business of cooking, notify in writing the food authority for the area in which the fishing vessel is based of his intention to do so, and shall at the same time supply the information specified in paragraph (3); and
(b) subsequently, similarly notify the food authority of any changes to the information originally supplied.

(4) Any cooking on board of either shrimps or molluscs, or both, shall be in accordance with the requirements of point 5 section I of Chapter III of the Annex to, and point 7 of Chapter IV of the Annex to, the Council Directive, as set out in the Schedule of the Food Safety (Fishery Products) (Derogations) Regulations 1992.

The Food Safety (Fisheries Products) (Derogations) Regulations 1992 (as amended)

Schedule

Chapter I. Conditions applicable to factory vessels

Section II. Conditions of hygiene relating to on-board handling and storage of fishery products

5A.-(1) Subject to sub-paragraph (2), any on-board processing (in particular any cooking) of shrimps or molluscs must be undertaken in accordance with such of—

(a) the approved treatment set out in Commission Decision 93/25/EEC approving certain treatments to inhibit the development of pathogenic micro-organisms in bivalve molluscs and marine gastropods; and

(b) the standards and other obligations set out in Commission Decision 93/51/EEC on the microbiological criteria applicable to the production of cooked crustaceans and molluscan shellfish,

as are appropriate in the particular circumstances of the case.

Chapter III. General conditions for establishments on land.

Section I. General conditions relating to premises and equipment.

Establishments shall afford at least the following facilities:
5. instruments working equipment such as cutting tables, containers, conveyor belts and knives made of corrosion-resistant materials, easy to clean and disinfect;

Chapter IV. Special conditions for handling fishery products on shore.

Section IV. Conditions for processed products

2. Where the processing treatment is carried out to inhibit the development of pathogenic micro-organisms, or if it is a significant factor in the preservation of the product, the treatment must be scientifically recognised by the law in force, or in the case of a treatment of products referred to in Chapter I Section 1(b) and (c) of Directive 91/492/EEC(b) which have not been relayed or purified, such treatment must be a form of treatment mentioned in the Annex to Commission Decision 93/24/EEC approving certain treatments to inhibit the development of pathogenic micro-organisms in bivalve molluscs and marine gastropods.

The person responsible for an establishment must keep a register of the processing carried out. Depending on the type of process employed, details such as heating time and temperature, salt content, pH, water content, etc, must be monitored and controlled. Records must be kept at least for the expected storage life of the products and be available to the competent authority.

In addition, the following conditions should be complied with.

4. Canning

In the case of fishery products which have been subjected to sterilization in hermetically sealed containers:

(a) the water used for the preparation of cans must be drinking water;

(b) the process used for the heat treatment must be appropriate, having regard to such major criteria as the heating time, temperature, filling, size of containers etc, a record of which must be kept; the heat treatment must be capable of destroying or inactivating pathogenic organisms and the spread of pathogenic micro-organisms. The heating equipment must be fitted with devices for verifying whether the containers have in fact undergone appropriate heat treatment. Drinking water must be used to cool containers after heat treatment, without prejudice to the presence of any chemical additives used in accordance with good technological practice to prevent corrosion of the equipment and containers;

(c) further checks must be carried out at random by the manufacturer to ensure that the processed products have undergone appropriate heat treatment, viz:
-incubation tests: incubation must be carried out at 37°C for seven days or at 35°C for ten days, or at any other equivalent combination;
- microbiological examination of contents and containers in the establishment's laboratory or in another approved laboratory;

(d) samples must be taken of production each day at predetermined intervals, to ensure the efficacy of sealing. For that purpose, appropriate equipment must be available for the examination of cross-sections of the can-seams;

(e) checks are carried out in order to ensure that containers are not damaged;

(f) all containers which have undergone heat treatment under practically identical conditions must be given a batch identification mark, in accordance with Council Directive 89/396/EEC of 14th June 1989 on indications or marks identifying the lot to which a foodstuff belongs.

7. Cooked crustacean and molluscan shellfish products

Crustaceans and molluscan shellfish must be cooked as follows:-
(a) any cooking must be followed by rapid cooling.
Water used for this purpose must be drinking water or clean seawater. If no other method of preservation is used, cooling must continue until the temperature approaching that of melting ice is reached:
(b) shelling or shucking must be carried out under hygienic conditions avoiding the contamination of the product. Where such operations are done by hand, workers must pay particular attention to the washing of their hands and all working surfaces must be cleaned thoroughly. If machines are used, they must be cleaned at frequent intervals and disinfected after each working day.
After shelling or shucking, cooked products must immediately be frozen or kept chilled at a temperature which will preclude the growth of pathogens, and be stored in appropriate premises:
(c) every manufacturer must carry out microbiological checks at regular intervals, complying with the standards and other obligations set out in Commission Decision 93/51/EEC on the microbiological criteria applicable to the production of cooked crustaceans and molluscan shellfish,

Commission Decision of 11 December 1992 Approving Certain Treatments to Inhibit the Development of Pathogenic Micro-Organisms in Bivalve Molluscs and Marine Gastropods (93/25/EEC)

Article 1

The treatments set out in the Annex to this Decision for inhibiting the development of pathogenic micro-organisms in bivalve molluscs and marine gastropods harvested in the areas referred to in Chapter I (1)(b) and (1)(c) or the Annex to Directive 91/492/EEC and which have not been subjected to relaying or purification before being placed on the market are hereby approved.

Annex

A. Sterilization

Bivalve molluscs and marine gastropods may be subjected to sterilization in hermetically sealed containers which comply with the requirements of Chapter IV (IV) (4) of the Annex to Directive 91/493/EEC.

B. Other heat treatments

Bivalve molluscs and marine gastropods in shell and not frozen may undergo one of the following processes:

1. - immersion in boiling water for the period required to raise the internal temperature of the mollusc flesh to not less than 90°C;
- maintenance of this minimum temperature for a period of not less than 90 seconds;
2. - cooking for three to five minutes in an enclosed space where:
- the temperature is between 120 and 160°C,
- the pressure is between 2 and 4kg/cm^2, followed by shelling and freezing of the flesh to a core temperature of -20°C.

The legislation is rather complex and needs some explanation.

The heat processing of molluscs and their handling after processing is covered by the Fishery Products Regulations. Prior to processing, live molluscs are covered by the Live Molluscs Regulations although the situation regarding fresh (chilled) or frozen molluscs is less clear and is discussed in Section 3.1.3.

Heat processing may be carried out simply because it is required to produce a cooked product from molluscs that are already safe to eat, or it may be heat treatment carried out of necessity in order to make microbiologically contaminated molluscs safe. There are different legal requirements covering these two situations.

'Other shellfish', wild caught scallops, bivalve molluscs from category 'A' areas and bivalve molluscs from category 'B' or 'C' areas that have been appropriately purified or relayed, all of which meet the requirements of the Live Molluscs Regulations for placing on the market for direct human consumption, are subject only to the basic requirements for cooking crustacean and molluscan shellfish given in Section IV of Chapter IV of the Schedule of the Fishery Products (Derogations) Regulations. The Fishery Products Regulations permit this cooking to be carried out in an approved establishment, on an approved factory vessel or on a suitably equipped fishing vessel registered with the local Food Authority. It is assumed that cooked products from registered fishing vessels must subsequently pass through an approved establishment for

wrapping and labelling and for the necessary checks and documentation. If final wrapping and labelling were carried out on a vessel, it would have to be an approved factory vessel. The decision on whether a particular vessel should be either registered or approved depends upon the totality of the operations carried out.

However, the Live Bivalve Mollusc Regulations require that when bivalve molluscs from category 'B' or 'C' areas are subject to heat treatment to make them safe, then the treatment and the place at which it is carried out must be approved under the Fishery Products Regulations. The approved treatment is that specified in Commission Decision 93/25/EEC and is either canning or a controlled heat treatment process. Places approved under the Fishery Products Regulations are approved establishments and approved factory vessels only.

Following either basic cooking or the approved heat treatment, the products must meet the microbiological standards specified in Commission Decision 93/51/EEC. This microbiological specification is given in Appendix III of these Guidelines.

It is technically permissible for the cooking of molluscs from any classified harvesting area to be carried out on an unregistered fishing vessel and for that cooking not to be subject to the requirements of the Schedule to the Derogations Regulations and the Commission Decisions, provided that subsequently the product is subjected to further cooking. It is assumed that the further cooking would have to be in accordance with the requirements of the Regulations.

The exemptions discussed in Sections 3.1.2 and 3.1.3 for fishermen harvesting only small quantities from Category 'A' areas and trading all their catch locally within the UK, also apply.

9.2 Recommendations

Prior to heat processing, live bivalve molluscs must be dealt with in accordance with the Live Bivalve Molluscs Regulations.

For the harvesting and handling of the raw material and for its transport to the processing establishment, the guidance is given in Section 4. of these Guidelines should be followed.

For the storage and handling of the raw material at the processing establishment, the guidance given in Section 7. for these activities at purification or dispatch centres should be followed.
The raw material should be washed and sorted prior to cooking. The washing water must not transfer any additional contamination to the molluscs.

During and after heat processing, molluscs must be dealt with in accordance with the Fishery Products Regulations.

The cooking of live bivalve molluscs that, prior to cooking, already satisfy the requirements of the Live Bivalve Mollusc Regulations for placing on the market for direct human consumption, may be carried out on a fishing vessel that meets the requirements of the Fishery Products Regulations and which has been registered with the local Food Authority or it may be carried out on a factory vessel or in an establishment that meets the further requirements of the Fishery Products Regulations and which has been approved by the local Food Authority. Cooked products from a registered fishing vessel must subsequently pass through an approved establishment.

For these basic cooking operations:

- **cooking must be followed by rapid cooling**
- **any water used for cooling must be clean**
- **equipment used must be made of corrosion resistant materials that are easy to clean and disinfect**
- **particular care must be taken in post-cooking handling operations such as shucking to**

avoid contamination of the product

- **the product must be chilled to a temperature approaching that of melting ice or be frozen and must be stored in a protected environment.**

Although initial cooking on vessels, when followed by further cooking, and the operations of fishermen harvesting only small quantities from category 'A' areas and trading all their catch locally within the UK are exempt from particular requirements of the Regulations, on a basis of good practice it is recommended that all cooking is done in accordance with the guidance given for basic cooking operations.

The approved heat treatment required to make safe any molluscs from category 'B' or 'C' areas, which have not been subjected to purification or relaying, may be carried out only on an approved factory vessel or in an approved establishment.

Further to the requirements for basic cooking operations, this approved heat treatment may be:

- **sterilisation in a canning process meeting the further requirements of the Fishery Products Regulations**

- **or immersion of unfrozen molluscs in boiling water for the period required to raise the internal temperature of the mollusc flesh to 90°C or more and to maintain that temperature for not less than 90 seconds**

- **or pressure cooking of unfrozen molluscs at a pressure of 2-5 kg/cm^2 and a temperature of 120-160°C for 3-5 minutes followed by shucking and freezing to a core temperature of -20°C.**

The approved heat treatment must be controlled and effective. To achieve this for the commonly used boiling treatment, it is recommended that:

- **a continuous cooker is used**

the raw material is fed mechanically into the cooker by a mechanism that provides an even rate of flow

- **the molluscs are conveyed mechanically at a set rate through the cooker to provide a known period of immersion in a bath of heated water**

- **a water temperature indicator and recorder are provided and that the indicator is interconnected with the feed and conveying mechanisms to stop them if the water temperature drops below a preset level**

- **the cooker is tested and preset before use to ensure that the required mollusc meat temperature and dwell time are achieved.**

Processing establishments and factory vessels must have their own suitable laboratory facilities for carrying out the prescribed microbiological testing or alternatively have access to the services of a suitable laboratory that is recognised by the local Food Authority. Registered fishing vessels must also meet these requirements unless the necessary testing is subsequently carried out when the product passes through an establishment.

Any cooking should be a controlled process in order to ensure product quality. Where approved heat treatment of raw material subject to contamination is required to ensure product safety, then that control is essential. Any frozen raw material must be thoroughly thawed prior to cooking. Further critical areas for the handling of all cooked, ready to eat products are the cleanliness of any water used in post-cook cooling and handling operations, the minimising of handling and potential re-contamination of the cooked product and the chilling and the protection of the product. Cooking molluscs more than once is not recommended as this is likely to result in overcooking with consequent loss in the eating quality of the product.

The hygiene standards required for factory vessels and establishments approved under the Fishery Products Regulations are somewhat higher than those for fishing vessels registered under those Regulations and for purification and dispatch centres approved under the Mollusc Regulations. It is particularly important to maintain high standards of hygiene in cooked product handling and storage areas.

For basic cooking operations on vessels, the general guidance given in the Seafish document 'Basic Guidance on Good Hygiene Practice for the Inshore Shrimp Industry' is recommended. The general hygiene problems and the legal requirements associated with cooking and handling shrimp at sea are similar to those for cooking molluscs, although more post-cook handling may be involved if the molluscs are shucked. Treatment of the seawater used on these vessels is recommended to ensure that it is clean. Chlorination is a suitable treatment for this application. The product should be containerised and must be chilled to protect it from contamination and to prevent bacterial growth.
In general, continous cookers are recommended in preference to batch cookers as they provide greater control over the cooking process without necessitating an over-long cook, although it is accepted that the use of batch cookers may be inevitable in small-scale operations. For batch cooking, it is important that the batch quantity and the cooking time are controlled. Continuous cookers have the further advantage that they provide a convenient means of separating the raw material handling area from the cooked product area, for example the cooker can pass through a wall between the two areas. They are also available as part of a purpose designed mechanised washing, sorting, cooking and shucking line which minimises the risk of contamination during transfer between process stages.

Continuous cookers satisfying the recommendations for the approved boiling treatment are commercially available. For batch boilers to provide equivalent safeguards for approved boiling treatment, there must be similar control over batch quantity, cooking temperature and time (for example with a temperature/time interlock on the access door opening mechanism). However, in order to ensure that the heat penetrates all the molluscs in the batch, it is usually necessary to set a relatively long cooking time which may result in overcooking some of the molluscs.

Further guidance on laboratory facilities is given in Section 7.2.11 dealing with purification and dispatch centres, although the microbiological sampling, analysis and standards are different for cooked products.

10. Waste Storage and Disposal

Contents

10. Waste Storage and Disposal

10.1 Legal Requirements

The Food Safety (Live Bivalve Molluscs) (Derogations) Regulations 1992 (as amended)

Schedule

Conditions for the approval of dispatch or purification centres

Section II. General hygiene requirements

6. waste products must be stored hygienically in a separate area and, where appropriate, in covered containers suitable for the purpose intended. Waste material must be removed from the vicinity of the establishment at appropriate intervals;

In addition, there is extensive legislation dealing with the environmental and health aspects of the disposal of waste in general. The relevant features of this general legislation are summarised below.

The Environmental Protection Act 1990 prohibits the keeping, treatment or disposal of waste on land unless a waste management licence has been granted for the purpose. It also places a duty of care onto businesses to dispose of waste correctly via an authorised waste transport operator or by taking it directly to an authorised place of disposal. There are documentation requirements associated with this. However, The Waste Management Licensing Regulations 1994 permit a number of unlicensed exemptions for waste disposal. Exemptions could possibly include the spreading of shell on agricultural land or the use of shell for land reclamation or improvement. This unlicensed disposal must be registered.

The Animal By-Products Order 1992 requires that specified forms of animal waste are disposed of by processing in approved premises, incineration or deep burial. Again, there are transportation and documentation requirements associated with this. However, as the list of materials covered specifically includes fish but not shellfish, it is considered that the Order does not apply to molluscs (fish are usually defined as being vertebrates whereas shellfish are invertebrates). In addition, material such as shell is considered unlikely to be covered by the Order.

The Food and Environment Protection Act 1985 prohibits the depositing of substances or articles in the sea unless a licence to do so has been granted. However, The Deposits in the Sea (Exemptions) Order 1985 permits a number of unlicensed exemptions for waste disposal from vessels or marine structures. These exemptions include:

- sewage disposal
- garbage (domestic waste) disposal (although this is limited by further legislation)
- the return of fish or shellfish and other materials taken from the sea in the course of fishing or processing operations
- the return of materials dredged from the sea in relation to the propagation or cultivation of fish or shellfish;

provided that this is done by those directly concerned and at the place of production or recovery of the waste and that it does not harm the environment. Any unlicensed deposit must be registered, although the usual registration of fishing boats for fishing purposes is considered adequate for their normal operations. The Order also permits the deposit of substances or articles in the sea for the purpose of propagation or cultivation of fish or shellfish and this could possibly include the deposit of shell for spat settlement.

Sea Fisheries Committee or other bye-laws may establish local rules governing the return of waste or other deposit in the sea.

The Merchant Shipping (Prevention of Pollution by Garbage) Regulations 1988 prevent the disposal in the sea, from vessels or from fixed platforms, of plastics or, in inshore areas, of garbage, except in specially designated areas. The Merchant Shipping (Reception Facilities For Garbage) Regulations 1988 require that persons responsible for the management of landing places provide adequate reception facilities for garbage from vessels.

The Water Resources Act 1991 requires a consent to be given for any discharge of effluent into controlled areas of the sea (including coastal waters) or to any inland or ground waters. Further legislation requires consent to be given for any discharge of effluent to a public sewer.

The Fish Health Regulations 1992 prevent the deposit in healthy areas of molluscs from areas known to be subject to disease. In addition, the immersion of these molluscs in installations ashore, such as purification systems, is permitted in healthy areas only if the installation is approved for that purpose and the waste water is discharged sufficiently far away from the marine environment or is effectively disinfected.

Matters concerning the disposal of waste on land are dealt with by the Local Authorities. Environmental matters concerning the disposal of waste at sea are dealt with by MAFF in England and Wales, SOAEFD in Scotland and DoE in Northern Ireland. Matters concerning merchant shipping are dealt with by the Marine Safety Agency. Matters concerning the discharge of effluent to controlled waters are dealt with by the Environment Agency in England and Wales, the Scottish Environmental Protection Agency in Scotland and DoE in Northern Ireland. Matters concerning the discharge of effluent to public sewers are dealt with by the Water Companies in England and Wales, the Public Water Authorities in Scotland and DoE in Northern Ireland. Matters concerning animal health are dealt with by Ministry Departments.

10.2 Recommendations

10.2.1 Solid Waste

Waste materials from harvesting operations may be returned directly to the sea from harvesting units during normal harvesting, handling or processing operations.

Garbage produced at sea must be landed for disposal ashore.
Any deposit of waste or other materials in the sea must also comply with any local bye-laws and with fish health regulations.

At landing places, adequate facilities must be provided to store and dispose of garbage from vessels.

At all places ashore where molluscs are handled, adequate facilities must be provided to hygienically store and dispose of any mollusc waste or garbage produced.

Waste storage facilities must provide protection against leakage, vermin and the weather and be easy to clean.

To avoid any possibility of cross-contamination, stored waste must be kept separate from molluscs intended for human consumption and from associated facilities, equipment and materials. Waste must not be allowed to accumulate or deteriorate such that it becomes an attraction to vermin or a risk to health.

It is recommended that there is a clearly designated area for the storage of waste, that area meeting the hygiene requirements and with easy access. The area should be hard surfaced and well drained.

It is recommended that waste is held in clearly marked containers used only for that purpose and that separate containers are used for general garbage and for mollusc waste.

The use of robust, re-usable containers is recommended and is often required by the authorised transport or licensed waste disposal agency. The containers must be leak-proof and it is recommended that they have secure, close-fitting lids. They should be constructed of durable, non-absorbent and corrosion resistant materials and be easy to clean.

Where practicable, it is recommended that waste is disposed of on a daily basis, particularly where volumes are large.

Where volumes are large or if waste is not disposed of daily, it is recommended that separate waste storage facilities are provided, outside of buildings used for mollusc handling or storage.

It is recommended that the advice of the Local Authority is sought on permissible local means of disposing of waste. This may be direct to a licensed disposal place or via an authorised waste transport operator or possibly by acceptable unlicensed but registered means of disposal.

Vehicles used for the transport of waste must be easy to clean. These vehicles, or the containers in which the waste is held during transport, must be leak-proof and covered. It is recommended that waste transport vehicles are not used for other purposes associated with foodstuffs unless the waste is held in well sealed containers and the vehicle is thoroughly cleaned and disinfected after carrying waste.

Care should be taken to avoid the littering of harvesting areas, particularly around fixed rafts or platforms.

Robust plastic bins are suitable for waste storage. Galvanised steel is adequate for larger containers, provided that it remains in good condition. Many waste transport and disposal agencies provide their own specialist containers compatible with their mechanical handling arrangements. Plastic bags may be used for the storage of garbage within bins but should not be used alone.

The storage of small quantities of waste in bins for short periods of time within mollusc handling areas is considered acceptable. It is recommended that outside storage facilities are protected by a roof but they must remain well ventilated and need not be fully enclosed if the waste is held in lidded bins. Placing bins on a permanent platform raised about 0.5 metres above the ground helps deter vermin. The use of large, covered skips may provide similar protection from the elements and vermin.

Processing establishments producing large quantities of shell may find it advantageous to seek alternatives to licensed waste disposal for this relatively inactive, rock-like material. Shell can be used for making paths and roadways on agricultural land and at other places and for the production of 'chicken grit'. It can also be deposited at sea to encourage spat settlement. However, for such disposal ashore, care must be taken to ensure that there is no nuisance caused by any residual organic material or liquor.

10.2.2 Liquid and Sewage Waste

Waste water may be discharged directly to the sea from harvesting units during harvesting, handling or processing operations.

Sewage waste produced on harvesting units may be discharged at sea but it is strongly recommended that this is not done over production areas, particularly from fixed rafts or platforms.

From sites ashore, waste water may be discharged to local waters or to a public sewer, provided that consent has been given.

However, any requirements of the fish health regulations must be complied with and any harmful chemicals such as oil may not be discharged and must be disposed of separately by licensed means.

For discharge to local waters, a consent to discharge must be obtained from the Environmental Agency or the equivalent body. That consent may or may not be granted and is likely to be conditional.

For connection to a public sewer, consent must be obtained from the appropriate Water Company or equivalent body. That consent is likely to be conditional and will have charges associated.

Care must be taken to avoid the contamination of harvesting areas by the discharge of sewage or other waste, particularly around fixed rafts or platforms. It is recommended that the use of potentially harmful chemicals on these fixed rafts or platforms is minimised and that waste collection facilities are provided.

Waste water discharged ashore can include sewage effluent and normal levels of cleaning chemicals and detritus, etc.

The re-immersion of susceptible molluscs from a diseased area in an installation ashore in a location close to the coast of a healthy area is not likely to be permitted. It may be permitted further inland but disinfection of the waste water may be required before discharge.

In practice, consent may be given for small-scale discharges to local waters, depending upon the nature of the waters, but consent to large-scale discharges and particularly of sewage effluent is less likely.

For either direct discharge or connection to a sewer, a likely condition is that drains are fitted with screens to prevent the passage of shell, etc. The provision of removable interceptor baskets is recommended.

11. Toilet, Washing and Cloakroom Facilities for Personnel

Contents

11. Toilet, Washing and Cloakroom Facilities for Personnel

11.1 Legal Requirements

The Food Safety (Live Bivalve Molluscs) (Derogations) Regulations 1992 (as amended)

Schedule

Conditions for the approval of dispatch or purification centres

Section I. General conditions relating to premises and equipment.

Centres must have at least:
2 .Access to an appropriate number of changing rooms, wash basins and lavatories; there must be a sufficient number of wash basins close to the lavatories;

Section II. General hygiene requirements

A high degree of cleanliness and hygiene must be required of staff, premises, equipment and working conditions:
1. staff who treat or handle live bivalve molluscs must in particular wear clean working clothes and, where appropriate, gloves which are suitable for the work in which the person is engaged;

There are no further requirements concerning these facilities in the Mollusc Regulations, although many of the places where live molluscs are handled will also be involved in the handling of fishery products or other foods and will be subject to the more extensive requirements relating to those foods. These places will include mollusc processing establishments, wholesale markets and places where retailing or catering is carried out. The more extensive requirements concerning other foods can include hot and cold running water, hand cleaning materials and drying facilities, toilets not opening directly into food rooms and adequate ventilation. The use of hand operated taps is not prohibited by the Mollusc Regulations.

In addition, health and safety legislation requires the provision of suitable sanitary, washing and clothing facilities at workplaces. Building regulations can require the provision of sanitary facilities and specify further detail for their installation.

EC Directive 93/103/EC covering health and safety on fishing vessels, which is to be enacted in the UK by Regulations under the Merchant Shipping Act 1995, establishes requirements for facilities on fishing vessels which have living quarters and which are larger than specified lengths between perpendiculars. New vessels of 15 metres or longer ordered (or the construction of which was started) after 23rd November 1995 must have shower facilities with hot and cold running water, wash-basins, toilets and somewhere to keep clothes. These facilities must be properly equipped and installed and the respective areas must be properly ventilated. Existing vessels of 18 metres or longer will require, by 23rd November 2002, toilets, wash-basins and, if possible, a shower and the respective areas must be properly ventilated. Modifications to existing vessels will have to comply with the new vessel standards. These matters concerning vessels are dealt with by the Marine Safety Agency which is to produce a Code of Practice giving further guidance.

The Workplace (Health, Safety and Welfare) Regulations 1992 and the associated 'Approved Code of Practice' establish requirements for facilities at places of work. However, these Regulations do not apply to ships, which are defined in the Docks Regulations 1988 and which include fishing vessels, or to transport vehicles or to domestic premises. It is considered, however, that they do apply, as appropriate, to rafts used in aquaculture and to similar moored or fixed structures. These Regulations require the provision of:

- suitable and sufficient sanitary conveniences at readily accessible places
- suitable and sufficient washing facilities at readily accessible places, including showers if necessary
- suitable and sufficient accommodation for clothing not worn during work and for any special clothing to be worn at work and not taken home
- suitable and sufficient facilities for changing into that special clothing.

There are further detailed stipulations concerning the ventilation, lighting and cleanliness of sanitary conveniences and of washing facilities, the provision of washing facilities close to sanitary conveniences and to changing rooms, supplies of hot and cold water, cleaning and drying materials, the protection of stored clothing, clothing drying facilities and separate facilities for men and women where necessary. However, at remote or temporary workplaces the relevant requirements apply 'so far is reasonably practicable' and at remote workplaces, the requirements for accommodation for clothing and for facilities for changing do not apply. These matters concerning workplaces are dealt with by the Health and Safety Executive. The Health and Safety Commission's 'Approved Code of Practice' gives practical guidance on meeting the requirements. This guidance includes interpretation of the legal requirements, the numbers of facilities required and their location, accessibility and equipment. Remote workplaces are considered to be places such as fields. Temporary workplaces are considered to include those only used infrequently or for short periods. Inevitably the classification of these workplaces and the consideration of practicability are open to further interpretation.

11.2 Recommendations

It is important to maintain standards of personal hygiene.

Although not necessarily required by law, it is recommended that access to basic toilet and hand washing facilities is provided for all harvesting units unless those units are occupied for only short periods at a time and that provision is impracticable.

Fishing vessels must comply with the relevant health and safety legislation. New vessels, ordered or constructed after 23rd November 1995, with living quarters and which are 15 metres or longer between perpendiculars, must have shower facilities with hot and cold running water, wash-basins, toilets and somewhere to keep clothes. These facilities must be properly equipped and installed and the respective areas must be properly ventilated. From 23rd November 2002, all vessels with living quarters and which are 18 metres or longer between perpendiculars, must at least have toilets and wash-basins and, if possible, have a shower. The respective areas must be adequately ventilated. Modifications to existing vessels must comply to the new vessel standards. It is

recommended that the Marine Safety Agencies' Code of Practice on these matters is followed.

Workplaces ashore and rafts, etc, must comply with the relevant requirements of The Workplace (Health, Safety and Welfare) Regulations 1992. These requirements include the provision of toilet, washing, clothes storage and, as necessary, changing facilities. It is recommended that the Health and Safety Commission's Approved Code of Practice is followed in respect of both the provision and the equipment of these facilities.

The relevant Health and Safety requirements for workplaces and the associated guidance include:

- **suitable and sufficient toilets and washing facilities must be provided, at readily accessible places**
- **toilet and washing facilities must be adequately ventilated and lit and be clean and tidy**
- **hand wash basins must be provided close to toilets and to any changing rooms**
- **washing facilities must include supplies of hot and cold water, soap and drying facilities and, if necessary, showers**
- **suitable and sufficient facilities must be provided for clothes storage**
- **clothes storage facilities must be in a suitable place. If practicable, clothes drying facilities must be provided**
- **suitable and sufficient changing facilities must be provided if there is a need to change clothes and there is no other suitable room for changing**
- **separate facilities must be provided, as necessary, for men and women**
- **toilet and washing facilities should, if possible, be on the premises. The use of public facilities is considered acceptable only as a last resort**
- **the surfaces of walls and floors in rooms containing toilets or washing facilities should be suitable for wet cleaning**
- **showers should be provided if the work is particularly strenuous or is dirty**
- **clothes should hang in a warm, dry, well-ventilated place**
- **separate storage should be provided for work clothes if they become wet or dirty**
- **individual lockers should be suitable as secure clothes storage**

changing rooms should be provided if it is necessary to remove more than outer clothing.

At remote workplaces the particular Health and Safety requirements concerning clothes storage and changing facilities do not apply and at either remote or temporary workplaces, all the relevant requirements apply only as practicable. However, the Mollusc Regulations require that at all purification and dispatch centres there is access to adequate toilets, wash basins and changing rooms, with wash basins close to toilets.

Although not required by law in premises handling only live bivalve molluscs and not other foods, it is recommended that toilets do not open directly into rooms in which molluscs are handled.

Access to basic toilet and hand washing facilities at all places where molluscs are handled and which are occupied for more than short periods at a time, is considered essential for maintaining personal hygiene. On rafts and similar offshore structures this may be provided on the supply vessel. In out of the way places ashore, with limited services, or at little used places, the provision of mobile facilities may be adequate. The provision of only cold water for washing may be considered adequate for these places. Access to shared facilities may be adequate and at little used places, access to public facilities may be considered adequate.

There is some risk of cross-contamination when using public facilities and, in practice, it is difficult to maintain public facilities in an adequate state of cleanliness and repair and to be fully equipped and readily accessible at all times.

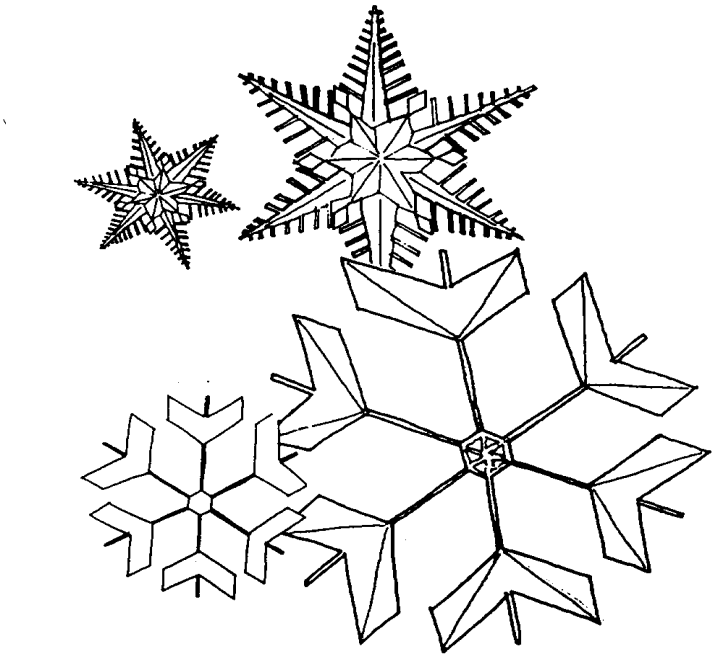
The provision of changing facilities is recommended for personnel involved in wet handling operations and whose clothes are likely to become wet and dirty. The provision of shower facilities may be considered appropriate if particularly wet or mucky work is carried out.

All the facilities should be under cover and be designed and constructed to be easy to clean. The general guidance on design and construction given in Section 7.2 for purification and dispatch centres is recommended, although in comparison to mollusc handling areas less robust surface finishes are normally adequate and the rooms containing the facilities need not be designed for continuous drainage.

Disposable towels or automatic roller feed towels are recommended for hand drying, in preference to ordinary towels which must be changed and laundered frequently and to hot air driers which are not as effective.

12. Ice Supply and Handling

Contents



12. Ice Supply and Handling

12.1 Legal Requirements

The Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations 1992

Schedule 7

Part 2 - Transport from the dispatch centre

5. Where ice is used in transporting consignments of live bivalve molluscs or other shellfish, it must have been made from potable water or clean seawater.

This is the only specific requirement relating to ice in the Mollusc Regulations, although the general requirements in the Regulations for hygienic handling and to avoid contamination of the molluscs could be construed as precluding any use of ice produced from contaminated water or which has become contaminated after its production.

If ice is used also for fishery products or other foods, it is subject to the more extensive legal requirements for these foods including the specific requirements that ice is produced, handled and stored under conditions which prevent its contamination.

12.2 Recommendations

If ice is used, it must be made from clean water and should be made, stored, transported and handled in hygienic conditions to avoid its contamination.

The use of freshwater ice made from public mains supplied potable water is generally recommended.

The hygienic design and construction of any ice manufacturing, storage, transport and handling facilities and equipment, should comply with the general recommendations given for facilities and equipment for molluscs. Ice should be transported and stored under cover, preferably in insulated conditions. It is recommended that containers for ice are clearly identified and have drain holes. Suitable insulated and lidded plastic bins are readily available.

Freshwater ice is usually easier to produce, store and use than seawater ice. Public mains supplied water should be clean. Seawater ice may also cause partial freezing of the molluscs.

APPENDIX I

Organisations that Contributed to the Guidelines

Association of Scottish Shellfish Growers

The Chartered Institute of Environmental Health

Cuan Sea Fisheries Limited

The Department of Environment (Northern Ireland)

The Department of Health

The Department of Health and Social Services (Northern Ireland)

The Environmental Health Department of Kings Lynn and West Norfolk Borough Council

Local Authorities Co-ordinating Body on Food and Trading Standards

Lynn of Lorne Oysters and Rubha Mor Oysters Limited

The Ministry of Agriculture, Fisheries and Food

Myti Mussels Limited

Offshore Farms Limited

The Royal Environmental Health Institute of Scotland

River Exe Shellfish Farms Limited

Seaharvest Limited

The Scottish Office Agriculture Environment and Fisheries Department

The Shellfish Association of Great Britain

Thameside Shellfish Limited

APPENDIX II

Summary of the Characteristics and Handling Requirements of the Major Species of Bivalve Molluscs Traded in the UK

The information is tabulated on the pages that follow. For each species of mollusc, the common names and the names permitted under the Food Labelling Regulations 1996 are given, together with a brief summary of their characteristics. Further data is given on storage life and sensitivity to physical damage and on purification requirements.

The characteristics summarised include suitability for trade as a live product, general handling sensitivity and seasonality. The data on storage life, which includes seasonal and temperature effects, and on sensitivity to physical damage, comes from Seafish trials work.

The useful storage life of live bivalve molluscs out of water is highly variable and depends on a number of factors, including their intrinsic condition and the temperatures and physical shocks to which they have been subjected from harvesting onwards. In addition, the useful life is shorter than that to the apparent death of the molluscs as 'off' flavours develop prior to death. The data given is indicative of the magnitude of these effects in a range of situations, rather than being an absolute statement of storage life. Similarly, the data on sensitivity to physical damage is indicative of sensitivity in particular situations.

It should also be noted that data is not yet available on some of the less common species, is somewhat limited for some other species and that the purification conditions are not yet specified for all species. Further detail on purification conditions is given in Section 5 of the Guidelines.

Bivalve Mollusc Species, Names and General Characteristics

Species	Common Names	Permitted Names	Summary of Characteristics
Mytilus edulis	Mussel, blue mussel	Mussel	Suitable for live storage and purification when not in spawning season or recovering. Quite robust but still sensitive to physical shock and high temperatures. Can be directly iced for best storage life. Frost hardy when grown intertidally. Spawns variably in the period April-September.
Mytilus galloprovincialis	Mussel, mediterranean blue mussel	Mussel	Grows with blue mussel in warmer UK waters. Characteristics thought to be similar to the blue mussel.
Ostrea edulis	Oyster, native oyster, flat oyster	Oyster, native oyster	Suitable for live storage and purification when not in spawning season or recovering. Quite robust but still sensitive to physical shock. Not frost hardy. Traditionally seasonal in availability. Spawns variably in the period May-September. Are subject to closed season when spawning.
Crassostrea gigas	Oyster, pacific oyster, gigas	Oyster, Pacific oyster	Suitable for live storage and purification all year round. Quite robust but with fragile lip and still sensitive to physical shock and high temperatures. Frost hardy when intertidally grown. Seasonally weak in warm summer months. Difficult to clean.
Mercenaria mercenaria	Hard shell clam	Clam, Hard shell clam	Suitable for live storage and purification all year round if carefully handled. Very fragile, also sensitive to high temperatures. Spawns only in warm conditions, in the summer months.
Tapes philippinarum (Tapes semidecussatus)	Manila clam	Not specified	Suitable for live storage and purification all year round if carefully handled. Very fragile, also sensitive to high temperatures. Seasonally weak in warm summer months.
Tapes descussatus	Native clam, carpet shell clam, palourde	Not specified	Thought to be similar to manila clam but does successfully spawn in the summer months.
Cerastoderma spp	Cockle	Cockle	Harvested all year round for cooked product. Can be suitable for live storage and purification when not in spawning season or recovering if carefully handled and with only short delay (6 hrs maximum recommended) before purification. Fragile and sensitive to frost damage and high temperatures. Spawns variably in the period April-September. Become exhausted and die if left immersed in tanks
Pecten maximus	Scallop, king scallop	Scallop	Harvested all year round for fresh fishery product. Keeps well when directly iced as fishery product. Not considered suitable for live storage out of water and for purification through lack of shell seal and because of mobility when immersed. Can be degritted if reimmersed with only a short delay after harvesting (12 hrs maximum recommended).
Chlamys opercularis	Queen scallop, queenie, queen	Scallop, queen scallop, queen	Similar to king scallop.
Ensis spp	Razor shell, spout	Clam, razor clam	Little data available, thought to be similar to king scallop. Best kept tightly banded.

SUMMARY OF RESULTS FROM SEAFISH INVESTIGATIONS OF LIVE HANDLING AND STORAGE					
Storage Life out of Water, under various conditions					
Species	**Harvesting and handling conditions prior to controlled storage**	**Controlled storage temperature**	**Period of controlled storage to mortality of 10% of molluscs**		**Useful proportion of storage period to 10% mortality before "off" flavours develop**
			Sample in seasonally weak condition	**Sample in seasonally strong condition**	
Mytilus edulis	Hand picked and 1 day at ambient before commencement of controlled storage	Directly iced	12 days	23 days	
		2-5°C	10 days	20 days	
		15°C	3 days	7 days	
	Dredged and riddled and 1 day at ambient before commencement of controlled storage	Iced	7 days	19 days	
		2-5°C	5 days	13 days	
		15°C	1 day	No Data	30-50%
Mytilus galloprovincialis	No trials data, thought to be similar to the blue mussel.				
Ostrea edulis	Dredged and purified then 1 day at ambient before commencement of controlled storage	Directly iced	7 days	12 days	
		2-5°C	5 days	18 days	
		15°C	9 days	14 days	20-40%
Crassostrea gigas	Dredged or hand picked then 1 day at ambient before commencement of controlled storage. NB: there was little difference between dredged and hand picked samples.	Directly iced	7 days	23 days	
		2-5°C	15 days	28 days	
		15°C	6 days	14 days	30-40%
Mercenaria mercenaria	Dredged and purified then 1 day at ambient before commencement of controlled storage	Directly iced	5 days	31 days	
		2-5°C	20 days	28 days	
		15°C	8 days	12 days	35-60%
Tapes philippinarum (Tapes semidecussatus)	Water lift and purified then 1 day at ambient before commencement of controlled storage	Directly iced	5 days	14 days	
		2-5°C	12 days	16 days	
		15°C	5 days	6 days	50-60%
Tapes descussatus	No Trials Data				
Cerastoderma spp.	Hand picked and 1 day at ambient before commencement of controlled storage	Directly iced	13 days	16 days	45-60%
		2-5°C	11 days	20 days	
		15°C	8 days	9 days	
Pecten maximus	Not Applicable				
Chlamys opercularis	Not Applicable				
Ensis spp.	Not Applicable				

SUMMARY OF RESULTS FROM SEAFISH INVESTIGATIONS OF LIVE HANDLING AND STORAGE

Sensitivity to Physical Shock

Species	25 kg bag of molluscs dropped 1 m onto concrete		Individual molluscs dropped 1 m onto concrete	
	Proportion of molluscs terminally damaged	Reduction in storage period of remainder to 10% mortality	Proportion of molluscs terminally damaged	Reduction in storage period of remainder to 10% mortality
Mytilus edulis	0%	4-41%	15%	10-40%
Mytilus galloprovincialis	No trials Data, thought to be similar to the blue mussel.			
Ostrea edulis	0%	30-77%	15%	25-66%
Crassostrea gigas	0%	10-36%	0%	25-30%
Mercenaria mercenaria	24%	50-66%	100%	none remaining
Tapes philippinarum (Tapes semidecussatus)	20%	33-40%	100%	none remaining
Tapes descussatus	No trials data			
Cerastoderma spp.	8%	38-50%	60%	30-40%
Pecten maximus	Not Applicable			
Chlamys opercularis	Not Applicable			
Ensis spp.	Not Applicable			

PURIFICATION REQUIREMENTS

Species	Water Temperature		Minimum salinity required by MAFF	Maximum layer/depth loading permitted by MAFF
	Minimum required by MAFF	Maximum recommended		
Mytilus edulis	5°C	15°C	19‰	80 mm depth in most systems (nominal 50 kg/m^2). 350 mm depth in deep bulk systems
Mytilus galloprovincialis	Assumed to be similar to the blue mussel			
Ostrea edulis	5°C	15°C	25‰	Single overlapping layer (nominally up to 530 animals/m^2)
Crassostrea gigas	8°C	18°C	20.5‰	Double layer (nominally up to 530 animals/m^2)
Mercenaria mercenaria	12°C	20°C	20.5‰	80 mm depth (Nominal 70 kg/m^2)
Tapes philippinarum (Tapes semidecussatus)	No requirements specified by MAFF but Seafish work suggests a minimum water temperature requirements of 5°C			
Tapes descussatus	No requirements specified by MAFF but Seafish work suggests a minimum water temperature requirements of 12°C			
Cerastoderma spp.	7°C	16°C	20‰	80 mm depth (Nominal 50 kg/m^2)
Pecten maximus	Not Applicable			

PURIFICATION REQUIREMENTS				
Species	Water Temperature		Minimum salinity required by MAFF	Maximum layer/depth loading permitted by MAFF
	Minimum required by MAFF	Maximum recommended		
Chlamys opercularis	Not Applicable			
Ensis spp.	Not Applicable			

Note: For the degritting of *Pecten maximus*, a full seawater salinity and a water temperature range of 10 - 18°C are recommended.

APPENDIX III

Relevant Legal Specifications for Production Areas and Products

The Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations 1992 (as amended)

Schedule 3. Conditions For Production Areas

Part 1. Class 'A' Areas

An area from which live bivalve molluscs can be gathered for direct human consumption provided such molluscs satisfy the requirements specified in Schedule 5.

Part 2. Class 'B' Areas

An area from which live bivalve mollucs may-
(a) be gathered but only placed on the market for human consumption after treatment in a purification centre or after relaying, or
(b) be used for relaying providing such relaying is followed by purification, or
(c) be heat treated by an approved process in an establishment approved for the purposes of the Food Safety (Fishery Products) Regulations 1992.

Conditions in relation to a class 'B' area

1. Prior to relaying or treatment in a purification centre or heat treatment, live bivalve molluscs from these areas must not exceed in 90% of samples the limits of either-
(a) a five-tube, three-dilution MPN-test of 6000 faecal coliforms per 100 grammes of flesh, or
(b) 4,600 E.Coli per 100 grammes of flesh.
2. After relaying or purification such molluscs must satisfy the requirements specified in Schedule 5.

Part 3. Class 'C' areas

An area from which live bivalve molluscs can be gathered but placed on the market for human consumption only after-
(a) a relaying period of a least 2 months, whether or not such relaying is combined with purification, or
(b) intensive purification.
(c) heat treatment by an approved process in an establishment approved for the purposes of the Food Safety (Fishery Products) Regulations 1992.

Conditions in relation to a class 'C' area.

1. Such molluscs must not, prior to relaying and any periods of purification or heat treatment, exceed the limits of a five-tube, three-dilution MPN-test of 60,000 faecal coliforms per 100 grammes of flesh.
2. For the purpose of this Schedule "intensive purification" means purification at an approved purification centre for a period and in accordance with such operating conditions as may have been previously approved by the Ministers.
3. Such molluscs must, after relaying and any period of purification, satisfy the requirements specified in Schedule 5.

Part 4. Relaying Areas

An area of either Class A or Class B areas from which live bivalve molluscs can be gathered.

Schedule 5. Requirements Concerning Live Bivalve Molluscs and Other Shellfish.

Live bivalve molluscs and other shellfish intended for immediate human consumption must comply with the following requirements:

1. The possession of visual characteristics associated with freshness and viability, including shells free of dirt, an adequate response to percussion, and normal amounts of intravalvular liquid.

2. They must contain less than 300 faecal coliforms or less than 230 E.Coli per 100g of mollusc flesh and intravalvular liquid based on a five-tube, three-dilution MPN-test or any other bacteriological procedure shown to be of equivalent accuracy.

3. They must not contain salmonella in 25g of mollusc flesh.

4. They must not contain toxic or objectionable compounds occurring naturally or added to the environment such as those listed in the Annex to Directive 79/223/EEC in such quantities that the calculated dietary intake exceeds the permissible daily intake (PDI) or that the taste of the molluscs may be impaired.

5.-(1) The total Paralytic Shellfish Poison (PSP) content in the edible parts of molluscs that is the whole body or any part edible separately must not exceed 80 micrograms per 100g of mollusc flesh in accordance with the biological testing method - in association if necessary with a chemical method for detection of Saxitoxin.

(2) If the results of such tests are challenged, the reference method shall be the biological method.

6. The customary biological testing methods must not give a positive result to the presence of Diarrhetic-Shellfish Poison (DSP) in the edible parts of molluscs that is the whole body or any part edible separately.

7. In the absence of routine virus testing procedures and the establishment of virological standards, health checks must be based on faecal bacteria counts.

8. Any examinations for checking compliance with the requirements of this Schedule must be carried out in accordance with methods which may from time to time be approved for the purpose of these Regulations by the Ministers.

Commission Decision of 15 December 1992 On The Microbiological Criteria Applicable To The Production Of Cooked Crustaceans and Molluscan Shellfish

Article 1
The microbiological standards applicable to the production of cooked crustaceans and molluscan shellfish provided for in Chapter IV (IV)(7)(c) of the Annex to Directive 91/493/EEC are laid down in the Annex hereto.

Article 2
The microbiological standards shall be checked by the manufacturer during the manufacturing process and before the crustacean and molluscan shellfish products cooked in the processing plant approved in accordance with Article 7 of Directive 91/493/EEC are placed on the market.

Article 3

1. Sampling programmes shall be established by the managerial staff of the processing plant in relation to the nature of the products (whole, shelled or shucked), the temperature and time of cooking and the risk evaluation, and shall meet the requirements of Article 6 of Directive 91/493/EEC.

2. The programme referred to in paragraph 1 shall contain, in the event of failure to comply with the standards laid down under headings 1 and 2 of the Annex hereto, an undertaking:

- *to notify the competent authorities of the findings made and the action taken with regard to unsatisfactory batches, as well as the measures provided for in the second indent below.*
- *to review the methods of supervising and checking the critical points so as to identify the contamination source, and to carry out analyses more frequently.*
- *not to market for human consumption batches found to be unsatisfactory on account of the discovery of pathogens or where the M value for Staphylococcus provided for under heading 2 of the Annex is exceeded.*

Article 4

Pending the establishment of Community methods of microbiological analysis, the methods of analysis used to verify the microbiological standards laid down in the Annex hereto shall be scientifically recognised at international level and tested in practice. The method of analysis used must be recorded with the corresponding results.

ANNEX

1. Pathogens

Type of pathogen	*Standard*
'Salmonella' spp.	*Absent in 25g* *n = 5 c = 0*

In addition, pathogens and toxins thereof which are to be sought according to the risk evaluation, must not be present in quantities such as to affect the health of consumers.

2.. Organisms indicating poor hygiene (shelled or shucked products)

Type of organisms	*Standard (per g)*
'Staphylococcus aureus'	*m = 100* *M = 1000* *n = 5* *c = 2*
either: Thermotolerant coliform (44°C on solid medium)	*m = 10* *M = 100* *n = 5*
or: Escherichia coli' (on solid medium)	*c = 2* *m = 10* *M = 100* *n = 5* *c = 1*

Where parameters n, m, M and c are defined as follows:
n = number of units comprising the sample,
m = limit below which all results are considered satisfactory.
M = acceptability limit beyond which the results are considered unsatisfactory.
c = number of sampling units giving bacterial counts of between m and M.

The quality of a batch is considered to be:
(a) satisfactory where all the values observed are 3m or less;
(b) acceptable where the values observed are between 3m and 10m (=M) and where c/n is 2/5 or less.

The quality of a batch is considered to be unsatisfactory:
-in all cases where values are above M,
-where c/n is greater than 2/5.

3. Indicator organisms (Guidelines)

Type of organism	*Standard (per g)*
Mesophilic aerobic bacteria (30°C) *(a) Whole products*	*m = 10000* *M = 100000nnnnnnnnn* *= 5*

(b) Shelled or shucked products with the exception of crabmeat	*c = 2* *m = 50000* *M = 500000* *n = 5* *c = 2*
(c) Crabmeat	*m = 100000* *M = 1000000* *n = 5* *c = 2*

These guidelines are to help manufacturers decide whether their plants are operating satisfactorily and to assist them in implementing the

production monitoring procedures.

APPENDIX IV

Other Sources of Information and Advice

General information and advice on hygiene and food safety matters can be obtained from the Local Food Authority, which is either the Port Health or the Local Government Authority. Although responsible for enforcing food safety law, the Environmental Health Officers employed by the Authorities would rather be called upon for advice than have to act as 'policemen' at a later date. The Local Authorities are also a good first point of contact for identifying the local agencies responsible for waste disposal, water supply and health and safety requirements.

Businesses are advised to join the appropriate trade association which provides both support and advice to industry. These include:

The Shellfish Association of Great Britain
Fishmonger's Hall
London Bridge
London
EC4R 9EL

Telephone No: 0171 283 8305
Fax No: 0171 929 1389

Association of Scottish Shellfish Growers
151 Warrender Park Road
Edinburgh
EH9 1DT

Telephone No: 0131 446 0187
Fax No: 0131 228 9614

Further information on the classification of production areas and on purification requirements can be obtained from:

Ministry of Agriculture, Fisheries and Food
Centre for Environment, Fisheries and Aquaculture Science (CEFAS)
Weymouth Laboratory
Barrack Road
The Nothe
Weymouth
Dorset
DT4 8UB

Telephone No: 01305 206600
Fax No: 01305 206601

Scottish Office Agriculture, Environment and Fisheries Department
Marine Laboratory
P O Box 101
Victoria Road
Aberdeen

Telephone No: 01224 876544
Fax No: 01224 295511

Department of Health and Social Services
Health Protection Policy
Annex 4
Castle Buildings
Stormont
Belfast
BT4 3SJ

Telephone No: 01232 522333
Fax No: 01232 523270

Information and advice on fish health matters can be obtained from MAFF and SOAEFD as above and from:

Department of Agriculture for Northern Ireland
Fisheries Division
Hut 5
Castle Grounds
Stormont
Belfast
BT4 3PW

Telephone No: 01232 520000
Fax No: 01232 761327

Technical Information and advice on all aspects of mollusc handling can be obtained from:

Sea Fish Industry Authority
Seafish Technology
Seafish House
St Andrews Dock
Hull
HU3 4QE

Telephone No: 01482 327837
Fax No: 01482 223310

APPENDIX V

Equivalent Scottish and Northern Ireland Legislation

England and Wales	Scotland	Northern Ireland
The Food Safety Act 1990	The Food Safety Act 1990	The Food Safety (Northern Ireland) Order 1991
The Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations 1992	The Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations 1992	The Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations (Northern Ireland) 1993
The Food Safety (Live Bivalve Molluscs) (Derogations) Regulations 1992	The Food Safety (Live Bivalve Molluscs) (Derogations) Regulations 1992	The Food Safety (Live Bivalve Molluscs) (Derogations) Regulations (Northern Ireland) 1992
The Food Safety (Live Bivalve Molluscs and Other Shellfish) (Import Conditions and Miscellaneous Amendments) Regulations 1994	The Food Safety (Live Bivalve Molluscs and Other Shellfish) (Import Conditions and Miscellaneous Amendments) Regulations 1994	The Food Safety (Live Bivalve Molluscs and Other Shellfish) (Import Conditions and Miscellaneous Amendments) Regulations (Northern Ireland) 1995
The Food Safety (Fishery Products) Regulations 1992	The Food Safety (Fishery Products) Regulations 1992	The Food Safety (Fishery Products) Regulations (Northern Ireland) 1993
The Food Safety (Fisheries Products) (Derogations) Regulations 1992	The Food Safety (Fisheries Products) (Derogations) Regulations 1992	The Food Safety (Fishery Products) (Derogations) Regulations (Northern Ireland) 1992
The Food Safety (Fishery Products) (Import Conditions and Miscellaneous Amendments) Regulations 1994	The Food Safety (Fishery Products) (Import Conditions and Miscellaneous Amendments) Regulations 1994	The Food Safety (Fishery Products) (Import Conditions and Miscellaneous Amendments) Regulations (Northern Ireland) 1995
The Food Safety (Fishery Products and Live Bivalve Molluscs and other Shellfish) (Miscellaneous Amendments) Regulations 1996	The Food Safety (Fishery Products and Live Bivalve Molluscs and other Shellfish) (Miscellaneous Amendments) Regulations 1996	The Food Safety (Fishery Products and Live Bivalve Molluscs and other Shellfish) (Miscellaneous Amendments) Regulations (Northern Ireland) 1996
The Food Safety (General Food Hygiene) Regulations 1995	The Food Safety (General Food Hygiene) Regulations 1995	The Food Safety (General Food Hygiene) Regulations (Northern Ireland) 1995
The Food Safety (Temperature Control) Regulations 1995	The Food Safety (Temperature Control) Regulations 1995	The Food Safety (Temperature Control) Regulations (Northern Ireland) 1995
The Materials and Articles in Contact with Food Regulations 1987	The Materials and Articles in Contact with Food Regulations 1987	The Materials and Articles in Contact with Food Regulations (Northern Ireland) 1987
The Food and Environment Protection Act 1985	The Food and Environment Protection Act 1985	The Food and Environment Protection Act 1985
The Loading and Unloading of Fishing Vessels Regulations 1988	The Loading and Unloading of Fishing Vessels Regulations 1988	The Loading and Unloading of Fishing Vessels Regulations (Northern Ireland) 1988
The Weights and Measures Act 1985	The Weights and Measures Act 1985	The Weights and Measures (Northern Ireland) Order 1981
The Water Resources Act 1991	The Water Act 1989	The Water Act 1972
The Environmental Protection Act 1990	The Environmental Protection Act 1990	No Northern Ireland Equivalent

England and Wales	Scotland	Northern Ireland
The Waste Management Licensing Regulations 1994	The Waste Management Licensing Regulations 1994	Pollution Control and Local Government (Northern Ireland) Order 1978
The Animal By-Products Order 1992	The Animal By-Products Order 1992	Animal By-Products Regulations (Northern Ireland) 1993
The Deposits in the Sea (Exemptions) Order 1985	The Deposits in the Sea (Exemptions) Order 1985	The Deposits in the Sea (Exemptions) Order (Northern Ireland) 1985
The Merchant Shipping (Prevention of Pollution by Garbage) Regulations 1988	The Merchant Shipping (Prevention of Pollution by Garbage) Regulations 1988	The Merchant Shipping (Prevention of Pollutiion by Garbage) Regulations 1988
The Merchant Shipping (Reception Facilities for Garbage) Regulations 1988	The Merchant Shipping (Reception Facilities for Garbage) Regulations 1988	The Merchant Shipping (Reception Facilities for Garbage) Regulations 1988
The Fish Health Regulations 1992	The Fish Health Regulations 1992	The Fish Health Regulations (Northern Ireland) 1993
The Workplace (Health, Safety and Welfare) Regulations 1992	The Workplace (Health, Safety and Welfare) Regulations 1992	The Workplace (Health, Safety and Welfare) Regulations (Northern Ireland) 1993