



Regulations implementing the Work in Fishing Convention come into force later this year, which include requirements for the provision of food and drinking water on fishing vessels.

This note provides provisional guidance on provision of food and water. This information is subject to change as the Regulations are finalised. It is the responsibility of the fishing vessel owner to check the final requirements.

PROVISION OF FOOD AND WATER

Summary

This Marine Guidance Note provides practical advice on the provision of food and water for all fishing vessels:

- Food and drinking water of appropriate quality, nutritional value and quantity to meet the needs of fishermen must be provided free of charge on board.
- Food hygiene principles and the provision and maintenance of fresh water must be applied regardless of the age, size and type of vessel.
- Bacterial contamination is the most serious risk to food and fresh water safety.
- Those preparing or serving food must demonstrate a working knowledge of the principles and practices of food hygiene.
- Prevention using a risk assessment and management approach is one of the most effective means of ensuring food and fresh water safety.
- The requirements for ships subject to the Merchant Shipping (Maritime Labour Convention) (Minimum Requirements for Seafarers etc.) Regulations 2014 are contained in MSN 1845(M) and MSN 1846(M).

1. Background: the Legal Framework

1.1 The main relevant regulations are the:

- [Regulations implementing the requirements of ILO 188 on provision of food and water - *not yet in force*]
- Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997

Copies of the regulations will be available from www.legislation.gov.uk

1.2 There are also public health regulations that are relevant, including the:

- Food Hygiene Regulations 2006, as amended; and
- Public Health (Ships) Regulations 1979, as amended.

1.3 The Regulations implementing ILO 188 provisions require that on all fishing vessels (regardless of length or date of build) –

1.3.1 the food and drinking water that are provided on board that vessel—

- a) are suitable in respect of quality, quantity and nutritional value taking account of
 - a. the number of fishermen on board and the character nature and duration of the voyage;
 - b. the different religious requirements and cultural practices in relation to food of the fishermen on board;
- b) do not contain anything which is likely to cause sickness injury to health or which render any food or drinking water unpalatable; and
- c) are otherwise fit for consumption;

1.3.2 the food and drinking water are provided free of charge to all fishermen while they are on board;

1.3.3 the galley and food storage facilities are maintained in a hygienic condition; and

1.3.4 waste is kept in closed well sealed containers and removed from food handling areas whenever necessary.

1.4 The cost of providing food and drinking water may be recovered as an operational cost where provide for under a share system.

1.5 The responsibility for complying with these requirements rest with the fishing vessel owner and the skipper.

2. General principles

2.1 In providing food and drinking water on board ship, account should be taken of factors including the duration and nature of the voyage; the number of crew on board; and the quantity, nutritional value, quality and variety of the food. The religious requirements and cultural practices of the crew as they relate to food should also be taken into account.

2.2 Food hygiene principles must be applied regardless of the age, size and type of vessel. The information contained in this Notice provides a practical food hygiene guide which supports International Labour Organisation (ILO) standards and general food safety principles where catering arrangements relate more to a domestic environment than a food business.

2.3 If vessels have a catering department, the organisation and equipment should be such as to permit the provision to the crew of adequate, varied and nutritious meals prepared and served in hygienic conditions.

3. Knowledge/instruction

- 3.1 Those with responsibility for catering should have an adequate knowledge of, or where appropriate be instructed in, food and personal hygiene to ensure that food is stored, stock rotated, handled, cooked and served safely and that good practice is clearly applied.
- 3.2 Periodic assessment should be made of the effectiveness of food safety and hygiene practices as part of the programme of inspections under paragraph 5. If there is any evidence of poor hygiene practices, designated cooks or others working in the galley should receive appropriate food hygiene instruction or training.
- 3.3 Anyone preparing or serving food to others should have an awareness of the potential problems associated with food allergy and intolerance and have a basic understanding of how to avoid cross contamination and the importance of providing accurate information to the crew.

4. Information for Crew on Food and Water Safety

- 4.1 Information on food and water safety reports should be readily available to members of the crew. The reports should be written in a language that can be clearly understood and in English.

5. Inspection and Enforcement

- 5.1 UK Regulations require the inspection at least once a week of the supplies of food and water by the skipper or master or his deputy together with a member of the crew. A record must be made of the inspection in the Official Log Book, including
 - (a) the time and date of the inspection;
 - (b) the name and rank of each person making the inspection; and
 - (c) the particulars of any respect in which the food and catering facilities were found by any of the persons making the inspection not to comply with these Regulations.
- 5.2 Ships are inspected by MCA surveyors for compliance with the ILO 188 inspection regime which provides for food safety and hygiene standards.
- 5.3 Environmental or Port Health Officers enforce food safety standards and for ships on international voyages issue ship sanitation certificates as required by the International Health Regulations.
- 5.4 A close liaison is maintained between local offices of respective organisations to avoid duplication of effort and to ensure that where inspections carried out by members of one organisation reveal a situation that would clearly also be of concern to the other, appropriate actions under respective powers can be considered.

6. More detailed guidance

6.1 Detailed guidance in this Notice is arranged as follows:

Annex 1: Food safety and hygiene including advice on diet and nutrition

Annex 2: Water, including its supply, storage and distribution and advice on maintenance of water systems.

October 2018

To be confirmed

FOOD SAFETY AND HYGIENE

This annex covers construction, design, equipment and maintenance of galley areas, health and safety, diet and nutrition, food and personal hygiene, preparation, cooking and food service, storage and cleaning.

1. Design, construction, equipment and maintenance of galley areas

Food areas should be designed, constructed, equipped and properly maintained to enable good hygiene and suitable health and safety standards. Materials used should be durable, non-absorbent, smooth and easy to clean with no sharp edges or corners. Decks should be anti-slip and provide adequate drainage if necessary. All spaces should be well lit.

The design and layout should enable clear access below, behind or between equipment or it should be properly sealed/integrated to prevent the accumulation of debris in inaccessible spaces. So far as practical, refrigeration units should not be located close to ovens or other large galley cooking units. There should be adequate working space to provide a safe working environment.

Ventilation should be adequate with suitable mechanical extraction to maintain reasonable temperatures and humidity levels. Condensation particularly on deck heads can be a problem but with suitable mechanical ventilation this can be kept under control. Supplementary ventilation should be provided for particular hot spots. Ventilation ducting should be accessible and regularly cleaned to minimise the risk of fire. An intervening air space should be provided between any WC and the galley/food preparation rooms.

Equipment should be adequate for the number of crew and fit for purpose. Equipment and utensils should be fixed in place or stored safely to avoid damage or injury when the ship rolls. Equipment should be stored so as to protect it against contamination.

Dedicated wash hand basins with provision for soap and towels should be provided in galleys. In addition, dedicated sinks for food preparation and washing catering equipment should be provided.

2. Health and Safety Issues

There are obvious hazards within the galley and store areas, such as wet greasy deck, extreme temperatures and humidity, congestion particularly around the galley range, and hot plate area. Cleaning materials, electrical appliances, fumes, knives, equipment such as deep fat fryers, brat pans and tilting kettles are also hazardous. Practical control measures should be in place to reduce the risk of injury in the catering environment, for example.

- Anyone working in catering areas should be provided with appropriate protective clothing and specialist anti-slip protected toe-cap footwear.
- Knives and other sharp utensils should not be left in a sink or washing up bowl submerged in water.
- Stowage – items should be properly secured.
- Pots and pans should be secured during cooking and only filled to safe levels particularly in heavy seas.
- Protective guards shall be fitted on mechanical fans, food mixers and other kitchen equipment with exposed blades or other dangerous parts.

Electrical equipment, including wiring in galley and store areas should be regularly inspected by either a qualified member of the crew or a shore side contractor.

Burns and scalds are common injuries. A first aid box should be provided either in the galley or a suitable area convenient to the galley. The contents of the first aid box should be checked and when necessary replenished at appropriate intervals. A notice stating the action to take if someone is burned or scalded should be prominently displayed in or close by the galley.

The use of anti-bacterial hand cleaners, moisturising cream and barrier creams should be encouraged to reduce the risk of skin infections particularly dermatitis.

3. Diet and Nutrition

A good variety of food provides a healthy diet. Meals should provide a balance of carbohydrates, protein, fat, fibre, vitamins and minerals. Food should be prepared and cooked with minimum levels of salt, fat and sugar. As a general guide:

Carbohydrates: High energy food including potatoes, rice, pasta, bread and breakfast cereals

Proteins: fish, meat, poultry, eggs, milk and other dairy products (*check the fat content of some cheeses*)

Vitamins and minerals: are contained in fresh, frozen, dried and canned fruit and vegetables including fruit juices*. (See below)

Drinks: as with food a balanced intake is important. Not too much sugar, caffeine and calories. Water, fruit juices* and low fat milk are all good alternatives.

*Current advice discourages drinking a lot of fruit juice because some contain high levels of sugar.

Provision should be made for any special needs because of religion, special dietary requirement, or customary dietary practices where certain rules or requirements in relation to some food or with the way food is prepared must be observed.

Those preparing and serving food should be aware of the dangers associated with food allergies. If a person with a food allergy inadvertently eats even a small amount of that food this can make them very ill or in extreme cases cause death.

The Food Safety Agency lists 14 food allergens that must always be labelled in pre-packed and non-prepacked foods (Taken from Annex II of the EU Food Information for Consumers Regulation No.1169/2011) Foods that need to be labelled ~~on pre-packed foods~~ when used as ingredients are:

- Cereals containing gluten, namely: wheat (such as spelt and Khorasan wheat), rye, barley, oats
- Crustaceans for example prawns, crabs, lobster, crayfish
- Eggs
- Fish
- Peanuts
- Soybeans
- Milk
- Nuts; namely almonds, hazelnuts, walnuts, cashews, pecan nuts, Brazil nuts, pistachio nuts, macadamia (or Queensland) nuts

- Celery (including celeriac)
- Mustard
- Sesame
- Sulphur dioxide/sulphites, where added and at a level above 10mg/kg in the finished product. This can be used as a preservative in dried fruit
- Lupin which includes lupin seeds and flour and can be found in types of bread, pastries and pasta
- Molluscs like clams, mussels, whelks, oysters, snails and squid

NOTE: This list is illustrative only as there are likely to be other ingredients that can cause adverse reactions in persons who are sensitive to them.

Information about any food allergies should be collected from crew joining the vessel, so that food free of any declared allergen can be made available. If anyone other than the crew may eat the food, anyone preparing food or serving pre-packed food to crew members should ensure details of the allergens contained are clearly visible.

4. Food Hygiene

4.1 Hazard Analysis and Critical Control Point System

In the case of companies operating vessels with a substantial crew complement, the philosophy of safety management systems is likely to have been extended to already include food and fresh water safety and hygiene issues, based on the Hazard Analysis and Critical Control Point (HACCP) system. A HACCP system is a structured and documented hazard analysis system, identifying critical control points and specific actions to be taken at these points. HACCP is required under food safety legislation and is applicable to food businesses. Such systems are based on robust food safety policy and detailed procedures, all fully documented, that will extend far beyond the primary advice contained in this Marine Guidance Note.

4.2 About Food Hygiene

Traditionally the basis for food hygiene standards has been the use of clean well-maintained catering spaces and the avoidance of unsanitary conditions. Even in clean, well-maintained galleys however, food may be handled carelessly with insufficient regard to food safety. Good food hygiene is more than cleanliness; it requires food to be protected from the risk of harmful contamination by bacteria, chemicals and other foreign bodies from point of delivery to point of consumption. Bacterial contamination is the most serious risk to food safety and causes the majority of food poisoning cases but physical and chemical contamination may also occur accidentally. For example, from loose buttons, jewellery, other foreign bodies or from cleaning agents.

Good food hygiene is also about sourcing safe food. In certain circumstances unsafe food will always remain unsafe regardless of the measures taken.

4.3 About bacteria

No catering environment operates without harmful bacteria being present at some time, and plenty of food is produced in environments where microbiological environmental levels are very low. A good HACCP system will prevent illness in these circumstances. Small numbers of certain bacteria such as *Salmonellae* can cause serious illness. Most pathogenic bacteria

are destroyed by adequate cooking but harmful preformed bacterial toxin, mycotoxins and algal toxins are unaffected by heat. Pathogenic bacteria also thrive in cool, dry and anaerobic conditions. Raw meat is considered to be high risk because of the likely presence of *E Coli*, *Salmonellae*, *L. monocytogenes*. Depending on the source viable cysts of intestinal parasites may also exist. Good practice before cooking or processing should prevent bacteria multiplying to the extent that would cause illness or food spoilage.

Bacteria levels rise rapidly in a warm moist environment on certain foods that support their growth such as high protein foods. However foods with high levels of sugar, salt, or other preservatives do not provide favourable growth conditions.

“High risk” foods, those most commonly implicated in food poisoning cases, is considered to be food that supports bacterial growth and is ready to eat without further cooking. For example,

- cooked meat, poultry and rice
- meat products such as gravy and stock
- milk, cream, eggs and egg products
- shellfish and other seafood.

Raw meat although a source of bacteria is not considered to be a “high risk” because it is generally cooked before consumption.

People may be carriers of some types of harmful bacteria at some point – hands are particularly susceptible. Other common sources are pests such as insects, flies, rodents etc, dust and waste food.

4.4 Bacterial Food Contamination

Contaminated food looks tastes and smells completely normal unless it is so contaminated that spoilage occurs. Bacteria levels in high risk food and raw meat will rise rapidly in warm conditions. Contamination usually occurs through recklessness, ignorance and people taking short cuts, and handling or storing food carelessly.

Bacteria can pass directly from the source to high risk food, for example raw meat can contaminate cooked meat where human, animal or insect intervention occurs. Cross contamination where bacteria are transferred by some other means is a constant threat to food safety. The main “vehicles” are hands, and hand and food contact surfaces, cloths and equipment. Other “vehicles” include water, other food and insects.

4.5 10 Main Reasons for Food Poisoning

1. Preparation of food too far in advance and stored at room temperature.
2. Cooling food too slowly prior to refrigeration.
3. Not reheating food to high enough temperatures to destroy harmful bacteria.
4. Using contaminated cooked food.
5. Undercooking.
6. Not thawing frozen meat for sufficient time.
7. Cross contamination from raw food to cooked food.
8. Storing hot food below 63°C.
9. Infected food handlers.
10. Improper use of leftovers.

4.6 Prevention of Bacterial Food Poisoning

Food must be protected against contamination. High standards of personal cleanliness and food safety must be observed. Any existing bacteria already in the food must be prevented from growing to dangerous levels. Most bacteria can be destroyed by thorough cooking but not preformed toxins. To reduce the risk of food poisoning a range of control measures should be put in place covering:

- Personal hygiene
- Temperature control (keep food hot $>63^{\circ}\text{C}$ or cold $<5^{\circ}\text{C}$)
- Segregation of raw and cooked foods
- Ensuring no risk of cross contamination via hands, cloths etc
- Thorough cooking
- Adequate and proper cleaning
- Purchasing safe supplies and ensuring safe delivery

4.7 Cross Contamination with Food Allergens

It is important for those preparing or serving food to others to be aware of the risk of allergen cross contamination in situations where a crew member has asked for food to be free of a certain ingredient to which they are allergic or intolerant. The following steps should be taken to reduce the risk:

- (i) preparing the food from scratch,
- (ii) keeping surfaces clear of the allergen of concern,
- (iii) using separate utensils to prepare and serve the allergen free food,
- (iv) avoiding transference of crumbs or seeds from other foods and by
- (v) using correctly labelled airtight containers.

5. Personal Hygiene

It is essential for anyone handling food for others to eat to strictly observe and practise high standards of personal cleanliness. They should be clean and tidy and wear suitable light-coloured protective clothing.

There must be adequate wash-hand basins with soap and hand drying facilities available. Disposable towels or a hot air dryer are better than a traditional towel. Those preparing or serving food must wash their hands regularly and always on entering the galley, before handling any food or equipment, after smoking and/or touching hair, nose, mouth, dirty clothing etc. Hands must also be washed after visiting the WC, and in between handling raw and cooked food.

Toilets with wash hand basins should be situated near to, but separate from the galley. Prominent signs about washing hands should be displayed.

Direct contact between hands and food should be avoided as far as possible, by using tongs for example. Appropriate protective gloves may be worn but they can give a false sense of security.

Cuts, spots, sores, etc should be completely covered by coloured waterproof dressings.

5.1 Fitness to Work

Anyone with symptoms of food poisoning, for example diarrhoea or vomiting or suspected of carrying food poisoning organisms because of a confirmed case should be immediately excluded from working with food and any job which might expose food or water to the risk of contamination. Anyone who has suffered sickness and diarrhoea should not handle food which others will eat for at least 48 hours after the symptoms have ceased. Several other conditions require infected persons to be similarly excluded for varying lengths of time according to medical advice. Secondary infections associated with boils and septic cuts, and respiratory infections from heavy colds may also require the suspension of food handling until successfully treated or the crew member has recovered.

6. Preparation and Cooking

6.1 Thawing

Defrosting raw meat and poultry should be carried out in controlled conditions and not simply be left to thaw at room temperature, particularly in a warm galley. Thawing should take place in a cool, clean area, separate from other foods that may be exposed to risk of contamination from thawed liquid. The food should be covered and stored in a container on a grille so that it is not resting in the thawed liquid. If there is a food handling room within the cold stores area this may be used. It is important to check that meat or poultry is thoroughly defrosted before cooking. Bacteria thrive in warm conditions, so raw meat, poultry, or fish should not be left in the so called danger zone (5°C-63°C) for longer than is absolutely necessary. As a general rule when handling food during and after preparation would be a single period of up to 2 hours at room temperature. In very high temperatures the handling period should be reduced to about 1½ hours.

6.2 Cooking

Most harmful bacteria can be destroyed by thorough cooking. It is however acceptable to serve a "rare" steak, or beef and lamb if it is a whole cut or joint of meat and the steak or joint has been properly sealed over a high heat to destroy any bacteria that might be on the surface. The following types of meat can have bacteria distributed throughout the mass of the meat; they must therefore be cooked thoroughly.

- Poultry
- Pork
- Burgers, sausages, kebabs
- Rolled joints using more than one cut
- Minced Meat (minced beef, minced lamb, or minced pork)

A skewer may be used to test that poultry or meat joints are thoroughly cooked. Juices should run clear. A centre temperature of 75°C (82°C in Scotland) is usually required and may be verified using a probe thermometer, the probe having been properly disinfected before use. Furthermore the thermometer's manufacturer's instructions must be followed and its accuracy verified.

Where practical, separate work surfaces should be set aside for the preparation of raw meat which; should not be used for the preparation of foods that will be eaten without further cooking. If the same work surface has to be used, care must be taken to ensure it is cleaned and disinfected between handling raw and cooked meats or other ready to eat products. Separate chopping boards clearly assigned, generally, by colour may be used to maintain segregation.

6.3 Service

Ideally food should be consumed as soon as it is prepared or cooked, but patterns of work and other unplanned factors can delay meal times. If there are significant delays, cold cuts can be stored in the fridge or in a chill display unit until the crew are ready to eat. Hot food can be safely left in the pot over a very low heat so long as it is regularly stirred to maintain a safe temperature of 63°C or it can be stored in a hot press.

6.4 Leftovers

Cooling high risk food must be done quickly to avoid potential health risks. Small amounts of food should cool relatively quickly but the process can be speeded up if necessary. For example:

- If available use a larder with a lower temperature.
- Pour liquids into shallow pans and stir frequently.
- Split food into relatively small pieces or batches.
- Use an iced water bath.

Once cold, leftovers should be date marked and be suitably stored in a fridge and used within 2 days preferably served cold, for example as part of a salad. If reheating is absolutely necessary food should be rapidly and thoroughly reheated, but only once. Reheated leftovers must have a core temperature of 75°C (82 °C in Scotland).

7. Stores

7.1 General

Ships should have adequate storage facilities for all stores. If storage spaces are inadequate, stock levels should be reduced by taking on stores more frequently or if that is not possible, additional storage should be made available. All stock should be rotated as and when necessary.

7.2 Cold Stores

Safe temperatures for cold stores are generally considered to be 5°C or colder and minus 18°C or colder for chill and freezer cabinets respectively but a slight tolerance of one or two degrees is unlikely to create a significant risk to food safety. If cabinets do not have a means of checking temperatures, a suitable thermometer should be provided. Thermometers should be calibrated periodically but a simple check on a monthly basis, using boiling water (99°C-101°C) or melting ice (-1°C to +1°C) will verify the accuracy of the thermometer.

In freezer units, the combination of high humidity and fluctuating temperatures (warmer than minus 10°C) accelerate mould and other spoilage bacterial growth. Fluctuating temperatures may also cause an accumulation of ice deposits. Food should never be stored in front of a cooling unit as this restricts the circulation of air. Suitable packaging is essential to avoid the loss of moisture from the surface of food which can produce freezer burn effect on exposed meat cuts or joints.

If defrosting is not an automatic process, equipment should be defrosted regularly to maintain its efficiency.

Although fridges and freezer cabinets should be maintained according to the ship's planned maintenance system. Cooks and others working in the galley should regularly check the condition of door seals and closing devices as well as routinely monitoring temperatures.

Provided food has been maintained in a hard frozen condition from production to delivery and during storage on board ship, it may be used beyond the best before date.

Chilled raw food must always be kept apart from cooked food or milk for example that requires no further treatment before consumption. Separate refrigerators are preferred although if in the same unit, the raw food must always be placed at the bottom to avoid drip contaminating ready prepared food. Food should also be covered or wrapped to prevent drying out, cross-contamination and absorption of odour.

7.3 Dry food stores

Dry food stores should be dry, cool (where possible around 10°C), well lit and ventilated. There should be adequate shelving and pallets to avoid stowage directly on the deck. Care should be taken to ensure stock is used in strict date rotation and that supplies have the best possible durability date. Perishable provisions should neither be ordered nor accepted in quantities greater than can be consumed before the expiry date. Daily checks should be made on short life perishable food such as fruit and vegetables.

8. Cleaning

To avoid a build up a dirt and waste, a "clean as you go" routine should be applied.

Trays, knives, cutting boards, food preparation machinery and work tops etc that come into contact with food should be thoroughly cleaned and disinfected. Mechanical dishwashers disinfect by virtue of the high temperature (around 82°C). Where dishes are hand washed they should be left to dry rather than use drying cloths, so long as they are put away as soon as they are dry.

Cloths and towels are a perfect breeding ground for bacteria so they must be washed regularly or discarded. Mops and waste bins should also be regularly washed and stowed in designated places.

Galley spaces should be cleaned at the end of each working day. Time should be set aside to do a regular systematic thorough clean of all areas including cupboards, store rooms, the deck and bulk heads, extractor fans and canopies. Greasy ventilation ducting is a serious fire hazard and should therefore be cleaned regularly. The frequency of cleaning should be determined using a risk assessment process.

Care should be taken to protect food and equipment during cleaning operations. Cleaning products and equipment should be safely stored away, preferably in a designated locker.

Garbage and food waste segregation and disposal arrangements should maintain operational health and safety standards and be in accordance with the ship's garbage management plan. It should be noted that lids on waste bins can increase the risk of cross contamination.

9. Pests

Good housekeeping obviously minimises the risk of infestation and it is important to ensure that areas, particularly refuse areas are kept in a clean and tidy condition. Waste bins should

be emptied regularly and lids should always be fitted unless they are being used. They should also be washed after emptying.

Flies, cockroaches and rodents present a serious hazard. Food suspected of being contaminated by rodents, flies or cockroaches must be destroyed.

A responsible member of crew should carry out routine inspections of food areas, particularly undisturbed areas. If pests are found appropriate action should be taken to eradicate or minimise the problem. This should include the use of a pest control book and if necessary the employment of a certified pest control agent.

Any treatments used should comply with the "Recommendations on the Safe Use of Pesticides in Ships" (IMO MSC.1/1358).

To be confirmed

FRESH WATER

This Annex covers fresh water loading and supply arrangements, disinfection, storage, distribution systems and maintenance.

1. Introduction

Crew accommodation requirements ensure that the supply of drinking water and fresh water to be such as to prevent any risk of contamination. In addition hot, fresh water and cold drinking water should be supplied to any sink, wash hand basin or other washing facility in the galley.

Improperly managed water is an established infectious disease transmission route on ships. Outbreaks of illness have been associated with contaminated bunkered water, cross connections between potable and non-potable water, improper loading procedures, poor design and construction of potable water storage tanks and inadequate disinfection. Evidence from outbreaks indicates that sewage is one of the more common sources of the pathogens that cause waterborne disease outbreaks on ships.

The most effective means of ensuring the safety of the fresh water supply is through the use of a risk assessment and management approach that covers the whole process from loading to delivery at the tap and includes a planned maintenance system. All of the information gathered should be used to develop a *Fresh Water Safety Plan* (FWSP), particularly for ships with a complex system, which could be incorporated into the ship's planned maintenance system. An FWSP should be based on the following format:

- System assessment and hazard analysis (including an assessment of source water loaded on to the ship)
- Management plan and control measures, (the selection and operation of appropriate treatment processes)
- Monitoring and corrective action system in accordance with the Plan (the prevention of contamination/re-contamination) during storage and distribution)

Control measures (treatments) will be influenced by the quality of the source water. In the event of the potable water becoming unfit for human consumption then the tanks and distribution system should be drained, super-chlorinated and flushed in accordance with section 7 below – Maintenance of water systems.

In addition to the above the ship should consider requesting water samples from the supplier prior to bunkering.

2. Fresh Water Loading and Supply Arrangements

Fresh water obtained from shore mains supply or water barge should be transferred by a designated fresh water hose. Hoses should be durable, with a smooth, impervious lining, and equipped with fittings, including adapters to permit connection to the shore potable water hydrants and filling connections to prevent their use for loading other liquids. Hoses should be:

- clearly marked (generally coloured blue)
- stowed in a locker clear of the deck

- drained and capped at both ends after use
- flushed through and discharged to waste before loading

Often ships use quayside hoses, in which case a designated crewmember should ensure that such hoses are in good condition and that they are routinely disinfected, safely stowed and capped in a clean environment.

Every potable water tank should have a filling line to which a hose can be attached. This line should not be cross-connected with any line on a non-potable water system. Each line should be clearly identified as such and painted blue with a screw cap or plug fastened by a short chain so that the cap does not touch the deck when hanging free.

3. Disinfection

There should be no facility for by-passing primary automatic disinfection systems. Automatic disinfection systems should have a fail safe control arrangement with an audible or visual automatic alarm to prevent the passage of water in the event of any malfunction. The power supply required to operate the alarm should be independent of the disinfection unit power supply.

3.1 Chlorination

The UK generally accepts chlorine as a disinfectant which requires around 20 minutes contact time to react. It can be the case that shore mains water only contains low concentrations of free chlorine which may be further decreased within the ship environment. Although there is no requirement to do so and control measures will be influenced by the quality of the source water, it is considered good practice to add chlorine as a routine when loading fresh water to a level that produces a 0.2 mg/L (ppm) residual free chlorine or 1.0 mg/L (ppm) chloramine when chloraminated water is supplied. Chlorine should preferably be applied as a hypochlorite solution, using a commercial hypochlorinator designed for the purpose or by using an automatic chlorination unit in the ships filling line. The concentration may also be achieved by the manual method using the formula contained in the *“World Health Organisation’s – Guide to Ship Sanitation”*. A commercial test kit should be used to check the free chlorine or chloramine levels.

Some other treatments available include:

3.2 Silver-coated filter candles

These filters retain suspended matter and they have a bactericidal effect. Treatment is instantaneous with any addition of chemicals.

3.3 Electro-Silver Ionisation

Electro-silver ionisation may be used for the automatic disinfecting of fresh water produced on board ships. Units should be set up by the manufacturer to ensure a minimum concentration of 0.1ppm to be added to the water under maximum flow conditions. The minimum time required for silver to take effect is 4 hours after passing through the unit. This should ensure a maximum of 0.08ppm in the system.

3.4 Ultra-violet Sterilisation

Although the sterilisation process is instantaneous, ultra-violet steriliser units have no dispersal or residual properties. For this reason UV treatment is generally used only as a

supplementary system fitted downstream of the water tank or supply pump. UV units may however be effective in certain cases where service lines are relatively short. They should be installed so that the direction of flow is vertical to keep deposits in the tubes to a minimum. The water should be continuously circulated in the system through the UV unit. There should be a means to measure the intensity of UV radiation and a switch off mechanism with an alarm should be fitted in the event of UV radiation being too weak. The performance of the tubes should be regularly monitored.

3.5 Thermal Disinfection (Calefaction)

Potable water supply lines contaminated with *legionellae* may not be reliably disinfected by means of chemical agents. Heating the flowing water **throughout the distribution system** (*legionella* tends to grow in dead legs and low use areas) to a temperature of at least 60°C and maintaining this temperature for 30 minutes is another established method used to destroy the *legionella* bacteria. If the water temperature is increased the period for maintaining the temperature will be proportionately reduced. This may be used in conjunction with chemical treatments.

4. Fresh Water from Water Making Plant

Seawater that is to be treated on ships should be taken from areas relatively free from pollution, including air pollution. Twenty miles from land is generally considered to be a safe distance but it may be in excess of twenty miles in some cases. Judgement should be used based on a risk assessment which should include consideration of the possible effect that ship operations might have on the quality of water intake.

The seawater inlets (sea chests) should be located forward and if possible on the opposite side of the ships from all overboard waste water and ballast tanks discharge outlets. Seawater should pass through suitable filters before entering the water making equipment.

The manufacturers' operating instructions should be clearly posted in the plant room and be strictly followed.

By-passes should not be installed around treatment units except where necessary as part of the treatment process. There should be an adequate store of spare replacement parts particularly for any vital or fragile parts. Distillation units should indicate low range salinity levels, operational temperature levels and have an automatic discharge to waste. They should also have an alarm with trip setting or equivalent.

Any chemicals used in an injection system to a sea suction intended to prevent the growth of organisms in the ship's piping system serving water making plant should be suitable for that purpose.

High pressure distillation and reverse osmosis plants are highly effective in removing micro-organisms and chemical constituents. They can therefore be employed as a single treatment so long as they remain effective. There is therefore a need for highly reliable on-line monitoring linked to rapid management intervention. They can however be combined with the application of a low level of residual chlorine or other equivalent disinfectant. Because low pressure evaporators operate at lower temperatures, this type of plant should be fitted with an automatic disinfecting unit, generally chlorine is used, before it is pumped to the storage tanks.

Desalinated water effectively demineralises the seawater which makes it corrosive with the potential to damage lines, tanks etc. Also the taste of desalinated water is bland, and may be considered unpalatable. Appropriate stabilising and mineralising chemical treatments should therefore be applied before the water is passed into the storage tank.

5. Filtration

Filters should be used only where necessary as part of a purification system that includes disinfection. Terminal of tap filters often collect bacteria and accelerate its growth and for this reason their use should be discouraged unless they can be disinfected or replacement cartridges are used. Filters should be maintained or replaced according to manufacturers instructions.

6. Water Storage and Distribution Arrangements

6.1 Potable Water Storage Tanks

Storage tanks should normally be sited above the inner bottom and independent of the hull and not adjacent to tanks containing oil. They should be sited and be of such dimensions that they are readily accessible to facilitate inspection, cleaning and coating.

Tanks should be clearly marked "Potable Water". They should be used in regular rotation to avoid stagnation.

Storage should normally carry at least a 2 day supply. Consideration may be given to the size of the ship's complement of officers and crew, the maximum number of passengers, the time and distance between ports of call and the availability of water suitable for treatment with facilities on board. Storage may be decreased if the water supply can be supplemented by water produced by water making plants, but only to the amount that can be readily supplied by the water making plant.

Coating systems other than cement should be specially developed for use in potable water tanks. Manufacturer's recommendations for application and drying or curing of the coating must be followed. All items that penetrate the tank, for example bolts, pipes and pipe flanges should be coated with the same product.

6.2 Distribution Systems

The fresh water distribution pumps should not be capable of being connected to any other service. The suction lines of the pumps should not be cross-connected with the piping or storage tank of any non-potable-water system. Lines should not be submerged in bilge water, or pass through tanks storing non-potable liquids. Overflows, vents and drains from tanks, and drains from the distribution system (including any treatment plant) should not be connected directly to sewage drains.

Potable water piping should be painted or hatched blue. If the direction of flow is important, this shall be shown by means of an arrow pointing in the respective direction. Potable water outlets should be labelled POTABLE WATER. All non-potable water outlets should be labelled UNFIT FOR DRINKING. If hot water piping and cold water piping run adjacent to one another, appropriate thermal insulation should be carried out.

Calorifiers and pressure tanks should be fitted with efficient connections at the lowest point of the unit so that loose scale or sludge can be completely drained off after cleaning and maintenance. They should have adequate access to enable thorough cleaning.

The design of the distribution system should provide maximum circulation, avoiding dead legs and optimum conditions for bacterial growth (15°C-50°C). The risk increases where sections of the system are not kept in continuous use. To minimise the risk a ring main system with circulation pumps in hot and cold water lines should be considered for large scale demand such as passenger ships.

Corrosion and scale inhibitors if used should be suitable for use in fresh water systems.

6.3 Taps and Other Fixtures

Fixtures should be resistant to the corrosive effects of salt water and saline atmosphere and fit for use with fresh water systems. They should be easy to clean and so designed to function easily and efficiently. Approved mixer taps should be fitted to showers and it is recommended that wash hand basins should have hot and cold mixer taps.

7. Maintenance of Water Systems.

All elements of fresh water production, treatment and delivery system including filters, pumps, calorifiers, pressure tanks etc should be inspected, cleaned, flushed out, or items replaced where appropriate according to the manufacturer's instructions and the planned maintenance system. The following maintenance is recommended.

Fresh Water Storage Tanks		
Persons inspecting or working in fresh water tanks should wear clean protective clothing and footwear which has not been used for any other work area and they should not be suffering from any skin infection or communicable disease.		
Actions		Intervals
To be thoroughly pumped out and where necessary hosed prior to refilling		6 monthly
To be opened up, emptied, ventilated and inspected and thoroughly cleaned, recoated as necessary, aired and refilled with clean fresh water chlorinated to a concentration of 0.2ppm free chlorine. The cleaning process should include disinfection with a solution of 50ppm chlorine.		12 monthly
The system (from machinery space to furthest outlets) should be charged with super-chlorinated fresh water at a concentration of 50ppm for a period of 12 hours then completely flushed out and refilled at 0.2ppm residual free chlorine		Refit or dry dock
Pressure tests on all FW tanks (After the pressure test, the system to be thoroughly flushed with potable water)		Intervals not greater than 5 years
Distribution Systems Maintenance		
Parts	Actions	Intervals
Filters	Clean Change	Monthly or according to manufacturer's instructions
UV exposure area	Clean	According to manufacturer's instructions
Calorifiers	To be opened up, inspected, scaled and cleaned. Before draining temperatures should be raised to 70°C for at least an hour to ensure	Periodically (general recommendation – annual inspection)

	destruction of bacteria which may have colonised the lower and cooler zone of the unit.	
Shower heads	Particularly in accommodation that has been out of use for an extended period. Clean in a 50ppm chlorine solution.	3 monthly
FW Hoses	Flush and fill with 50ppm chlorine solution and allow to stand for at least an hour before emptying and stowage	6 monthly or more frequently if required

8. Health and Safety

Adequate care should be taken when handling chemicals or biological agents, for example chemicals, corrosion inhibitors, filters etc, suitable risk assessments and control measures should be applied.

The rules for classification and construction of seagoing ships stated by the relevant classification societies should be observed. Reference should also be made to the following British Standards in relation to sanitary design and construction of ship water supplies obtainable from ISO. See <http://www.iso.org/iso/home/standards.htm>

- ISO 15748-1:2002 Ships and marine technology – Potable water supply on ships and marine structures – Part 1: Planning and design.
- ISO 15748-2:2002 Ships and marine technology – Potable water supply on ships and marine structures – Part 2: Method of calculation.

9. Other sources of guidance

The WHO Guide to Ship Sanitation

This Guide provides advice on a number of topics, including the management of swimming pools and spas on board ships, and is available to download from the internet

www.who.int/water_sanitation_health/publications/2011/ship_sanitation_guide/en/

The HSE Approved Code of Practice and Guidance for the Control of Legionella Bacteria in Water Systems.

This guide provides practical advice for the control of legionella bacteria in any undertaking involving a work activity and to premises controlled in connection with a trade, business or other undertaking where there is a reasonably foreseeable risk of exposure to legionella bacteria. Although the Code of Practice is not specific to a marine environment, it provides advice about prevention or controlling exposure to the bacteria and treatment and control programmes. The Code of Practice may be obtained from the Health and Safety Executive - www.hse.gov.uk