codex alimentarius commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

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ALINORM 76/18A

CODEX ALIMENTARIUS COMMISSION
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REPORT OF THE TENTH SESSION OF THE CODEX COMMITTEE ON FISH AND FISHERY PRODUCTS
Bergen (Norway), 29 September-4 October 1975

INTRODUCTION

1. The Codex Committee on Fish and Fishery Products held its Tenth Session in Bergen, Norway, from 29 September - 4 October 1975 by courtesy of the Government of Norway. Dr. O.R. Braekkan, Norway, was in the chair. The Chairman particularly welcomed the delegations of Bulgaria, Iraq, Mexico and Senegal, whose countries were represented here for the first time.

2. Mr. K. Vartdal, Director-General of Fisheries of Norway, welcomed the participants on behalf of the Norwegian authorities. He referred to the work before the Committee and expressed the hope that an increasing number of countries would find it possible to accept the various Recommended Fish Standards and introduce these recommendations into their legislation. This would remove discriminatory regulations and promote trade to the benefit of both consumers and producers.

3. The session was attended by government delegations from the following 34 countries:

Argentina	Iceland	Portugal
Australia	India	Senegal
Belgium	Iran	Spain
Bulgaria	Iraq	Sweden
Brazil	Ireland	Switzerland
Canada	Italy	Thailand
Cuba	Japan	United Kingdom
Denmark	Morocco	United States of America
Finland	Mexico	Uruguay
France	Netherlands	Yugoslavia
Fed.Rep. of Germany	Norway	South Africa (Observer)
	Poland	

Observers were present from the following four international organizations:

Association des Industries de poisson de la CEE (AIPCEE)
Association of Official Analytical Chemists (AOAC)
European Economic Community (EEC)
International Institute of Refrigeration (IIR)

The list of participants including officers from FAO and WHO is contained in Appendix I to this Report.

ELECTION OF RAPPORTEURS

4. On the proposal of the Chairman, Mr. I.M.V. Adams (United Kingdom) and Mlle F. Soudan and Dr. Y. Lagoin (France), were appointed as rapporteurs to the session.

ADOPTION OF PROVISIONAL AGENDA

5. The agenda was adopted with a modification of the order of the items to be discussed.

REVIEW OF MATTERS DISCUSSED BY VARIOUS CODEX COMMITTEES

Matters arising from the 9th Session of the Joint ECE/Codex Alimentarius Group of Experts on Standardization of Quick Frozen Foods (October 1974, ALINORM 76/25)

6. The Secretariat pointed out that the Group of Experts had revised the "Process Definition" in individual standards for quick frozen foods. In addition to a definition of the process proper, a provision for "Handling Practice" had been included in all standards for quick frozen foods. It was noted that the Group had recommended that the revision should also be submitted to the Commission as a proposed amendment to all relevant standards at Step 9 (see also paras 23-24 of this Report).

7. The Committee further noted that the text of standards for quick frozen foods also contained a provision for "Packaging" which did not appear in standards for quick frozen fish (see also para 34 of this report).

Matters arising from the 10th Session of the Codex Committee on Food Labelling (May 1975, ALINORM 76/22)

8. The Committee was informed that the labelling provisions for the Draft Standards for Quick Frozen Fillets of Flat Fish and Canned Crab Meat had been endorsed.

9. The Secretariat pointed out that in some standards for quick frozen foods, directions for keeping were specified. It had not been clear to the Labelling Committee whether the intent of the provision was to cover both the whole distribution chain and advice to the consumer or whether it was limited to the latter and the Commodity Committee had been requested to reconsider this matter in detail.

10. The Committee discussed the recommendation of the Labelling Committee with regard to date marking, namely that first consideration should be given to the date of minimum durability and that if this date was not considered appropriate for the commodity in question, the date of manufacture should be the next option. If neither of these dates were suitable other alternatives listed in the guidelines for date marking of prepackaged foods could be used.

11. Some delegations expressed a preference for declaration of the date of manufacture rather than the date of minimum durability. They pointed out that durability would depend on the condition of the fish prior to freezing and its declaration might therefore present more difficulties than advantages. The Committee agreed to deal with this matter as and when the various standards were discussed (see paras 32-33 of this Report).

Matters arising from the 10th Session of the Codex Committee on Food Additives (June 1975, ALINORM 76/12).

12. It was also pointed out that there was a growing necessity for more detailed end-product specifications with regard to contaminants in quick frozen fish. The Chairman expressed the view that a distinction should be made between "natural" contaminants and those coming from extraneous sources. It was noted, however, that the important consideration from the standpoint of consumer protection was the admissible level of contamination whatever its source and that as methods of analysis became more sophisticated and more contaminants could be recognized it was also necessary to specify the methods of analysis to be used.

13. It was agreed that although the general question of setting limits for contaminants did not fall strictly within the scope of this Committee, there was nevertheless a body of expert knowledge available to the Committee which could serve as a basis for making recommendations.

STATEMENT BY THE REPRESENTATIVE OF WHO

14. The representative of WHO reviewed current and planned activities related to the work of the Committee. He referred firstly to a Joint FAO/WHO Expert Consultation on Microbiological Specifications for Foods, which met in Geneva in April this year to consider Microbiological Specifications for Egg Products including provisions on sampling, microbiological methods and microbiological limits. In addition the Consultation made proposals for future work. Non-fat dried milk and precooked frozen sea foods were considered to have high priority.

15. The Report of the Consultation with its recommendations was considered by the 12th Session of the Codex Committee on Food Hygiene which has since been submitted to governments for comments. The Food Hygiene Committee discussed aspects of setting internationally acceptable microbiological specifications for foods for inclusion in Codex Alimentarius codes and standards.

16. A meeting of an Expert Committee on Microbiological Aspects of Food Hygiene was planned for March 1976 to review the health aspects of the microbiological load and related quality of foodstuffs in the light of developments since the first WHO Expert Committee on this subject in 1967. A consultation on post-graduate training in food microbiology would be held in November 1975.

17. The Committee was informed that the retrieval system of the WHO Food Virology Programme was now ready for providing health authorities and others interested in this subject matter with information from the data collection on viruses in food and related health implications.

18. Within the Joint FAO/WHO Food Contamination Monitoring Programme two Expert Consultations had been convened since the last session of this Committee, one to select contaminants to be monitored and methodologies to be used and another to discuss a system for handling of the collected data.

19. A "Guide to Shellfish Hygiene" was in an advanced state of preparation. This guide was intended for use by public health and food control authorities who had the responsibility for preventive and control measures in cases where shellfish were suspected or shown as being a vehicle for agents causing food-borne illness.

STATEMENT BY THE REPRESENTATIVE OF THE FAO FISHERY DEPARTMENT

20. The representative of the FAO Fishery Department reviewed the progress on codes of practice for various fishery products. He reported that immediately following the present session a Consultation would meet in Rome to discuss Codes of Practice for Lobster and Related Species, Salted Fish, and Minced Fish Flesh. The Consultation would also make recommendations for the elaboration of further codes.

CONSIDERATION OF DRAFT STANDARD FOR QUICK FROZEN FILLETS OF HAKE AT STEP 7

21. The Committee considered the above draft standard (ALINORM 74/18, Appendix V) and government comments (CX/FFP 75/13 + Addenda CRD 75/3 and 75/3-1).

Product Definition (2.1)

22. The Committee discussed which species could properly be classified as hake. Several delegations were of the opinion that Urophycis species should not be covered by the standard and that only Merluccius species should be so described. The Committee noted that in the Multilingual Dictionary of Fish and Fishery Products (OECD) "hake" applied to both Merluccius and Urophycis species. It was agreed the standard applied to both genera and that Urophycis brasiliensis should be added to the list of species quoted as examples.

Process Definition (2.2)

23. The Committee considered the amendments made by the Joint ECE/Codex Alimentarius Group of Experts on Quick Frozen Foods in the process definition in which a separate provision for "handling practice" had been introduced. Several delegations proposed that a similar amendment should

be made in the standard for hake fillets. Other delegations, however, held the view that the standard should deal with the end product only and that a provision for handling practice was not relevant.

24. The Committee recognized that the Commission at its 11th Session would have before it the recommendation of the Group of Experts and decided for the moment not to segregate the reference to handling practice but to amend the process definition by changing the phrase "at a low temperature" to "under such conditions" - similar to the decision taken by the Group of Experts - to take into account factors other than temperature.

Optional Ingredients (3.2)

25. The proposal was made to delete the provision which allowed the use of sodium chloride as an optional ingredient. It was pointed out that in the case of hake the addition of salt improved both organoleptic and textural qualities. The Committee decided to allow for sodium chloride at a level not exceeding 1% m/m and that it would be mentioned on the label as an ingredient.

Final Product (3.3)

26. It was pointed out that the inspection of fish fillets was made in the first instance on the thawed raw fish and that in doubtful cases corroborative evidence was sought by cooking the product. The Committee therefore agreed to amend sub-section (new) 3.3.2 as follows: "After thawing and/or after cooking ...".

Food Additives (4)

27. The Committee noted that the Codex Committee on Food Additives had endorsed this section. The delegation of the Fed. Rep. of Germany was of the opinion that the use of triphosphates and polyphosphates was not indispensable to the quality of the product. Some delegations supported this view. Other delegations held the opposite view. The findings of the Torry Research Station (United Kingdom) and the Fishing Industry Research Institute (South Africa) demonstrating that the quality of hake fillets improved when treated with polyphosphates were quoted. The Committee decided to retain the present list of additives.

Hygiene (5)

28. The Committee agreed to include in this section the provisions contained in subsections 5.1 and 5.2 of the Draft Standard for Quick Frozen Shrimps or Prawns which covered the raw product and further agreed to attract a provision containing microbiological requirements from the End Product Specifications of the Code of Practice for Fresh Fish (6.1.B).

Name of Product (6.1)

29. During the discussion of the Product Definition the Committee had noted that hake species were marketed under a diversity of local and national names. To take account of this the Committee agreed to amend this provision to read: "The name of the product as declared on the label shall be "fillets of hake", "hake fillets" whether qualified or not, or in countries where laws or customs so provide the name may be "fillets of whiting" or "whiting fillets" or other names which do not mislead the consumer. Packs of fillets cut ....".

Country of Origin (6.5)

30. The delegation of Canada was of the opinion that declaration of the country of origin should be mandatory. The proposal was made to delete the provision (6.5.2) dealing with food undergoing processing in a second country since only quick frozen fillets of hake offered for direct consumption without further processing were covered by the standard. It was pointed out that e.g. skinning of imported "skin on" fillets was possible. The Committee decided to retain the present text. It was realized, however, that the Food Labelling Committee might work to harmonize this provision in the standards for different commodities.

Lot Identification - Date Marking - Directions for Keeping (6.6)

31. In line with the decision taken by the Committee on Food Labelling that a clear distinction should be made between lot identification and date marking, the Committee decided to reword the provision to apply only to lot identification.

32. With regard to date marking there was further discussion as to whether date of manufacture was preferable to durability date and also whether date marking was appropriate for quick frozen fillets of hake. It was pointed out that the general question would be raised at the next session of the Group of Experts on Frozen Foods (6-10 October 1975) and it was also on the agenda of the 11th Session of the Committee on Food Labelling (March 1976).

33. The Committee agreed to postpone action until the Commission had considered the recommendations which the Committee on Food Labelling would make on the question of date marking. The majority of the Committee also took the same view with regard to provision for directions on keeping, which some delegations proposed for inclusion in the standard.

Packaging

34. The Committee noted that the standards for quick frozen foods carried a section on "Packaging". It was pointed out that provisions of this nature were adequately covered by the Code of Practice for Frozen Fish. The Committee agreed that it was not necessary to provide for a separate packaging section but that a general reference to the Code of Practice for Frozen Fish should be included in the Standard.

Determination of Net Contents of Products Covered by Glaze (7.6)

35. The Committee agreed to defer the discussion of the matter until the general discussion of the background paper on the subject prepared by the delegation of the United Kingdom which would be held later in the session (see paras 111-113 of this Report).

Organoleptic Examination (7.5)

36. In line with its decision on inspection of the final product (see paras 26 and 38 of this Report) the Committee decided on a consequential amendment in this provision.

Lot Acceptance (9)

37. The Committee agreed to the proposal of the delegation of the Fed. Rep. of Germany to amend the text of the second sentence as follows: "The average net contents of all containers determined by procedures to be elaborated by the Codex Committee on Methods of Analysis and Sampling, is not less than the declared net content".

Annex A - Cooking Procedure

38. It was agreed to delete the reference to "thawed" under "Baking" and "Boiling in Bag" and to add a cross reference to thawing as described in section 7, Sampling, Examination and Analysis.

Annex B - Recommended Defect Table - Hake

39. Several delegations were of the opinion that the defect table system followed in the standards for sardines in which defects were classified as minor, major and serious could also be profitably applied to hake. It was agreed to revise the table along these lines as suggested by the delegations of Canada, Fed. Rep. of Germany, Norway, United Kingdom, USA and the observer from South Africa.

Status of the Standard

40. The Committee agreed to retain the Draft Standard at Step 7 of the Procedure, and to request governments to comment in particular on the revised defect table and on the procedures for the determination of net content of glazed products. The revised Draft Standard is attached to this report as Appendix II.

DRAFT STANDARD FOR QUICK FROZEN SHRIMPS AND PRAWNS AT STEP 7

41. The Committee had before it the above standard for consideration (ALINORM 74/18A, Appendix III) in the light of comments from governments (CX/FFP 75/14 and Conference Room Document 75/4).

Process Definition (2.2)

42. The Committee agreed to bring the provision for raw shrimps in line with the text adopted in the Standard for Quick Frozen Lobsters. Similarly with regard to the definitions for "parboiled" and "cooked" it was decided to delete the phrase "exposed to (atmospheric) steam or hot water" and to substitute "heated".

43. As a consequence of the decision taken with regard to the process definition in the Standard for Quick Frozen Fillets of Hake it was decided to make a similar amendment in this Standard (see also paras 23-24 of this Report).

44. The Committee agreed that the second sentence of sub-section 2.2.3 requiring that individually quick frozen shrimps be maintained separate was redundant since it also appeared in sub-section 3.3.1 Final Product - Appearance.

Presentation - Pieces (2.3.5)

45. The delegation of Canada in its written comments pointed out that it was not possible to count "pieces" in the final product on the basis of a theoretical count in the raw headless state. The Committee agreed with this observation and decided to adopt the Canadian proposal for a revised text.

Final Product - Appearance (3.3.1)

46. The Committee adopted two amendments to the present text: in the first sentence the words "or container" were added after "count category"; in the third sentence a number of defects were inserted in line with the revised defect table (see also para 59 of this Report).

Final Product - Texture (3.3.3)

47. It was proposed to require that shrimps should be "firm but not tough" since toughness could arise through abuse of bisulphite treatment. It was pointed out that quick frozen shrimps were often slightly tough and that this was a desired characteristic. No amendment was made.

Size Classification (3.3.5)

48. It was pointed out that no provision existed for unsized shrimp. The Committee agreed to adopt a revised text which allowed for unsized shrimp. It was further agreed that sized shrimp should be of comparable size per unit weight.

Food Additives (4)

49. Several delegations cited their country's regulations and stated their reservations with regard to a number of the additives listed. In particular the technological necessity of colours was questioned. With regard to sulphite it was agreed to differentiate between the raw and the cooked edible portion of the product and to allow for 100 and 30 mg/kg respectively. With regard to hydrophilic colloids the Committee agreed that since there was no specific information on the substances to be listed they could be deleted.

Hygiene (5)

50. In line with the decision taken to revise the hygiene provisions in the Standard for Quick Frozen Fillets of Hake, the Committee agreed to include similar provisions for shrimps. For the heat treated product the present provision on microbiological requirements was maintained (new 5.4) (see para 28 of this Report).

Name of the Food (6.1)

51. The Committee agreed to remove the square brackets around the provision allowing for the labelling of the product as either "shrimps" or "prawns" according to the usage in the country in which the product was to be sold (6.1.1). The Committee further agreed to require that the state in which the product is presented, i.e. whether raw or heat treated - should appear on the label (6.1.3).

Size Classification (6.2.2)

52. The Committee decided to delete the requirement (in square brackets) that the ungraded product should be so labelled. The delegation of France stated that it wished the provision to be retained.

List of Ingredients (6.3)

53. The Committee noted that in the text as it stood there appeared to be some confusion between the use of the words "additives" and "ingredients". The wording of the provision was re-arranged.

Country of Origin (6.6)

54. There was considerable further discussion on what constituted the country of origin. A number of delegations pointed out that particularly in the case of fishery products this was difficult to define. While it was agreed that the declaration of the country of origin was of fundamental importance, the Committee considered that the present wording of the provision provided protection to the consumer against possible deception.

55. It was pointed out that the present provision was taken from the Recommended International General Standard for the Labelling of Prepackaged Foods (sub-section 3.5) and thus was applicable to all Codex standards and concerned basic principles. For this reason it was thought that it would be better to discuss the subject in a wider forum.

Lot Identification (6.7)

56. The Committee agreed to bring the text of the provision into line with that of other standards for quick frozen fish products.

Cooking (7.3.2)

57. After some discussion it was decided to delete the reference to cooking time.

Lot Acceptance (9)

58. The Committee decided to rephrase the provision and further to require that there should be no obvious visual differences from the requirements listed in the product definition.

Defect Definitions and Defect Table (Annexes B + C)

59. The list of definitions (Annex B) was extended to include: Headless, Partially Headless, Discoloration and Blackening. The defect table (Annex C) was amended accordingly. With regard to "Tolerance for Uniformity" the Committee recognized that when mechanical sorting was employed it could be difficult to meet present requirements and the tolerances were therefore modified.

Size Classification (Annex D)

60. It was recognized that the present classification applied to all styles except whole shrimps, a further size classification for whole shrimps was added. It was decided to remove the square brackets from the alternative method for size classification and to revise the text.

Status of the Standard

61. The Committee agreed to submit the amended draft standard to the Commission at Step 8 of the Procedure. The revised document is attached to this Report as Appendix III.

CONSIDERATION OF PROPOSED DRAFT STANDARD FOR CANNED MACKEREL AND JACK MACKEREL AT STEP 4

62. The Committee had before it the above Proposed Draft Standard (ALINORM 76/18, Appendix V) and government comments CX/FFP 75/11, CRD 75/1 and CRD 75/1.1. The Committee decided to consider in conjunction with the standard a paper prepared by Australia, United Kingdom and USA entitled "The problem posed for new products by mandatory styles provisions in Codex Commodity Standards" (CX/FFP 75/17).

Styles - Presentation

63. The Committee noted that the Commission at its 10th Session (ALINORM 74/44) had agreed to adopt the recommendation of the Executive Committee (ALINORM 74/4) that Codex Standards should embrace as far as possible all the styles of products which were known to be of significance in international trade and therefore the listing of styles in Codex Standards should be considered as exclusive. When new styles were to be introduced, it was open to governments to propose them as amendments to Standards.

64. The Committee considered how the principles of the Commission's decision could best be interpreted in the development of styles for the present standard. It was decided to form two working groups - the first to discuss the implications of the Commission's decision and to develop phraseology which would cover present forms of presentation and at the same time be general enough to cover future potential forms of pack. The second to define forms of presentation for Canned Mackerel and Jack Mackerel.

65. The Committee considered the findings of the working group on phraseology and agreed to incorporate in section 2.2 "Presentation", the following wording to cover products not specifically named:

"Any other presentation of the product shall be permitted provided that it:

(i) is sufficiently distinctive from other forms of presentation laid down in this standard;

(ii) meets allthe other requirements of this standard;

(iii) is adequately described on the label to avoid confusing or misleading the consumer."

The Committee agreed that this provision should be included in all standards and then proceeded to discuss the proposed draft standard.

Scope (1)

66. The Committee agreed to bring the text of the Scope into line with that of the Recommended Standard for Tuna and Bonito in Water or Oil. The wording would allow for a product without salt to be included in the standard.

Product Definition (2.1)

67. This provision was amended to take account of the amendments made to the Scope. After consulting the Multilingual Dictionary of Fish and Fishery Products it was agreed to list the genus Decapterus under Jack Mackerel. It was noted that the classification of the species Rastrelliger and Auxis was open to question. It was pointed out that apart from the species Scomber there was little information on the level of trade in other species listed under mackerel. The Committee agreed that governments should be requested to provide production and trade data and further relevant information on the other species listed.

68. There was a consensus that mackerel (Scombridae) and jack mackerel (Carangidae) were different organoleptically and should not be packed together. Some delegations were of the opinion that the mixing of species within the families should not be allowed. The majority agreed, however, that species of the same genus with similar organoleptic qualities could be packed together and the product definition was amended to take account of this. Consequential amendments were made throughout the standard.

Presentation (2.2)

69. The Committee had before it a proposal for listing "Forms of Packed Fish" and "Packing Media" compiled by the working group mentioned above. Following some minor amendments it was agreed to include these provisions in the standard.

Optional Ingredients (3.3)

70. Natural starches were included under optional ingredients. Opinion was sharply divided as to whether provision should be made for the addition of vegetables, fruits, etc. Some delegations regarded products with these ingredients to be speciality products. Other delegations pointed out that the quantity of the added ingredients was small in relation to the fish part of the pack and that the use of such ingredients was well established.

71. The Committee decided that more information was required on the composition of products containing the optional ingredients in question. The delegation of the Fed. Rep. of Germany undertook to present to the next session of the Committee the required information which ultimately might be included in the standard as a separate provision.

Processing (3.4)

72. Amendments were made to take account of jack mackerel and minor amendments were made with regard to can quality requirements.

Final Product (3.5)

73. It was pointed out that in other standards it was required that "the product should be free from foreign matter". The Committee agreed to the inclusion of this provision. The sub-section on "Bones" was expanded to include "tails and pectoral fins". It was agreed to incorporate in the final product a provision for the appropriate characteristics listed in the defect table.

Food Additives (4)

74. Several delegations suggested expansion of the list of food additives. The substances proposed were: acetic, tartaric, lactic and citric acids; agar agar; tragacanth, guar gum, and arabic gum; caroub bean gum, carrageenan and modified starches. For the latter the justification provided was an improvement of the consistency, texture and appearance; the limits suggested were 10 g/kg. It was proposed to raise the maximum level in the final product for CMC from 800 mg/kg to 2.5 g/kg. The delegations of the Fed. Rep. of Germany and Poland stated that in their countries the use of CMC and smoke flavours was prohibited.

75. Following a discussion on what exactly constituted additives and what should be regarded as ingredients, the Committee decided to request the Committee on Food Additives for guidance on, for example, spice oils.

Hygiene (5)

76. It was agreed to include the recommendation that the product be prepared in accordance with the Code of Practice for Canned Fish.

Weights and Measures

77. The Committee agreed to include - in square brackets - a section on weights and measures requiring a minimum fill with mackerel or jack mackerel for packs in own juice, brine or marinades.

Labelling (6)

78. Several consequential amendments were made as a result of the revision of the sub-section (2.2.1 & 2.2.2) on presentation. It was also agreed to require that reference should be made to 'smoked' or 'smoke flavoured' in close proximity to the name of the product.

79. The provision for food undergoing processing in a second country was considered redundant and was deleted. For net contents an additional text was included - in square brackets - requiring that packs containing a liquid medium normally discarded before consumption should carry a declaration of the drained weight.

Sensory Examination (7.2)

80. The Committee was informed that the Joint ECE/Codex Alimentarius Group of Experts on Standardization of Fruit Juices at their 11th Session (October 1974 - ALINORM 76/14, para 138) had considered a paper prepared by Romania on the terms "organoleptic" versus "sensory".

81. The Group had noted that while the term "organoleptic" described qualities which caused the stimulation of senses, the term "sensory" referred to the evaluation of such stimuli.

82. The Committee decided to apply the same principle to Fish and Fishery Product Standards.

Defect Table

83. The Committee considered a proposal to provide for a defect table similar to the table elaborated by a working group for sardines and sardine type products. It was agreed to request the delegations of Canada, Denmark (Coordinator), France, Japan, Norway, Poland, Portugal and the USA to act as a working group to study in particular defect provisions.

Status of the Standard

84. The Committee agreed to return the Standard to Step 3 of the Procedure for a further round of government comments. The revised document is given in Appendix IV to this Report.

CONSIDERATION OF PROPOSED DRAFT STANDARD FOR CANNED SARDINES AND SARDINE TYPE PRODUCTS AT STEP 4

85. The Committee had before it the above proposed draft standard (ALINORM 76/18, App. VI) and government comments contained in CX/FFP 75/9, CX/FFP 75/12, CRD 75/2 and CRD 75/2.1.

Scope (1)

86. It was agreed that the terminology used in the Recommended Standard for Canned Tuna and Bonito in Water or Oil should also be used in this standard.

Product Definition (2.1.a)

87. The Committee again discussed whether the qualification "small" in relation to the fish to be used in the preparation of the product was appropriate. It was agreed to retain the qualification. The delegation of Japan reserved its position.

88. The delegations of Argentina and Uruguay supported by other delegations proposed that Engraulis anchoita should be included among the species which could be used to prepare a sardine type product. They stated that there was a considerable trade in this product, for which e.g. the name "Sardinas Argentinas" was used. Other delegations held the view that the proposed species differed considerably from those already listed and should therefore not be covered by the standard.

89. It was pointed out that, as was the case with species in the mackerel and jack mackerel standard, organoleptic similarity should decide which species were to be included (see also para 68 of this Report). The Committee agreed to the inclusion of the named species in the standard. The delegations of Portugal and Morocco stated their reservations.

Presentation (2.2)

90. The Committee agreed to relocate the provision for "packed" (2.1.b) in this sub-section.

91. The Committee discussed in detail the minimum number of fish that should be contained in a can. It was finally agreed that two should be the lower limit. A proposal was made to relate the number of fish in a container to its volume and it was suggested that the label should indicate the range or average number of fish present in the can. Some delegations pointed out practical difficulties inherent in these proposals and it was decided to request governments for specific comments on this matter. The proposals ranged from a minimum of three fish per 125 ml to three fish per 180 ml.

92. As had been decided earlier the provision on forms of presentation not listed in the standard at present was included.

Raw Material (3.1), Packing Media (3.2) and Optional Ingredients (3.3)

93. The provisions were revised to bring them into line with the similar provision in the standard for canned mackerel (see also paras 70-71 of this Report).

Processing (3.4)

94. It was agreed to remove the square brackets around the word "practically" and further to state that the milt might be retained in the gutted fish as it had been found difficult in practice under certain circumstances to remove it. The Committee also agreed that the fish could be either cooked or smoked.

Appearance (3.5.1)

95. After considerable discussion it was decided not to make specifications for fish size or for limits in the space between the fish and the can and instead to state these requirements in general terms.

"Sardines", smoke flavoured

96. The Committee agreed that no definition for smoke flavoured sardines as distinct from smoked products was required as a provision for the naming of the two kinds of product appeared in the labelling section (new 6.1.2).

Food Additives (4)

97. It was decided that the same additives as those which were included in the standard for Canned Mackerel should be allowed for.

Weights and Measures (old 6)

98. The Committee did not consider this provision necessary and agreed to its deletion.

Name of the Food (new 6.1)

99. The attention of the Committee was drawn to the clause that the name of the food should be "in accordance with the law and custom of the country in which the product is sold". One delegation held the view that such a requirement was not conducive to harmonization of food legislation. Other delegations stated that for sardines and sardine type products this provision was indispensable. It was agreed to request governments to supply information on the names commonly used in the labelling of these types of product in their countries.

100. For smoked fish or smoke flavoured fish (new 6.1.2) the Committee decided to adopt the same wording as for Canned Mackerel and delete the requirement that this treatment be part of the name on the label. It was noted that the addition of smoke flavour changed the nature of the product to such a degree that mere listing in the list of additives would not provide sufficient information to the consumer. It was suggested that it was adequate for "smoked" or "smoke flavoured" to appear conspicuously on the label; however, it was agreed to leave the phrase "in close proximity to the name" in the provision.

101. The Committee agreed to revise the provision on exuded water and to relate it to the product packed in edible oil (new 6.1.3).

Net Contents (new 6.3.2)

102. Some delegations proposed that the declaration of the net drained weight be made mandatory. The Committee could not agree with this suggestion and some delegations proposed the deletion of the provision which at present was optional. It was decided not to alter the text but to place it in square brackets so that governments could comment.

Country of Origin (new 6.5)

103. The Committee agreed to insert the standard wording.

Defect Table (Annex A)

104. Several delegations stated that the defect table which had been presented by the "Nantes" working group at the 9th Session of the Committee had been tested with good results. Some modifications based on the experience gathered were suggested and the Committee agreed to place the demerit points for ventral breaks, excessively tough or fibrous flesh and severe discolouration in square brackets to draw the attention of governments to the classification of these specific defects. It was also agreed to revise the percentage limits for ventral breaks and broken or craked flesh.

105. In the discussion it was pointed out that the defects and the associated demerit points should be considered in relation to each other and not be judged in isolation.

Status of the Standard

106. The Committee agreed to submit the amended Proposed Draft Standard to the Commission at Step 5 of the Procedure. The revised document is attached as Appendix V to this Report.

CONSIDERATION OF PROPOSED DRAFT STANDARD FOR QUICK FROZEN BLOCKS OF COD, HADDOCK, HAKE AND OCEAN PERCH AT STEP 2

107. The delegation of Poland introduced the report of a meeting of an informal working group consisting of delegates from Canada, Denmark, Japan, New Zealand, Poland and the United States and the observer from South Africa on a Proposed Draft Standard for Quick Frozen Blocks of White Fish Fillets and Minced White Fish Flesh (CX/FFP 75/5).

108. The Committee expressed its appreciation for the work done and noted that substantial agreement on the standard had been reached by the Working Group. It was decided to send the document out to governments and request early comments at Step 3 of the Procedure. The delegation of the Netherlands reiterated its opposition to the development of this standard and further stated that it would have preferred a revision of the document prior to it being circulated for comments.

CONSIDERATION OF PROPOSED DRAFT STANDARD FOR QUICK FROZEN BREADED FISH FINGERS (FISH STICKS) AND BREADED FISH PORTIONS

109. The Committee considered the Proposed Draft Standard (CX/FFP 75/8) which was introduced by the United Kingdom, the author country. It was pointed out that the document had been prepared as a general basis for comments and that several sections had been left open.

110. There was general agreement that the paper would provide a good basis for further discussion and the Committee thanked the delegation of the United Kingdom for its efforts. It was proposed that provisions should be added for (i) cooking and evaluation of texture, and (ii) evaluation of fish content. The Committee decided that the document be sent to governments for early comments at Step 3 of the Procedure.

DETERMINATION OF NET CONTENTS OF PRODUCTS COVERED BY GLAZE

111. The delegation of the United Kingdom had prepared a paper on determination of glaze (CX/FFP 75/15). Results were presented on tests to determine glaze on quick frozen fillets of plaice and on individually frozen scampi meat. The method was based on the drying and removal of the thawed glaze with a paper cloth or cellulose towel. With the method as presently given in the standard there was a risk of inaccurate results as the water might refreeze and this was avoided by the paper towel technique. The method was, however, also affected by the presence of phosphates. During storage particularly under adverse storage conditions water could migrate from the body of the fish which could give rise to abnormally high results. This difficulty was not related to the method and in fact could be an indicator of storage conditions.

112. The Committee agreed to accept the revised method for use in the standard for hake and to ask for goverment comments on the procedure below:
"7.3 Determination of Net Contents of Products covered by Glaze. As soon as a package is removed from low temperature storage, open immediately and place the contents under a gentle spray of cold water. Agitate carefully so that the product is not broken. Spray until all ice glaze that can be seen or felt is removed. Remove adhering water by the use of a paper towel and weigh the product in a tared pan.
Note: Storage of the product may cause or contribute to a low net weight (whether or not the product has been glazed)".

113. The Committee considered whether this method would be generally applicable. It was pointed out that, in the case of shrimps and prawns - because of the large number of forms of presentation covering both raw and heated products, the small units often involved and the quantity of interstitial water in quick frozen blocks - the paper cloth method might not be applicable and give accurate results. For this reason the Committee decided that the amended method should apply to raw fillets only and should be inserted in the hake standard.

CONSIDERATION OF PROPOSED DRAFT CODE OF PRACTICE FOR FROZEN FISH AT STEP 4 AND FURTHER DISCUSSION OF PROPOSED DRAFT CODES OF PRACTICE FOR FRESH FISH (STEP 5) AND FOR CANNED FISH (STEP 5)

Working Group

114. The Committee appointed a working group to review the Proposed Draft Code of Practice for Frozen Fish and to consider the present status of the Proposed Draft Codes of Practice for Fresh Fish and for Canned Fish. The Group which met on 29 and 30 September and 1 October 1975 comprised members of the delegations of Canada, Denmark, Ireland (Chairman), Netherlands, Sweden and USA and representatives of FAO and WHO.

PROPOSED DRAFT CODE OF PRACTICE FOR FROZEN FISH

115. The Group considered the Draft Code of Practice for Frozen Fish (CX/FFP 73/5) in the light of government comments received (CX/FFP 75/16) and Conference Room Documents 75/5 and 75/5.1. Furthermore in accordance with the decision of the Codex Alimentarius Commission at its 10th Session in July 1974 (ALINORM 74/44) the Group conducted this examination in conjunction with an examination of the draft Code of Practice for the Processing and Handling of Quick Frozen Foods (ALINORM 74/25, Appendix VII = CX/FFP 75/10 - Step 8) and ensured that the two codes were consistent with each other.

116. The Group found that the government comments received were, in the main, of an editorial nature and included these in its proposal for revision of the text of the Code. Two matters of a substantive nature were discussed by the Group and these matters were referred back to the Committee for consideration.

117. The first issue was a proposal by the delegation of Sweden that the title "Proposed Draft Code of Practice for Frozen Fish" should be changed to read "Proposed Draft Code of Practice for Quick Frozen Fish", it being the opinion of the delegation that international trade in frozen fish consisted almost entirely of fishery products which had been quick frozen.

118. The delegation of Sweden also considered that there was a danger that the omission of the term "quick" might lead to an extended trade in fishery products which were not properly quick frozen. It was pointed out that in the case of large fish such as tuna, there were technical difficulties to quick freezing and the Committee agreed to let the title remain unchanged.

119. The second point arose from a statement made in the explanatory text attached to paragraph 7.6 of the Proposed Draft Code of Practice for Frozen Fish. This states: "Frozen fish thawed prior to sale should be sold as such. It is a questionable practice to designate such products as fresh fish". It was the opinion of the Working Group that this was best left to the jurisdiction of individual countries. The Committee agreed with this conclusion.

120. The Working Group was of the opinion that the Codex Committee on Fish and Fishery Products should consider if the code as revised should be advanced to Step 5 and submitted to the next session of the Codex Committee on Food Hygiene. It was of the opinion that this Code of Practice was now a valuable source of reference to sound technological practices and that this would be further enhanced by improvements in the layout and general presentation and in particular by the addition of a subject index that would facilitate reference.

Status of the Proposed Draft Code

121. The Committee agreed to advance the revised Proposed Draft Code of Practice for Frozen Fish to Step 5 of the Procedure, with the proviso that any substantial changes made by the Committee on Food Hygiene would be further considered by this Committee at its next Session. It was further agreed to propose to the Commission to omit Steps 6-8 of the Procedure. The revised document is attached as Appendix VI to this Report.

PROPOSED DRAFT CODES OF PRACTICE FOR FRESH FISH AND FOR CANNED FISH

122. The Working Group (see para 114 of this Report) noted the recommendations of the 12th Session of the Codex Committee on Food Hygiene in Washington in May 1975 in relation to the hygiene provisions in the Proposed Draft Codes of Practice for Fresh Fish and Canned Fish. The Hygiene Committee had been of the opinion that the amendments made were of such a nature that reference back to the Committee on Fish and Fishery Products was not necessary.

123. The Committee agreed with this view and recognized that the amendments in question made a substantial contribution to the hygiene aspects of the Codes. It wished to place on record its appreciation of the valuable contribution made by the Codex Committee on Food Hygiene. The Committee also endorsed the view of the Codex Committee on Food Hygiene in expressing its satisfaction for the fruitful collaboration with the FAO Fisheries Department during the elaboration of the two Codes of Practice.

124. The Committee confirmed its agreement to submit to the Commission at Step 5 of the Procedure, with the proposal that Steps 6, 7 and 8 be omitted, the Proposed Draft Codes for Fresh Fish and for Canned Fish (as contained in Appendices II and III of the Report of the 12th Session of the Codex Committee on Food Hygiene, ALINORM 76/13A) with a list of corrigenda as contained in a separately issued corrigendum to the English version of ALINORM 76/13A.*

GENERAL

125. The Working Group had also considered a suggestion as to whether the titles of Codes developed by Commodity Committees should be amended to read "Codes of Technological and Hygiene Practice" in recognition of their important hygienic implications. The Working Group pointed out that because of the preponderance of technological matters in the Codes and because only the more important hygienic aspects were dealt with, there would be a danger, if such a title were adopted, that those making use of the codes might conclude that the Codes were a comprehensive statement of all hygienic requirements. The Committee agreed with this view and decided to leave the title unchanged.

126. The Committee also agreed with the Working Group that there should be a better recognition of the importance of the hygiene aspects of the Codes and that this could be best achieved by placing greater emphasis on hygiene in Scope provisions by adopting the text drafted for the Fresh Fish Code which reads as follows: "It contains the technological guidelines and the most essential requirements of hygiene".

CONSIDERATION AT STEP 2 OF THE PROPOSED DRAFT CODES OF PRACTICE FOR SMOKED FISH AND FOR FROZEN SHRIMPS AND PRAWNS

127. The Committee considered the above Proposed Draft Codes of Practice as contained in documents CX/FFP 75/6 and CX/FFP 75/7 respectively and agreed that they should be sent to governments for comments at Step 3 of the Procedure.

OTHER BUSINESS

Use of the Spanish Language

128. The delegations of Argentina and Cuba asked that Spanish be introduced as one of the working languages of the Committee. They expressed the view that this would stimulate participation by Spanish speaking countries.

129. To support their request, they pointed out that over the last three years the Committee's sessions had been attended by a greater number of delegations whose official language was Spanish than by those whose official language was French. Moreover a substantial number of Spanish speaking countries had sent in written comments.

130. The Chairman took note of the delegations' observations and agreed to pass on their request.

Revision of the Multilingual Dictionary on Fish and Fishery Products

131. The Committee was informed that revision of this dictionary by the Fisheries Division of OECD was in progress. Governments were requested to send any suggestion for additions or modifications to:

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F-75016 Paris
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Standard for Frog Legs

132. The delegation of Cuba requested that the Committee consider the elaboration of a Standard for Frog Legs. The Secretariat pointed out that the Commission had received an earlier request and had been of the opinion that the preparation of frog's legs mainly involved hygienic requirements. It had therefore charged the Codex Committee on Food Hygiene with the task of elaborating a Code of Hygienic Practice for Frog Legs.

*Note: In the case of the French and Spanish versions, the amendments have been incorporated directly into the text.

133. A Draft Code prepared by the delegation of the USA with the assistance of India and Mexico had been submitted to the 12th Session (1975) of the Committee on Food Hygiene and was now at Step 3 of the Procedure.

134. The Fisheries Department of FAO was also considering to place before the Consultation on Codes of Practice a proposal to begin work on a Code for Frog Legs.

135. Taking account of these activities, the Committee agreed to consider at a future date whether the criteria for the elaboration of a Standard for Frog Legs were complied with.

Standard for Salted and Dried Fish

136. The delegation of Brazil proposed that a standard for Salted and Dried Fish be elaborated. No decision was taken.

Draft Standard for Canned Crab Meat - Monosodium Glutamate

137. The Committee noted the request of the Codex Committee on Food Additives to reconsider the maximum level of glutamic acid in Canned Crab Meat. The Committee agreed to request governments to forward information on the technological need for the use of M.S.G. and proposals for maximum limits of M.S.G. in the end product taking into account the amount of this substance that was naturally present.

DATE AND PLACE OF NEXT SESSION

138. The Committee was informed that the date for the next session had not yet been decided and would be communicated after consultation between the Norwegian authorities and the Codex Alimentarius Secretariat in Rome.

SUMMARY STATUS OF WORK

Standard/Code	Step	To be dealt with by	Document
Canned Pacific Salmon	9	Governments	CAC/RS 3-1969 Rev.1 1/
QF Gutted Pacific Salmon	9	Governments	CAC/RS 36-1970 1/
Canned Shrimps or Prawns	9	Governments	CAC/RS 37-1970 Rev.1 1/
QF Fillets of Cod and Haddock	9	Governments	CAC/RS 50-1971
QF Fillets of Ocean Perch	9	Governments	CAC/RS 51-1971
Canned Tuna and Bonito in Water or Oil	9	Governments	CAC/RS 70-1974 1/
Canned Crab Meat	8	11th CAC	ALINORM 76/18 IV
Canned Sardines and Sardine-type Products	5	11th CAC/ 11th FFP	ALINORM 76/18A V
Canned Mackerel and Jack Mackerel	3	11th FFP	ALINORM 76/18A IV
QF Fillets of Flat Fish	8	11th CAC	ALINORM 76/18 II
QF Shrimps or Prawns	8	11th CAC	ALINORM 76/18A III
QF Fillets of Hake	7	11th FFP	ALINORM 76/18A II
QF Lobsters, Rock Lobsters, Spiny Lobsters and Slipper Lobsters	5	11th CAC/ 11th FFP	ALINORM 76/18 III
QF Blocks of Cod, Haddock, Hake and Ocean Perch	3	11th FFP	CX/FFP 75/5 2/
QF Breaded Fish Portions	3	11th FFP	CX/FFP 75/8 2/ 3/
Code of Practice for Fresh Fish	5	11th CAC 4/	ALINORM 76/13A II 5/
Code of Practice for Canned Fish	5	11th CAC 4/	ALINORM 76/13A III 5/
Code of Practice for Frozen Fish	5	11th CAC/ 13th FH ('76)/ 11th FFP	ALINORM 76/18A VI
Code of Practice for Smoked Fish	3	11th FFP	CX/FFP 75/6 2/
Code of Practice for Shrimps and Prawns	3	11th FFP	CX/FFP 75/7 2/
Code of Practice for Lobsters and Related Species	2	11th FFP	CX/FFP 76/16 1/
Code of Practice for Salted Fish	-	Exp.Consult./ 12th FFP	
Code of Practice for Minced Fish Blocks	-	Exp.Consult./ 12th FFP	
Code of Hygienic Practice for Molluscan Shellfish	5	11th CAC/ 13th FH ('76)	ALINORM 76/13A VI 6/

1/ To be distributed in due time. 2/ Distributed in 1975 prior to 10th Session.
3/ See also para 110 of this Report. 4/ With the recommendation to omit Steps 6, 7 and 8.
5/ Plus corrigendum (English version only - separately issued; amendments have been incorporated directly into the French and Spanish texts).
6/ Elaborated independently by the Food Hygiene Committee.

ALINORM 76/18A
APPENDIX I

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DRAFT STANDARD FOR QUICK FROZEN FILLETS OF HAKE
(retained at Step 7)

1. SCOPE

This standard applies to quick frozen fillets of the species as defined below and offered for direct consumption without further processing. It does not apply to the product indicated as intended for further processing or for other industrial purposes.

2. DESCRIPTION

2.1 Product Definition

2.1.1 Quick frozen fillets of hake are obtained from fish of the genera Merluccius and Urophycis including the following species:

(a) Merluccius merluccius
(b) Merluccius bilinearis
(c) Merluccius hubbsi
(d) Merluccius capensis
(e) Merluccius paradoxus
(f) Merluccius gayi
(g) Merluccius polli
(h) Merluccius Senegalensis
(i) Urophycis chuss
(j) Urophycis tenuis
(k) Urophycis brasiliensis

2.1.2 Fillets are slices of fish of irregular size and shape which are removed from the carcase by cuts made parallel to the backbone and sections of such fillets cut so as to facilitate packing.

2.2 Process Definition

The product after any suitable preparation shall be subjected to a freezing process and shall comply with the conditions laid down hereafter. The freezing process shall be carried out in appropriate equipment in such a way that the range of temperature of maximum crystallization is passed quickly. The quick freezing process shall not be regarded as complete unless and until the product temperature has reached -18°C (0°F) at the thermal centre after thermal stabilization. The product shall be maintained under such conditions as will maintain the quality during transportation, storage and distribution up to and including the time of final sale.
The recognized practice of repacking quick frozen products under controlled conditions followed by the re-application of the quick freezing process as defined is permitted.

2.3 Presentation

2.3.1 Fillets shall be presented as:

2.3.1.1 skin-on, unscaled; or
2.3.1.2 skin-on, scaled (scales removed); or
2.3.1.3 skinless

Fillets may be presented as boneless, provided that boning has been completed including the removal of pin bones.

2.3.2 Other Presentation

Any other presentation of the product shall be permitted provided that it:
(i) is sufficiently distinctive from other forms of presentation laid down in this standard;
(ii) meets all the other requirements of this standard;
(iii) is adequately described on the label to avoid confusing or misleading the consumer.

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Raw Material

Quick frozen fillets of hake shall be prepared from sound fish of the species listed under sub-section 2.1.1 which are of a quality such as to be fit to be sold fresh for human consumption.

3.2 Optional Ingredients

Sodium chloride may be present at a level not exceeding 1.0 % m/m.

3.3 Final Product

3.3.1 Appearance

3.3.1.1 The fillets shall be free from foreign matter and all internal organs and shall be reasonably free from ragged edges, tears, fins or part fins, significantly discoloured flesh, bruises, blood clots, black membrane (belly wall), parasites and where appropriate skin, scales and bones (see Annex B).

3.3.1.2 The final product shall be free from deep dehydration (freezerburn) which cannot easily be removed by scraping without unduly affecting the quality and appearance of the final product.

3.3.1.3 The final product shall be reasonably free from undesirably small fillet pieces, and where more than one fillet or fillet piece is packed in a pack, the portions shall be reasonably uniform in size. No piece added for mass adjustment shall have a mass of less than 30 g, and the maximum number of small fillet pieces shall be one per pack except as provided for in sub-section 6.1.1.

3.3.2 Odour, Flavour, Colour and Texture

After thawing and/or after cooking by steaming, baking or boiling as set out in sub-section 7.3, the product shall have an odour, flavour, colour and texture characteristic of the species and shall be free from any objectionable odours and flavours and its texture shall be firm and not tough, soft or gelatinous.

3.3.3 Glazing

Note by the Secretariat: In other standards for Quick Frozen Fish and Fishery Products there is a provision for glazing.

3.3.4 Defects and Tolerances (Recommended)

A recommended table of physical defects, as defined in Annex A, for optional use with consignments of the final product with an AQL of 6.5 is appended as Annex B.

4. FOOD ADDITIVES (endorsed: ALINORM 74/12, para 79)

Additive	Maximum level in the final product
Water-binding agent (driploss prevention)	
- Monophosphate, monosodium or monopotassium (Na or K orthophosphate)	0.5% m/m expressed as P_2O_5, singly or in combination
- Diphosphate, tetrasodium or tetrapotassium (Na or K pyrophosphate)	
- Triphosphate, pentasodium or pentapotassium or calcium (Na, K or Ca tripolyphosphate)	
- Polyphosphate, sodium (Na hexametaphosphate)	
Antioxidant	
- Ascorbate, sodium or potassium salts	0.1% m/m expressed as ascorbic acid

5. HYGIENE AND HANDLING

5.1 It is recommended that the product covered by the provisions of this standard be prepared and handled in accordance with the following Codes:

(i) the appropriate sections of the Recommended International Code of Practice - General Principles of Food Hygiene (CAC/RCP 1-1969)
(ii) the (Recommended) Code of Practice for Frozen Fish (CAC/RCP .....)

5.2 To the extent possible in good manufacturing practice, the product shall be free from objectionable matter.

5.3 When tested by appropriate methods of sampling and examination, the product:

a. shall be free from microorganisms in amounts harmful to man;
b. shall be free from parasites harmful to man; and
c. shall not contain any toxic substances originating from microorganisms in amounts which may represent a hazard to health.

6. LABELLING

In addition to sections 1, 2, 4 and 6 of the Recommended International General Standard for the Labelling of Prepackaged Foods (CAC/RS 1-1969) the following specific provisions apply subject to endorsement by the Codex Committee on Food Labelling.

6.1 Name of the Food

6.1.1 The name of the product as declared on the label shall be:

- "fillets of hake", "hake fillets" whether qualified or not, or in countries where laws and customs so provide, the name may be "fillets of whiting" or "whiting fillets" or other names which do not mislead the consumer;
- packs of fillets cut from blocks which may contain a number of small pieces in excess of the number permitted by sub-section 3.3.1.3 may be labelled as fillets of hake provided that such labelling is customarily used in the country where the products are to be sold and provided the product is identified to the consumer so that he will not be misled.

6.1.2 In addition, there may appear on the label reference to the form of presentation as skin-on or skinless and/or boneless, as appropriate. This information shall be included if the omission of such labelling would mislead the consumer.

6.1.3 The term "quick frozen" shall also appear on the label, except that the term "frozen" 1/ may be applied in countries where this term is customarily used for describing the product processed in accordance with sub-section 2.2 of this standard.

6.2 List of Ingredients

A complete list of ingredients shall be declared on the label in descending order of proportion; sub-sections 3.2(b) and (c) of the Recommended International General Standard for the Labelling of Prepackaged Foods (CAC/RS 1-1969) are applicable.

6.3 Net Contents

6.3.1 The net contents shall be declared by weight in either the metric system ("Système international" units) or avoirdupois or both systems of measurement as required by the country in which the product is sold.

6.3.2 Where products have been glazed the declaration of net contents of the product shall be exclusive of the glaze.

6.4 Name and Address

The name and address of the manufacturer, packer, distributor, importer, exporter or vendor of the product shall be declared.

6.5 Country of Origin

6.5.1 The country of origin of the product shall be declared it its omission would mislead or deceive the consumer.

6.5.2 When the food undergoes processing in a second country which changes its nature, the country in which the processing is performed shall be considered to be the country of origin for the purposes of labelling.

6.6 Lot Identification

Each container shall be permanently marked in code or in clear to identify the producing factory and the date of production.

7. SAMPLING, EXAMINATION AND ANALYSIS

7.1 Sampling

Sampling of lots for examination of the product shall be in accordance with the FAO/WHO Codex Alimentarius Sampling Plans for Prepackaged Foods (AQL-6.5) (CAC/RM 42-1969).

7.2 Thawing (CAC/RM 40-1971)

The sample is thawed by enclosing it in a film type bag and immersing in an agitated water bath held at approximately 20°C (68°F). The complete thawing of the product is determined by gently squeezing the bag occasionally so as not to damage the texture of the fish, until no hard core or ice crystals are felt.

1/ "frozen": This term is used as an alternative to "quick frozen" in some English speaking countries.

7.3 Cooking

7.3.1 Steaming

Steam the sample in a closed dish over boiling water for about 35 minutes if frozen, or for about 20 minutes after thawing the product.
The dish should be covered and should be kept in a water bath at 60°C (140°F) during testing.

7.3.2 Baking

Place the sample in a baking pan lined with aluminium foil. Cover the pan with a sheet of aluminium foil and crimp the foil around the edges of the top of the pan. Place the pan and contents in a pre-heated oven maintained at 230°C (450°F) until cooking is completed. This requires about 20 minutes.

7.3.3 Boiling in Bag

Place the sample into a boilable film-type pouch and seal. Immerse the pouch and its contents into boiling water and cook until the internal temperature of the fillet sample reaches 70°C (160°F). Remove the boiled product from the pouch and drain.
Note: see also sub-sections 7.2 and 7.5.

7.4 Examination for Physical Defects

The sample may be examined for defects set out in Annex A according to Annex B.

7.5 Organoleptic Assessment

Organoleptic assessment of the product shall be made only by persons trained in such assessment and shall take place after the sample has been thawed in accordance with the procedure as set forth in sub-section 7.2. When applicable, the sample shall be cooked prior to organoleptic assessment according to a method set out in sub-section 7.3.

7.6 Determination of Net Contents of Products Covered by Glaze

As soon as a package is removed from low temperature storage open immediately and place the contents under a gentle spray of cold water. Agitate carefully so that the product is not broken. Spray until all ice glaze that can be seen or felt is removed. Remove adhering water by the use of a paper towel and weigh the product in a tared pan.
Note: Storage of the product may cause or contribute to a low net weight (whether or not the product has been glazed).

8. CLASSIFICATION OF DEFECTIVES

A sample shall be considered as "defective" when it fails to meet one or more of the quality requirements for the final product (sub-sections 3.3.1.1, 2 and 3 and 3.3.2).

9. LOT ACCEPTANCE

A lot will be considered as meeting the final product requirements of this standard when:

a. the total number of "defectives" does not exceed the acceptance number (c) of the appropriate sampling plan in the Sampling Plans for Prepackaged Foods (AQL-6.5) (CAC/RM 42-1969); and
b. the average net contents of all containers determined by procedures to be elaborated by the Codex Committee on Methods of Analysis and Sampling is not less than the declared net contents.

ANNEX "A"

RECOMMENDED DEFINITIONS OF DEFECTS IN QUICK FROZEN FILLETS OF HAKE

Dehydration (Freezerburn)

i) Deep dehydration

An excessive loss of moisture from the surface of the fillet which masks the characteristic colour, penetrates below the surface and cannot be easily removed by scraping, and covers more than [1] cm^2 of the surface area of the fillet.

ii) Moderate dehydration

A loss of moisture from the surface of the fillet which is colour masking, and covers more than [1] cm^2 of the fillet but does not penetrate the surface and can be easily removed by scraping.

Foreign matter

Any material not derived from fish or not permitted by the standard.

Viscera

Any portion of the internal organs.

Parasites

Each parasite with a capsular diameter greater than 3 mm or a parasite not encapsulated and greater than 1 cm in length, or a parasite which is objectionable by virtue of its colour or any other characteristic.

[Ragged edges and tears

The cut longitudinal edges of the fillet exhibit marked irregularities.]

Discoloration, bruises and blood clots

i) Any significant discoloration, including bruises, browning or yellowing which is greater than 3 cm^2 up to and including 10 cm^2 and each additional complete 5 cm^2 thereafter.

ii) Any lump or mass of clotted blood greater than 5 mm in any dimension.

Skin and black membrane (belly lining)

i) In the case of skin-on or skinless fillets each piece of black membrane (belly lining) greater than 5 cm^2 up to and including 10 cm^2 and every additional complete 5 cm^2 thereafter.

ii) In the case of skinless fillets each piece of skin greater than 3 cm^2 up to and including 10 cm^2 and every additional complete 5 cm^2 thereafter.

Scales

i) Skin-on fillets
   (a) Each area of scales over 3 cm^2 up to and including 10 cm^2 and every additional complete 5 cm^2 thereafter.
   (b) Each complete unit of [5] loose scales.

ii) Skinless fillets
   Each complete unit of [5] loose scales.

Fins or part fins

Any fin or part fin (part fins are two or more rays connected by membrane).

Bones

Any bones exceeding the sizes specified in Annex B.9. Pin bones are not to be counted as a defect for fillets not designated boneless.

[Small pieces (not applicable to products cut from blocks)

(a) Each piece less than or equal to 30 g in weight.
(b) Each piece greater than 30 g but less than half the size of the average size of fillets in the pack.]

Odour in thawed state

Any odour which is distinctly objectionable.

Odour and flavour in cooked state

Any odour or flavour which after cooking is distinctly objectionable.

Texture

Any texture which after cooking is not characteristic of the species or is mushy or gelatinous, or tough.

ANNEX "B"

RECOMMENDED DEFECT TABLE FOR QUICK FROZEN FILLETS OF HAKE

Defect description	Classification		
	Serious	Major	Minor
FROZEN STATE (1 kg sample unit)			
Dehydration: i) Deep dehydration - > [1] cm^2	6	-	-
- < [1] cm^2	-	2	-
ii) Moderate dehydration, > [1] cm^2	-	-	1
THAWED STATE (1 kg sample unit)			
1. Foreign matter - each instance	6	-	-
2. Viscera - each instance	2	-	-
3. Parasites - each instance	2	-	-
[4]. Ragged edges and tears - each instance	-	-	1
5. Discoloration, bruises and blood clots			
i) Each significant discoloration > 3 cm^2 - < 10 cm^2	-	-	1
ii) Over 10 cm^2 significant discoloration, each additional complete 5 cm^2	-	-	1
iii) Each blood clot > 5 mm in any dimension	-	2	-
6. Skin and black membrane (belly lining)			
(a) Skin-on fillets			
i) Each piece of black membrane > 5 cm^2 - < 10 cm^2	-	-	1
ii) Over 10 cm^2 black membrane, each additional complete 5 cm^2	-	-	1
(b) Skinless fillets			
i) Each piece of skin > 3 cm^2 - < 10 cm^2, or each piece of black membrane > 5 cm^2 - < 10 cm^2	-	-	1
ii) Over 10 cm^2 skin or black membrane, each additional complete 5 cm^2	-	-	1
7. Scales			
(a) Skin-on fillets			
i) Each area of scale > 3 cm^2 - < 10 cm^2	-	-	1
ii) Over 10 cm^2 scale, every additional complete 5 cm^2	-	-	1
(b) Skinless fillets			
Each complete unit of [5] loose scales	-	-	1
8. Fins or part fins			
(a) Skin-on fillets - each fin or part fin	-	-	1
(b) Fillets designated boneless and/or skinless, each fin or part fin	-	2	-
9. Bones			
(a) Fillets not designated boneless - each single bone, other than pin bones, > 5 mm in any dimension or each cluster of such bones within an area of 3 cm^2	-	2	-
(b) Fillets designated boneless - each single bone > 5 mm in any dimension	2	-	-
[Or as an alternative:			
(a) Fillets not designated boneless - each single bone, other than pin bones, > 15 mm in length or > 1/3 mm in diameter or each cluster of such bones within an area of 3 cm^2	-	2	-
(b) Fillets designated boneless - each single bone > 15 mm in length or > 1/3 mm in diameter	2	-	-]
[10. Small pieces			
i) Each piece < 30 g in weight	-	2	-
ii) Each other small piece as defined in Annex A	-	2	-]
11. Odour - distinctly objectionable	6	-	-
COOKED STATE (100 g sub-sample)			
1. Odour or flavour distinctly objectionable	6	-	-
2. Texture			
i) The flesh is definitely not characteristic of the species or is mushy or very tough	6	-	-
ii) The flesh is tough or very soft	4	-	-

Maximum allowable tolerances for defects

A sample is considered defective if it has:

a) More than 4 points for defects classified as Serious; or
b) More than a total of [10] points for defects in the Major classification; or
c) More than a total of [12] points for defects in the combined classifications (including minor).

DRAFT STANDARD FOR QUICK FROZEN SHRIMPS OR PRAWNS
(advanced to Step 8)

1. SCOPE

This standard applies to quick frozen raw shrimps or prawns and those which have been steamed, parboiled or fully boiled during processing and offered for direct consumption. It does not apply to products indicated as intended for further processing or speciality products where shrimps or prawns only constitute a portion of the edible contents.

2. DESCRIPTION

2.1 Product Definition

2.1.1 Quick frozen shrimps or prawns are obtained from species of the families:

(a) Peneidae
(b) Pandalidae
(c) Crangonidae
(d) Palaemonidae

2.1.2 Shrimps or prawns of comparable size and colour may be mixed. Shrimps or prawns of obvious visual differences shall not be mixed.

2.2 Process Definition

2.2.1 The shrimps or prawns can be:

(i) "Raw" - not exposed to temperatures sufficiently high to coagulate the protein at the surface;

(ii) "Parboiled" - heated for a period of time such that the surface of the product reaches a temperature adequate to coagulate the protein at the surface of the shrimp but inadequate to coagulate the protein at the thermal centre;

(iii) "Cooked" - heated for a period of time such that the thermal centre of the shrimp reaches a temperature adequate to coagulate the protein.

2.2.2 The product, after any suitable preparation, shall be subjected to a freezing process and shall comply with the conditions laid down hereafter. The freezing process shall be carried out in appropriate equipment in such a way that the range of temperature of maximum crystallization is passed quickly. The quick freezing process shall not be regarded as complete unless and until the product temperature has reached -18°C (0°F) at the thermal centre after thermal stabilization. The product shall be maintained under such conditions as will maintain the quality during transportation, storage and distribution up to and including the time of final sale.
The recognized practice of repacking quick frozen products under controlled conditions followed by the re-application of the quick freezing process as defined is permitted.

2.2.3 Shrimps or prawns shall be either individually quick frozen or quick frozen in mass.

2.3 Presentation

2.3.1 Shrimps or prawns shall be presented as:

2.3.1.1 Whole - Cephalothorax (head), shell and tail fans on.
2.3.1.2 Headless - Cephalothorax (head) removed, shell and tail fans on.
2.3.1.3 Peeled (tail fans on) - Cephalothorax (head) removed and shell removed down to the last segment. The shell on the last segment and the tail fans to be present.

(i) Round - Prepared as described in 2.3.1.3.

(ii) Round and deveined - In addition to the preparation as described in 2.3.1.3, the back of the peeled segments of the shrimps or prawns have been cut open and the vein removed.

(iii) Fantail (split or outlet) - In addition to the preparation described in 2.3.1.3, the peeled segments of the shrimps or prawns have been split longitudinally through the dorsal axis, laid open and the vein removed.

(iv) Western style - In addition to the preparation as described in 2.3.1.3, the peeled segments of the shrimps or prawns have been split completely and longitudinally through the dorsal axis of the first four segments, laid apart and the vein removed.

2.3.1.4 Peeled (tail fans removed) - Cephalothorax (head) and all shell including tail fans removed.

(i) Peeled - Prepared as described in 2.3.1.4.

(ii) Peeled and deveined - In addition to the preparation as described in 2.3.1.4, the back has been cut open and the vein removed.

2.3.1.5 Pieces

Where the count of unglazed shrimps or prawns is greater than 150 per kg (> 70 lbs) a shrimp or prawn consisting of less than four segments is regarded as a piece; where the count of unglazed shrimps or prawns is 150 or less per kg (≤ 70 lbs) a shrimp or prawn consisting of less than five segments is regarded as a piece.
Such pieces may be present in the products defined in sub-sections 2.3.1.1, 2.3.1.2, 2.3.1.3 and 2.3.1.4, subject to the tolerances provided for in 3.3.6. When pieces are packed and sold as such, they shall be designated in accordance with section 6.1.2.

2.3.2 Other Presentation

Any other presentation of the product shall be permitted provided that it:

(i) is sufficiently distinctive from other forms of presentation laid down in this standard;

(ii) meets all the other requirements of this standard;

(iii) is adequately described on the label to avoid confusing or misleading the consumer.

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Raw Material

Quick frozen shrimps or prawns shall be prepared from clean and sound fresh or prefrozen shrimps or prawns of the species of the families listed under sub-section 2.1.1 and be of such a quality that they are suitable for human consumption.

3.2 Optional Ingredients

Water utilized either for glazing, cooking or for freezing may contain:

- Salt
- Lemon juice
- Sugars (sucrose, invert sugar, dextrose, fructose, glucose syrup, lactose)
- Seasonings, spices, flavourings (hydrolized vegetable protein).

3.3 Final Product

3.3.1 Appearance

- Clean, generally uniform in size within any count category or container where appropriate, and easily separated when labelled as individually frozen.
- Colour characteristic of the species and habitat or areas from which harvested.
- Free from foreign matter and practically free from: dehydration; black spot, blackening or other abnormal colouration; legs, loose shell, antennae, heads; shrimps or prawns with parts of heads, veins, or improperly peeled as appropriate for the form of presentation; torn, damaged shrimps or prawns; and free from otherwise unacceptable shrimps or prawns.
- Free from pieces in any form of presentation except as provided for in sub-section 2.3.1.5 and subject to the tolerances provided for in sub-section 3.3.6.

3.3.2 Odour and Flavour

After thawing and where applicable cooking by steaming or boiling as set out in sub-section 7.3, shrimps or prawns shall have a good characteristic odour and flavour and shall be free from objectionable odours and flavours of any kind. A natural odour or flavour reminiscent of iodoform is not a defect unless excessive.

3.3.3 Texture

After thawing and where applicable cooking by steaming or boiling as set out in sub-section 7.3, shrimps or prawns shall be relatively firm and not mushy.

3.3.4 Glazing

Shrimps or prawns may be glazed either individually or in bulk. When glazed the coating of ice shall cover the shrimps or prawns so as to minimize dehydration and oxidation. The water used in glazing shall be of potable quality. Standards for potability shall be not less than those contained in the "International Standards for Drinking Water", World Health Organization. Any ingredient or additive as listed in 3.2 and 4 respectively, used for glazing shall fulfill the hygiene requirements of section 5.

3.3.5 Size Classification

Quick frozen shrimps or prawns in any form of presentation may be sized or unsized. If they are sized they may be packed by count, i.e. the average number of shrimps or prawns of comparable size per unit weight (or mass) expressed as a range or the average number of shrimps or prawns either in the metric system ("Système International" units) or avoirdupois or both systems of measurement as required by the country in which the product is sold, and may be so declared as described in Annex D.

3.3.6 Defects and Tolerances

The quick frozen shrimps or prawns in the various forms of presentation shall comply with the definition and essential quality factors as set forth in this standard, subject to tolerance allowances as defined in Annex B and set out in Annex C.

4. FOOD ADDITIVES

The following additives in quick frozen shrimps or prawns have been or are subject to endorsement by the Codex Committee on Food Additives:

Additive	Maximum level in the final product
Citric acid	according to GMP (endorsed ALINORM 74/12, para 80)
Ascorbic acid	(limit to be proposed)
Canthaxanthine C.I. 75135	30 mg/kg singly or in combination - in heat treated products only (see also para 49 of this Report)
Erythrosine C.I. 45430	
Ponceau 4R C.I. 16255	
Diphosphate, tetrasodium or tetrapotassium (Na or K pyrophosphate)	5 g/kg expressed as P_2O_5; singly or in combination (endorsed ALINORM 74/12, para 82)
Triphosphate, pentasodium or pentapotassium (Na or K tripolyphosphates)	
Sodium bisulphite (For use in raw product only)	100 mg/kg in the edible part of the raw product; 30 mg/kg in the edible part of the cooked product, expressed as SO_2; singly or in combination (limit to be proposed)
Sodium sulphite	
Sodium hyposulphite	
Sodium or potassium metabisulphite	
Monosodium glutamate	

5. HYGIENE AND HANDLING

5.1 It is recommended that the products covered by the provisions of this standard be prepared and handled in accordance with the following Codes:

(i) the appropriate sections of the Recommended International Code of Practice - General Principles of Food Hygiene (CAC/RCP 1-1969)
(ii) the (Recommended) Code of Practice for Frozen Fish (CAC/RCP .....)
(iii) the (Recommended) Code of Practice for Shrimps or Prawns (CAC/RCP .....)

5.2 To the extent possible in good manufacturing practice, the product shall be free from objectionable matter.

5.3 When tested by appropriate methods of sampling and examination, the raw product:

a. shall be free from microorganisms in amounts harmful to man;
b. shall be free from parasites harmful to man; and
c. shall not contain any toxic substances originating from microorganisms in amounts which may represent a hazard to health.

5.4 When tested by appropriate methods of sampling and examination, the heat treated product:

a. shall not contain any pathogenic microorganisms; and
b. shall not contain any substances originating from microorganisms in amounts which may represent a hazard to health.

6. LABELLING

In addition to Sections 1, 2, 4 and 6 of the Recommended International General Standard for the Labelling of Prepackaged Foods (CAC/RS 1-1969) the following specific provisions apply subject to endorsement by the Codex Committee on Food Labelling.

6.1 Name of the Food

6.1.1 The name of the product as declared on the label shall be "shrimp" or "shrimps" or "prawns" provided that such labelling is customarily used in the country where the products are to be sold and provided the product is identified to the consumer so that he will not be misled.

6.1.2 In addition, there shall appear on the label in conjunction with the name of the product, the form of presentation as indicated below:

Style of presentation	Labelling designation
Whole	- Whole shrimp, shrimps or prawns
Headless	- Headless shrimp, shrimps or prawns
Peeled (tail fans on)	- Peeled (tail fans on), shrimp, shrimps or prawns. In addition, one of the words "deveined", "fantail", "cutlet", "butterfly", "split" or "round" may be used as appropriate
Peeled (tail fans removed)	- Peeled shrimp, shrimps or prawns. In addition, the word "deveined" may be used as appropriate
Pieces	- Pieces of shrimp, shrimps or prawns - shell on
Peeled Pieces or Broken Shrimp Meat	- Peeled pieces of shrimp, shrimps or prawns. In addition, the word "deveined" may be used if appropriate.

6.1.3 The nature of the product shall appear on the label: raw, parboiled or cooked. In the case of heated products, an indication of the degree of cooking shall conform to the provisions of sub-section 2.2.1.

6.1.4 (i) The term "quick frozen" shall also appear on the label, except that the term "frozen" 1/ may be applied in countries where this term is customarily used for describing the product processed in accordance with sub-section 2.2.2 of this standard.

(ii) Shrimps or prawns in any form of presentation may be individually quick frozen, and in such cases the labelling may be "individually quick frozen" or "individually frozen"1/.

6.1.5 In addition to the specified labelling designations above, the usual or common trade names of the variety may be added so long as it is not misleading to the consumer in the country in which the product will be distributed.

6.2 Size Classification

If quick frozen shrimps or prawns are labelled as to count, the classification must comply with the provisions of sub-section 3.3.5.

6.3 List of Ingredients

A complete list of ingredients shall be declared on the label in descending order of proportion; sub-sections 3.2(b) and (c) of the Recommended International General Standard for the Labelling of Prepackaged Foods (CAC/RS 1-1969) are applicable.
When the shrimps or prawns are glazed no specific label declaration shall be required unless the cooking and/or glazing water contains additives.

1/ "Frozen": This term is used as an alternative to "quick frozen" in some English speaking countries.

6.4 Net Contents

6.4.1 The net contents shall be declared by weight in either the metric system ("Système international" units) or avoirdupois or both systems of measurement as required by the country in which the product is sold.

6.4.2 Where products have been glazed the declaration of net contents of the product shall be exclusive of the glaze.

6.5 Name and Address

The name and address of the manufacturer, packer, distributor, importer, exporter or vendor of the product shall be declared.

6.6 Country of Origin

6.6.1 The country of origin of the product shall be declared if its omission would mislead or deceive the consumer.

6.6.2 When the food undergoes processing in a second country which changes its nature, the country in which the processing is performed shall be considered to be the country of origin for the purposes of labelling.

6.7 Lot Identification

Each container shall be permanently marked in code or in clear to identify the producing factory and the date of production.

7. SAMPLING, EXAMINATION AND ANALYSIS

7.1 Sampling

Sampling of lots for examination of the product shall be in accordance with the Codex Alimentarius Sampling Plans for Prepackaged Foods (AQL-6.5) (CAC/RM 42-1969).

7.2 Thawing (CAC/RM 40-1971)

The sample is thawed by enclosing it in a film type bag and immersing in an agitated water bath held at approximately 20°C (68°F). The complete thawing of the product is determined by gently squeezing the bag occasionally so as not to damage the texture of the shrimps or prawns, until no hard core or ice-crystals are felt.

7.3 Cooking - (to be used prior to examination, as appropriate)

7.3.1 Steaming - Steam the sample in a closed dish of 18 cm (7 inches) diameter over boiling water for about 15-20 minutes if frozen, or for about 7-10 minutes after thawing the product. The dish should be covered and should be kept in a water bath at 60°C (140°F) during testing.

7.3.2 Boiling in Bag - Place the sample into a boilable film-type pouch and seal. Immerse the pouch and its contents into boiling water and cook until the internal temperature of the product reaches 70°C (160°F). Remove the boiled product from the pouch and drain.
Note: See also sub-sections 7.2 and 7.5.

7.4 Examination of Physical Defects

The sample shall be examined for defects set out in Annex B according to Annex C.

7.5 Organoleptic Assessment

Organoleptic assessment of the product shall be made only by persons trained in such assessment and shall take place after the sample has been thawed in accordance with the procedure as set forth in sub-section 7.2. When applicable, the sample shall be cooked prior to organoleptic assessment by a method set out in sub-section 7.3.

7.6 Determination of Net Contents of Products covered by Glaze

Procedure

(1) Open the package with quick frozen shrimps or prawns immediately after removal from low temperature storage.
   (i) For the raw product, place the contents in a container into which fresh water at room temperature is introduced from the bottom at a flow of approximately 25 litres per minute.

(ii) For the cooked product place the product in a container containing an amount of fresh potable water of 27°C (80°F) equal to 8 times the declared weight of the product. Leave the product in the water until all ice is melted. If the product is block frozen, turn block over several times during thawing. The point at which thawing is complete can be determined by gently probing the block apart.

(2) Weigh a dry clean sieve with woven wire cloth with nominal size of the square aperture 2.8 mm (ISO Recommendation R565) or alternatively 2.38 mm (U.S. No.8 Standard Screen).
(i) If the quantity of the total contents of the package is 500 g (1.1 lbs) or less, use a sieve with a diameter of 20 cm (8 inches).
(ii) If the quantity of the total contents of the package is more than 500 g (1.1 lbs) use a sieve with a diameter of 30 cm (12 inches).

(3) After all glaze that can be seen or flet has been removed and the shrimps or prawns separate easily, empty the contents of the container on the previously weighed sieve. Incline the sieve at an angle of about 20° and drain for two minutes.

(4) Weigh the sieve containing the drained product. Subtract the mass of the sieve; the resultant figure shall be considered to be the net content of the package.

8. CLASSIFICATION OF DEFECTIVES

A sample shall be considered a "defective" when it fails to meet one or more of the quality requirements for the final product:

a. appearance (sub-section 3.3.1) subject to the tolerance for physical defects per sample unit of 500 g as shown in Annex C.
b. odour and flavour (sub-section 3.3.2).
c. texture (sub-section 3.3.3).

9. LOT ACCEPTANCE

A lot will be considered as meeting the final product requirements of this standard when:

a. the total number of "defectives" does not exceed the acceptance number (c) of the appropriate sampling plan in the Sampling Plans for Prepackaged Foods (AQL-6.5) (CAC/RM 42-1969); and
b. the average net contents of all containers determined by procedures to be elaborated by the Codex Committee on Methods of Analysis and Sampling is not less than the declared net contents; and
c. the size of the shrimps or prawns complies with the declared number (Annex D); and
d. there are no obvious visual differences as described in 2.1.2.

ANNEX A

The traditional practice followed in several countries of including "prawn", with some qualifying designation, in the common name of species which are not true prawns, such as "Dublin Bay Prawn" for Nephrops norvegicus, is recognized and nothing in the standard shall prevent this practice continuing provided due precautions are taken in the labelling of the product to ensure that the consumer in those countries will not be misled.

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ANNEX B

DEFINITIONS OF DEFECTS IN QUICK FROZEN SHRIMPS OR PRAWNS
(to be examined in the thawed state)

(a) Dehydration - the shrimps or prawns shell or meat contains whitish areas which seriously affect its appearance, texture or palatability.

(b) Discoloration - the shrimps or prawns possess an obvious yellow appearance which seriously affects their appearance, texture and/or palatability.

(c) Blackening - the shrimps or prawns show an obvious dark appearance which seriously affects their appearance or palatability.

(d) Black spot - the shrimps or prawns shell or meat contains darkened areas which seriously affect its appearance.

(e) Headless - a shrimp or prawn with the cephalothorax (head) entirely detached.

(f) Partially headless - a shrimp or prawn having an incompletely detached cephalothorax (head).

(g) Cut or torn, damaged, piece
   i) Cut or torn - a shrimp or prawn having a break in the meat greater than one third of the thickness of the shrimp or prawn at the location of the cut or tear.
   ii) Damaged - a shrimp or prawn which is crushed or mutilated so as to seriously affect its appearance.
   iii) Piece - a portion of a shrimp or prawn that contains less than five segments for counts $\leq$150/kg (70/1b) and less than four segments for counts $>$150/kg (70/1b).

(h) Improperly peeled - shrimps or prawns which have shell or pieces of shell on the meat in excess of that warranted by the form of presentation.

(i) Incompletely deveined - any black or dark vein that has not been removed if warranted by the form of presentation.

(j) Legs, loose shells, antennae
   i) Legs - walking legs either loose or attached to the shrimps or prawns.
   ii) Loose shell - any piece of shell which is completely detached from the shrimps or prawns.
   iii) Antennae -

(k) Extraneous materials - any material in a container which is not shrimp material and is not harmful when eaten.

ANNEX C

DEFECT TABLE

C.1 This table and the maximum allowable number of instances of defects are based on an AQL of 6.5. The defect table is not applied to individual packs but to consignments in association with the Sampling Plans for Prepackaged Foods (CAC/RM 42-1969). Instances of defects are awarded for the indicated occurrences per 500 grammes sample of product.

Type of defect		One instance	Additional Instance
Not more than 440/kg (200/lb)			
Dehydration/desiccation		5% by count	+ 3%
Discoloration (includes blackening and abnormal coloration)		5% by count	+ 3%
Black spot	meat	8% by count	+ 4%
	Shell	12% by count	+ 6%
Headless		5% by weight	+ 3%
Partially headless		8% by weight	+ 4%
Cut, torn or damaged		9% by weight	+ 5%
Pieces (does not apply to 2.3.5)		9% by weight	+ 5%
Improperly peeled in relation to form of presentation		5% by weight	+ 3%
Incompletely deveined (when specified)		5% by count	+ 3%
Heads, parts of heads and soft shell shrimp		3% by weight	+ 2%
Legs, loose shell and antennae		5 by number	+ 3
Extraneous material (not harmful)		2 by number	+ 1
Over 440/kg (200/lb)			
Dehydration/desiccation		5% by count	+ 3%
Black spot	meat	8% by count	+ 4%
	shell	12% by count	+ 6%
Cut, torn or damaged		9% by weight	+ 5%
Pieces (does not apply to 2.3.5)		25% by weight	+10%
Improperly peeled in relation to form of presentation		5% by weight	+ 3%
Incompletely deveined (when specified)		5% by count	+ 3%
Heads, parts of heads and soft shell shrimp		3% by weight	+ 2%
Legs and loose shell		20 by number	+ 5
Extraneous material (not harmful)		2 by number	+ 1

Maximum allowable tolerances for defects: A sample of 500 grammes will be considered defective if it contains more than 4 instances of defects.

C.2 Tolerance for uniformity (as set forth in Annex D)

Uniformity of size is determined by computing the actual count per kilogramme or pound of the shrimps or prawns in the sample unit, then allowing a tolerance as follows:

1. Sixty percent of the shrimp must fall into the stated count bracket, except that:
2. Only 20% of the remaining shrimp by number may fall into the next two larger count brackets, and the remaining 20% must fall into any lower count bracket.

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ANNEX D

SIZE CLASSIFICATION (OPTIONAL) FOR UNGLAZED SHRIMPS OR PRAWNS*

D.1.1 WHOLE SHRIMPS OR PRAWNS

Number of whole shrimps or prawns per kilogramme

Under 10
10 to 15 included
More than 15 but not more than 23
More than 23 but not more than 32
More than 32 but not more than 42
More than 42 but not more than 53
More than 53 but not more than 65
More than 65 but not more than 78
More than 78 but not more than 99
More than 99 but not more than 120

D.1.2 ALL STYLES EXCEPT WHOLE

Number of shrimps or prawns per kilogramme	Number of shrimps or prawns per pound
Under 22	Under 10
22 to 33 inclusive	10 to 15 inclusive
More than 33 but not more than 44	More than 15 but not more than 20
More than 44 but not more than 55	More than 20 but not more than 25
More than 55 but not more than 66	More than 25 but not more than 30
More than 66 but not more than 77	More than 30 but not more than 35
More than 77 but not more than 88	More than 35 but not more than 40
More than 88 but not more than 110	More than 40 but not more than 50
More than 110 but not more than 132	More than 50 but not more than 60
More than 132 but not more than 154	More than 60 but not more than 70
More than 154 but not more than 176	More than 70 but not more than 80
More than 176 but not more than 198	More than 80 but not more than 90
More than 198 but not more than 220	More than 90 but not more than 100
More than 220 but not more than 286	More than 100 but not more than 130
More than 286 but not more than 440	More than 130 but not more than 200
More than 440 but not more than 660	More than 200 but not more than 300
More than 660 but not more than 1100	More than 300 but not more than 500
Over 1100	Over 500

D.2 The following is an alternative method for size classification:

The size classification shall refer to the unglazed shrimps or prawns contained in the final product and may be expressed by indicating the average number of shrimps or prawns per unit of weight. The weight of the largest shrimp or prawn in the package shall not exceed the average weight (calculated by dividing the unit of weight by the average number declared) of the shrimp or prawn by more than 10% of such average weight, and the weight of the smallest shrimp or prawn shall not be more than 10% below of such average weight.

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* The count designation of quick frozen shrimps or prawns shall apply to the unglazed shrimps or prawns in the form of presentation designated on the label.

PROPOSED DRAFT STANDARD FOR CANNED MACKEREL AND JACK MACKEREL
(returned to Step 3)

1. SCOPE

This standard applies to canned mackerel and canned jack mackerel packed in water or oil or other suitable packing medium. It does not apply to speciality products where mackerel or jack mackerel only constitute a portion of the edible contents.

2. DESCRIPTION

2.1 Product Definition

Canned mackerel and canned jack mackerel are the products:

2.1.1 Prepared from species of the following families and genera:

Mackerel	Jack Mackerel
Scombridae	Carangidae
Scomber	Trachurus
Scomberomorus	Decapterus
Rastrelliger	
Acanthocybium	
Grammatorcynus	
Auxis	
Gasterochisma	

The pack shall not contain a mixture of genera but may contain a mixture of species of the same genus which have similar organoleptic qualities.

2.1.2 Packed in water or oil or other suitable packing media in hermetically sealed containers.

2.1.3 Processed by heat so as to prevent spoilage.

2.2 Presentation

2.2.1 Forms of packed fish

The fish pre-cooked or not, smoked or unsmoked, fried or unfried shall be presented in one of the following forms of pack:

2.2.1.1 Dressed fish - eviscerated fish with heads and tails removed (small fish may have the tails on), but with skin and bone. There shall be no free pieces other than a piece or segment added to fill the container.

2.2.1.2 Fillets - slices of fish of irregular size and shape, which are removed from the carcase by cuts made parallel to the back bone and sections of such fillets cut so as to facilitate packing.

2.2.1.3 Solid Pack - transverse segments of dressed fish without skin and bone. There shall be no free pieces other than a piece or segment added to fill the container.

2.2.1.4 Cutlets - complete or half transverse segments of dressed fish. There shall be no free pieces other than a piece or segment added to fill the container.

2.2.1.5 Middle-cut - complete transverse segments of dressed fish not including any part of the belly cavity. There shall be no free pieces other than a piece or segment added to fill the container.

2.2.1.6 Chunks - skinned and deboned pieces of fish substantially consisting of two or more flakes.

2.2.1.7 Bits - irregular shaped pieces.

2.2.1.8 Flake or flakes - skinned and deboned flakes. The muscle structure of the flesh is retained.

2.2.1.9 Grated, shredded or minced - comminuted fish not including skin or bone and not having the consistency of a paste.

2.2.2 Form of packing media

The product shall be presented in one of the following packing media with or without permitted optional ingredients.

2.2.2.1 Own juice
2.2.2.2 Brine or water
2.2.2.3 Edible oil
2.2.2.4 Edible oil with own juice
2.2.2.5 Sauce
2.2.2.6 Marinades with or without wine
2.2.2.7 Aspic (jelly)

2.2.3 Other Presentations

Any other presentation of the product shall be permitted provided that it:
(i) is sufficiently distinctive from other forms of presentation laid down in this standard;
(ii) meets all the other requirements of this standard;
(iii) is adequately described on the label to avoid confusing or misleading the consumer.

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Raw Material

The product shall be prepared from clean, wholesome and sound fish belonging to one of the genera listed under sub-section 2.1.1. The raw material may be either fresh, frozen or smoked and shall be suitable for human consumption.

3.2 Packing media

Own juice, brine, water*, edible oil with or without own juice, sauce, marinades with or without wine, aspic (jelly) and other packing media. The packing medium used shall be in good condition.

3.3 Optional Ingredients

3.3.1 Salt

3.3.2 Natural starches

3.3.3 Spices and spice oils and extracts, herbs, vegetable seasonings /vegetables/, /fruits and other kinds of foods/, vinegar and other edible acids, and wine. The ingredients shall be in good condition and shall be free from abnormal taste, flavour or odour.

3.4 Processing

Head (including gills), tail and viscera (excluding kidneys) shall be completely removed; where possible the kidneys, blood and pectoral fins and scutes in the case of jack mackerel shall also be removed; damaged flesh associated with bruises and/or blood spots shall be cut away.
The fish shall be well washed; the body cavity shall be thoroughly cleaned.
The fish may be cooked, fried or smoked and shall be well packed in accordance with the form of pack desired. After sealing the containers shall be heat processed and cooled.

3.5 Final Product

3.5.1 Appearance

3.5.1.1 The product in a can shall comprise fish of an appearance and colour characteristic of the genus processed and packed in the manner indicated (2.2.1).

3.5.1.2 The packing medium shall be of normal colour and consistency for the type.

3.5.1.3 The can shall be well filled with fish.

3.5.1.4 The final product shall be free from foreign and objectionable matter to the extent possible in good manufacturing practice (5.2).

* Potable water of properties in accordance with the requirements contained in the WHO "International Standards for Drinking Water".

3.5.2 Odour and Flavour

The product shall have an odour and flavour characteristic of the genus and type of packing medium, and be free from objectionable odours and flavours of any kind.

3.5.3 Texture

The fish shall have a texture characteristic of the species, free from mushiness and not crumbly.

3.5.4 Bones

Bones, scutes, tails and pectoral fins when present shall be soft.

3.5.5 Defects and Tolerances

The product shall comply with the definition and essential quality factors as set forth in this standard, subject to tolerance allowances as defined and set out in Annex A.

4. FOOD ADDITIVES

The following additives in canned mackerel and canned jack mackerel are subject to endorsement by the Codex Committee on Food Additives:

Additive	Maximum level in the final product
Thickening or jellifying agents:	
- Sodium carboxymethyl cellulose (CMC)	2.5 g/kg
- Modified starches	10 g/kg
- Agar agar	10 g/kg
- Arabic gum	10 g/kg
- Carrageenan	10 g/kg
- Guar gum	10 g/kg
- Caroub bean gum	10 g/kg
- Tragacanth	10 g/kg
Acidifying agents:	
- Acetic acid	
- Citric acid	
- Lactic acid	
- Tartaric acid	
Natural flavours, e.g.	
- Spice oils - Spice extracts	Limited by GMP
Smoke flavours	Limited by GMP (temporarily endorsed, ALINORM 76/18, para 74)

5. HYGIENE AND HANDLING

5.1 It is recommended that the products covered by the provisions of this standard be prepared and handled in accordance with the following Codes:

(i) the appropriate sections of the Recommended International Code of Practice - General Principles of Food Hygiene (CAC/RCP 1-1969)
(ii) the (Recommended) Code of Practice for Canned Fish (CAC/RCP .....)

5.2 To the extent possible in good manufacturing practice the product shall be free from objectionable matter.

5.3 When tested by appropriate methods of sampling and examination, the product:

a. shall be free from microorganisms capable of development under normal conditions of storage; and
b. shall not contain any substances originating from microorganisms in amounts which may represent a hazard to health.

5.4 Products with an equilibrium pH above 4.6 shall have received a processing treatment sufficient to destroy all spores of Clostridium botulinum, unless growth of surviving spores is permanently prevented by product characteristics other than pH.

6. WEIGHTS AND MEASURES

The net weight of contents of canned mackerel and jack mackerel shall be determined in accordance with the method specified in sub-section 8.3. [In the case of canned mackerel or jack mackerel in own juice (with or without added edible oil) or in brine or in marinades, the container shall be filled so that the mackerel or jack mackerel constitutes not less than [ ] percent m/m of the water capacity of the container when determined by the method specified in sub-section 8.4].

7. LABELLING

In addition to sections 1, 2, 4 and 6 of the Recommended International General Standard for the Labelling of Prepackaged Foods (CAC/RS 1-1969) the following specific provisions apply subject to endorsement by the Codex Committee on Food Labelling.

7.1 Name of the Food

7.1.1 The name of the product shall be:

- mackerel or jack mackerel in accordance with sub-section 2.1, whether qualified or not, used in accordance with the law and custom of the country in which the product is sold, and in a manner so as not to mislead the consumer;
- a local designation may be used provided it is not misleading to the consumer in the country in which the product is distributed.

7.1.2 The name of the packing medium used shall form part of the name of the food.

7.1.3 If the fish has been smoked or smoke flavoured, this information shall appear on the label in close proximity to the name.

7.1.4 Where in a product containing oil the exuded water exceeds [ ]%, the product shall be declared as "X processed in own juice with oil added" ("X" shall be the name of the food).

7.2 Presentation

Except where the product is in the form of dressed fish, the method of presentation specified in sub-section 2.2.1.2-2.2.1.9 shall be adequately described on the label. The packing medium if present shall be declared as specified in 2.2.2.1-2.2.2.7.

7.3 List of Ingredients

A complete list of ingredients shall be declared on the label in descending order of proportion; sub-sections 3.2(b) and (c) of the Recommended International General Standard for the Labelling of Prepackaged Foods (CAC/RS 1-1969) are applicable.

7.4 Net Contents

7.4.1 The total net contents shall be declared by weight in either the metric system ("Système international" units) or avoirdupois or both systems of measurement as required by the country in which the product is sold.

7.4.2 Mackerel or jack mackerel packed in a liquid medium normally discarded before consumption shall carry a declaration of the drained weight of the mackerel or jack mackerel.

7.5 Name and Address

The name and address of the manufacturer, packer, distributor, importer, exporter or vendor of the product shall be declared.

7.6 Country of Origin

The country of origin of the product shall be declared if its omission would mislead or deceive the consumer.

7.7 Lot Identification

Each container shall be embossed or otherwise permanently marked in code or in clear to identify the producing factory, the date of production and the contents of the container.

8. METHODS OF ANALYSIS AND SAMPLING

The methods of analysis and sampling described hereunder are international referee methods.

8.1 Sampling for Destructive Examination

Sampling of lots for examination of the product shall be in accordance with the FAO/WHO Codex Alimentarius Sampling Plans for Prepackaged Foods (AQL-6.5) (CAC/RM 42-1969).

8.2 Organoleptic Assessment

Organoleptic assessment of the product shall be made only by persons trained in such assessment.

8.3 Determination of Net Contents

Net contents shall be determined by averaging the results from all containers of a sample representing a lot, provided there is no unreasonable shortage in any individual container.

Procedure

(1) Weigh the unopened container.
(2) Open the container and remove the contents, wash the container and cover and dry with absorbent paper or cloth.
(3) Weigh the empty container, including the top.
(4) Subtract the mass of the empty container from the mass of the unopened container. The resultant figure shall be considered to be the net content.

8.4 Determination of Drained Mackerel or Jack Mackerel in relation to Water Capacity of the Container

Drained weight shall be determined by averaging the results from all containers of a sample representing a lot, provided there is no unreasonable underweight in any individual container.

8.4.1 Specifications for Circular Sieve

(i) If the quantity of the total contents of the container is less than 1.5 kg (3 lbs.) use a sieve with a diameter of 20 cm (8 in.).
(ii) If the quantity of the total contents of the container is 1.5 kg (3 lbs.) or more, use a sieve with a diameter of 30 cm (12 in.).
(iii) The meshes of sieves are made by so weaving wire as to form square openings of 2.8 mm by 2.8 mm.

8.4.2 Procedure

The weight of drained mackerel or jack mackerel shall be determined on containers that have been kept at a temperature of not less than 20°C (68°F) or more than 24°C (75°F) for a minimum of 12 hours prior to examination. After opening, tilt the container so as to distribute the contents over the meshes of a circular sieve which has been previously weighed. Incline the sieve at an angle of approximately 17°-20° and allow the mackerel or jack mackerel to drain two minutes, measured from the time the product is poured into the sieve. Weigh the sieve containing the drained mackerel or jack mackerel.

8.4.3 Calculation and Expression of Drained Mackerel or Jack Mackerel

The percentage m/m drained mackerel or jack mackerel is given by the following equation:

$$\frac{m_2 - m_1}{m_w} \times 100$$

where m_1 = mass of the sieve

m_2 = mass of the sieve plus drained product

m_w = water capacity of the container as determined in sub-section 8.4.4.

8.4.4 Determination of Water Capacity of Container

Procedure

(1) Select a container which is undamaged in all respects.
(2) Wash, dry and weigh the empty container after cutting out the lid without removing or altering the height of the double seam.
(3) Fill the container with distilled water at 20° to 5 mm vertical distance below the top level of the container, and weigh the container thus filled.
(4) Subtract the weight found in (2) from the weight found in (3). The difference shall be considered to be the weight of water required to fill the container.

9. CLASSIFICATION OF DEFECTIVES

A container which fails to meet the final product requirements specified in sub-section 3.5 shall be considered a "defective".

10. LOT ACCEPTANCE

A lot will be considered as meeting the final product and weight requirements of this standard when the total number of "defectives" as classified according to Annex A does not exceed the acceptance number (c) of the appropriate sampling plan in the Sampling Plans for Prepackaged Foods (AQL-6.5) (CAC/RM 42-1969), and when the average net contents of all containers examined is not less than the declared weight provided there is no unreasonable shortage in individual containers.

ANNEX A

DEFECT TABLE - CANNED MACKEREL AND JACK MACKEREL

(To be developed by ad hoc working group - see also para 83 of this Report).

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PROPOSED DRAFT STANDARD FOR CANNED SARDINES AND SARDINE-TYPE PRODUCTS
(advanced to Step 5)

1. SCOPE

This standard applies to canned sardines and sardine-type products packed in water or oil or other suitable packing medium. It does not apply to speciality products where sardines or sardine-type products only constitute a portion of the edible contents.

2. DESCRIPTION

2.1 Product Definition

Canned sardines and sardine-type products are the products:

2.1.1 Prepared from small fish of the following species:

Sardina pilchardus (Walbaum)
Sardina sardina
Sardinops caerulea, melanostica, neopilchardus, ocellata, or sagax
Sardinella aurita, anchovia, brasiliensis, or eba
Clupea harengus
Clupea antipodum, bassensis, or fuegensis
Sprattus sprattus (Clupea sprattus)
Hyperlophus vittatus
Fluvialosa viaminghi
Etrumeus micropus
Ethmidium maculatus
Engraulis anchoita

The pack may contain a mixture of species of the same genus which have similar organoleptic qualities.

2.1.2 Packed in water or oil or other suitable packing media in hermetically sealed containers.

2.1.3 Processed by heat so as to prevent spoilage.

2.2 Presentation

2.2.1 Forms of Packed Fish

The fish pre-cooked or not, smoked or unsmoked shall be neatly arranged within the can. At least [2] fish shall be contained in each can.

2.2.2 Forms of Packing Media

The product shall be presented in one of the following packing media with or without permitted optional ingredients.

2.2.2.1 Own juice
2.2.2.2 Brine or water
2.2.2.3 Edible oil
2.2.2.4 Edible oil with own juice
2.2.2.5 Sauce
2.2.2.6 Marinades with or without wine
2.2.2.7 Aspic (jelly)

2.2.3 Other Presentations

Any other presentation of the product shall be permitted provided that it:

(i) is sufficiently distinctive from other forms of presentation laid down in this standard;
(ii) meets all the other requirements of this standard;
(iii) is adequately described on the label to avoid confusing or misleading the consumer.

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Raw Material

The product shall be prepared from clean, wholesome and sound fish belonging to one of the species listed under sub-section 2.1.1. The raw material may be either fresh, frozen or smoked and shall be suitable for human consumption.

3.2 Packing Media

Own juice, brine, water*, edible oil with or without own juice, sauce, marinades with or without wine, aspic (jelly) and other packing media. The packing medium used shall be in good condition.

3.3 Optional Ingredients

3.3.1 Salt

3.3.2 Natural starches

3.3.3 Spices and spice oils and extracts, herbs, vegetable seasonings [vegetables], [fruits and other kinds of foods], vinegar and other edoble acids, and wine.
The ingredients shall be in good condition and shall be free from abnormal taste, flavour or odour.

3.4 Processing

Head and gills shall be completely removed; scales and/or tail may be removed.
The fish may be gutted. If gutted, it shall be practically free from visceral parts other than roe, milt or kidney. If ungutted, it shall be practically free from undigested feed or vent feed which would impair the quality of the product.
The fish shall be well washed.
The fish may be cooked or smoked and shall be well packed in accordance with the form of pack desired.
After sealing the containers shall be heat processed and cooled.

3.5 Final Product

3.5.1 Appearance

3.5.1.1 The product in a can shall comprise fish:

(i) reasonably uniform in size;
(ii) of an appearance and colour characteristic of the species processed and packed in the manner indicated (2.2.1);
(iii) neatly cut to remove the head;
(iv) without excessive ventral breaks (unsightly rupture of the ventral area), or breaks and craks in the flesh.

3.5.1.2 The packing medium shall be of normal colour and consistency for the type.

3.5.1.3 The can shall be tightly packed.

3.5.1.4 The final product shall be free from foreign and objectionable matter to the extent possible in good manufacturing practice (5.2).

3.5.2 Odour and Flavour

The product shall have an odour and flavour characteristic of the species and type of packing medium, and be free from objectionable odours and flavours of any kind.

3.5.3 Texture and Colour

The fish shall be reasonably firm, free from mushiness, with soft bones. The colour of the flesh shall be characteristic of the species and type of pack (3.5.1.1 (ii).

3.5.4 Defects and Tolerances

The product shall comply with the definition and essential quality factors as set forth in this standard, subject to tolerance allowances as defined and set out in Annex A.

* Potable water of properties in accordance with the requirements contained in the WHO "International Standardsfor Drinking Water".

4. FOOD ADDITIVES

The following additives in canned sardines and sardine-type products are subject to endorsement by the Codex Committee on Food Additives:

Additive	Maximum level in the final product
Thickening or jellifying agents:	
- Sodium carboxymethyl cellulose (CMC)	[2.5] g/kg
- Modified starches	10 g/kg
- Agar agar	10 g/kg
- Arabic gum	10 g/kg
- Carrageenan	10 g/kg
- Guar gum	10 g/kg
- Caroub bean gum	10 g/kg
- Tragacanth	10 g/kg
Acidifying agents:	
- Acetic acid - Citric acid - Lactic acid - Tartaric acid	
Natural flavours, e.g.	
- Spice oils - Spice extracts	Limited by GMP
Smoke flavours	Limited by GMP

5. HYGIENE AND HANDLING

5.1 It is recommended that the products covered by the provisions of this standard be prepared and handled in accordance with the following Codes:

(i) the appropriate sections of the Recommended International Code of Practice - General Principles of Food Hygiene (CAC/RCP 1-1969)
(ii) the (Recommended) Code of Practice for Canned Fish (CAC/RCP .....)

5.2 To the extent possible in good manufacturing practice, the product shall be free from objectionable matter.

5.3 When tested by appropriate methods of sampling and examination, the product:

a. shall be free from microorganisms capable of development under normal conditions of storage; and
b. shall not contain any substances originating from microorganisms in amounts which may represent a hazard to health.

5.4 Products with an equilibrium pH above 4.6 shall have received a processing treatment sufficient to destroy all spores of Clostridium botulinum, unless growth of surviving spores is permanently prevented by product characteristics other than pH.

6. LABELLING

In addition to Sections 1, 2, 4 and 6 of the Recommended International General Standard for the Labelling of Prepackaged Foods (CAC/RS 1-1969) the following specific provisions apply subject to endorsement by the Codex Committee on Food Labelling.

6.1 Name of the Food

6.1.1 The name of the product shall be:

(i) "Sardines" (to be reserved exclusively for Sardina pilchardus) (Walbaum); or
(ii) "X sardines", where "X" is the name of a country, a geographic area or the species; or
(iii) the common name of the species;

in accordance with the law and custom of the country in which the product is sold, and in a manner so as not to mislead the consumer.

In addition, if required by the country in which the product is sold, the common name shall be accompanied either by the common name of the species or by one of the terms "sardine style" or "sardine type" or by both descriptions.

6.1.2 The name of the packing medium used shall form part of the name of the food.

6.1.3 If the fish has been smoked or smoke flavoured, this information shall appear on the label in close proximity to the name.

6.1.4 Where in a product containing oil the exuded water exceeds [12]%, the product shall be declared as "X processed in own juice with oil added" ("X" shall be the name of the food).

6.2 List of Ingredients

A complete list of ingredients shall be declared on the label in descending order of proportion; sub-sections 3.2(b) and (c) of the Recommended International General Standard for the Labelling of Prepackaged Foods (CAC/RS 1-1969) are applicable.

6.3 Net Contents

6.3.1 The total net contents shall be declared by weight in either the metric system ("Système international" units) or avoirdupois or both systems of measurement as required by the country in which the product is sold.

6.3.2 The net drained weight of the fish and/or the number of fish in the can may de declared.

6.4 Name and Address

The name and address of the manufacturer, packer, distributor, importer, exporter or vendor of the product shall be declared.

6.5 Country of Origin

The country of origin of the product shall be declared if its omission would mislead or deceive the consumer.

6.6 Lot Identification

Each container shall be embossed or otherwise permanently marked in code or in clear to identify the producing factory, the date of production and the contents of the container.

7. METHODS OF ANALYSIS AND SAMPLING

The methods of analysis and sampling described hereunder are international referee methods.

7.1 Sampling for Destructive Examination

Sampling of lots for examination of the product shall be in accordance with the FAO/WHO Codex Alimentarius Sampling Plans for Prepackaged Foods (AQL-6.5) (CAC/RM 42-1969).

7.2 Organoleptic Assessment

Organoleptic assessment of the product shall be made only by persons trained in such assessment.

7.3 Determination of Net Contents

Net contents shall be determined by averaging the results from all containers of a sample representing a lot, provided there is no unreasonable shortage in any individual container.

Procedure

(1) Weigh the unopened container.
(2) Open the container and remove the contents, wash the container and cover and dry with absorbent paper or cloth.
(3) Weigh the empty container, including the top.
(4) Subtract the mass of the empty container from the mass of the unopened container. The resultant figure shall be considered to be the net content.

7.4 Determination of Drained Weight To be developed

8. CLASSIFICATION OF "DEFECTIVES"

A container which fails to meet the final product requirements specified in subsection 3.5 shall be considered a "defective".

9. LOT ACCEPTANCE

A lot will be considered as meeting the final product and weight requirements of this standard when the total number of "defectives" as classified according to Annex A, does not exceed the acceptance number (c) of the appropriate sampling plan in the Sampling Plans for Prepackaged Foods (AQL-6.5) (CAC/RM 42-1969), and when the average net contents of all containers examined is not less than the declared weight provided there is no unreasonable shortage in individual containers.

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ANNEX A

DEFECTS TABLE FOR SARDINES AND SARDINE TYPE PRODUCTS

DEFINITION OF DEFECT	CLASSIFICATION		
	Serious	Major	Minor
Removal of Head			
Head incompletely removed			
(a) a can containing more than 10 fish			
– more than 20% of fish	–	2	–
– up to 20% of fish	–	–	1
(b) a can containing 10 or fewer fish			
– more than 2 fish	–	2	–
– 2 or fewer fish	–	–	1
Ventral Breaks			
– More than 40% of fish in a can having ventral breaks of half the length or more of the abdominal cavity	[4]	–	–
– 30–40% of fish in a can with ventral breaks	–	2	–
Broken or cracked flesh			
– More than 45% of fish with greater than ½ the width of the fish at the point of occurrence	[4]	–	–
– > 25 – 45%	–	2	–
– 15 – 25%	–	–	1
Colour of packing oil			
– Very brown (except smoked products)	–	2	–
– Slightly brown (except smoked products) or cloudy	–	–	1
Odour and Flavour			
– Distinctly objectionable odour and flavour (e.g. metallic, rancid)	6	–	–
Texture			
– Excessively mushy flesh (i.e. if the fish does not retain its shape after draining on a screen)	6	–	–
– Excessively tough or fibrous flesh	[4]	–	–
– Hard bones (not easily friable using thumb and forefinger)	–	–	1
Discolouration			
– Severe	–	[2]	–
– Slight or localised	–	–	1
Exuded water (oil packs only)			
Water content (expressed as % of net contents of can)			
– > 10–12% (if above 12% Section 6.1.3 applies)	4	–	–
– 8 – 10%	–	2	–

Defective Unit

A can shall be considered a defective if it has:

(a) More than 4 points for defects classified as serious; or
(b) More than 8 points (oil packs) or 6 points (other packs) for defects classified as major; or
(c) More than a total of 10 points (oil packs) or 8 points (other packs) for defects in the combined classifications (including minor).

[NOTE: Packing media may need to be defined in regard to consistency for sauces.]

INTRODUCTION

This code of practice has been evolved by combining the former FAO Code of Practice for Frozen Fish (FAO Fisheries Circular No 145), which was mainly of a technological nature, with the Code of Hygienic Practice for Handling Fresh and Frozen Fish, as proposed by the FAO/WHO Codex Alimentarius Commission, Codex Committee on Food Hygiene.

The code offers general advice on the production, storage and handling of frozen fish and fish fillets on board fishing vessels and on shore. It deals also with the distribution, retail display and thawing of frozen fish for industrial purposes.

Introduction of freezing into the fishing industry had an enormous impact on the world fisheries. The industry, apart from having another method of preserving fish, was able to increase significantly the efficiency of harvesting, and gear its operation to more dependable sources of raw material such as large stocks of frozen fish.

Up to that time, the industry relied entirely upon the wet fish which, even where properly chilled, had a short keeping time. This factor alone limited the fishermen's efforts, kept the processing industry from developing into a modern dynamic stage, restricted marketing of fish and provided the consumer with the fish usually at its "last day" of quality.

With the application of fish freezing technology, the fishing vessels, equippped to freeze at sea, were able to fish more distant waters and remain on the fishing grounds until fully loaded. Fish or fish products, offered to the consuming public on the local or international market, could compete successfully with other foods because of high quality.

The technology of freezing fish for human consumption, in the light of modern engineering concepts, is still under development. In fact, the complex nature of the raw material provides unlimited possibilities for further progress. It is felt, therefore, that to advance intelligently and successfully in this area, all the techniques and practices that have been developed and that have withstood so far the test of time should be followed.

The aim of this code, therefore, is to assist all those who are engaged in the freezing of fish, or are concerned with the storage, distribution, export, import and sale of frozen fish, in attaining the highest possible quality products which can be sold on national or international markets.

The code is intended also as background information or as a guideline for the elaboration of national quality standards, quality control and fish inspection regulations in countries where these, as yet, have not been developed. In addition, it could be used for training of fishermen and employees of the fish processing industry.

It must be acknowledged, however, that most of the practical information on production, storage and handling of frozen fish, both at sea and on shore, has been gained from particular areas, mainly the North Atlantic and North Pacific fisheries. Little is known from fisheries in other areas, for example in the tropics. It should be appreciated that the variety and the number of fish species involved in world fisheries do not allow for a single code of practice to be drawn up, covering the whole spectrum of industrial practices.

This code, therefore, is not intended to replace the advice or guidance of trained and experienced technologists regarding the complex technicological and hygienic problems which might be unique to a specific geographical area or specific fishery.

REVISED CODE OF PRACTICE FOR FROZEN FISH

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The practical application of this "international" code, with regard to "national" fisheries, would therefore require some modifications and amendments, taking into account local conditions and specific consumer requirements. In other words, it should be possible for "national" codes of practice to be elaborated for the guidance of individual fisheries, based on this code.

It should be mentioned, that in this code no attempt was made to define the terms and procedures pertaining to "quick freezing" or "deep freezing" as opposed to "freezing".

The freezing of shellfish has not been dealt with in this code as these products merit special consideration due to their high susceptibility to quality loss during freezing and cold storage. Similarly the freezing of pre-cooked products such as fish sticks or portions was omitted because they are handled in a different manner to whole or gutted fish and fillets. Products such as these will be covered in future by more specific codes of practice.

This code will require to be revised periodically, as research and development bring new techniques and facilities into commercial practice.

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CODE OF PRACTICE FOR FROZEN FISH

Note

- The hygienic and some of the technological requirements of this Code are partially based on the General Principles of Food Hygiene, and the Proposed Draft Code of Practice for Fresh Fish (ALINORM 76/13A, Appendix II).

- The letter and number codes given in the right hand margin indicate relevant requirements taken from the Draft Code of Practice for Fresh Fish (ALINORM 76/13A, Appendix II and Corrigendum).

1. SECTION I - SCOPE

- This code of practice applies to frozen fish and fish fillets, intended for human consumption.
- It contains the technological guidelines and the most essential requirements of hygiene for the production, storage and handling of frozen fish and fish fillets on board fishing vessels and on shore.
- It deals with the distribution and display in retail cabinets of frozen fish and also with thawing of frozen fish for further processing or other industrial purposes.
- Although the code does not deal specifically with the freezing of shellfish, fresh water fish and various precooked fishery products, most of the recommendations made would apply.

2. SECTION II - DEFINITIONS

For the purpose of this code:

2.1 "air blast freezer" is a freezer in which heat is removed from the product by a stream of rapidly moving cold air.

In the continuous type, the product is frozen as it is slowly conveyed through an air blast freezing chamber or tunnel. In other types the product is placed in the freezer on suitable trays or racks which remain stationary during the freezing process. The air blast freezer can accommodate a wider range in shape and size of products than can the contact freezer;

2.2 "air lock" is an enclosed space with outer and inner doors at the entrance to a freezer store.

During entry or exit one door is closed before the other is opened, thus reducing the inflow of warm air and the outflow of cold air from the freezer store. Cold air curtains are sometimes used instead of air locks;

2.3 "brine freezer" is a freezer in which heat is removed from the product by immersion in low temperature brine;

2.4 "buffer freezer store" is a temporary holding freezer store.

Small batches of the product can be held for a short period of time if, for any reason, they cannot be loaded into the main freezer storage space immediately after freezing; the temperature should be -18°C (0°F) or lower;

2.5 "chill store" is a store in which the raw material can be stored at a temperature of melting ice for a short period, if for one reason or another it cannot be frozen immediately;

2.6 "chilling" is a process where the product is cooled to a temperature approaching that of melting ice; FF (2.4)

2.7 "clean sea water" is sea water which meets the same microbiological standards as potable water and is free from objectionable substances; FF (2.5)

2.8 "cleaning" of surfaces means the removal of objectionable matter; FF (2.6)

2.9 "contact freezer" or plate freezer is a freezer in which heat transfer occurs by contact between the product and metal plates through which the refrigerant passes.

Two types, in use today, are the vertical contact plate freezer, mostly freezing large blocks of whole or gutted fish, and the horizontal contact plate freezer, in which smaller fish or fillet blocks or packages of fish or fillets are frozen. Pressure is used to bring the plates to bear on the product or package to ensure good surface contact during freezing;

2.10 "contamination" means direct or indirect transmission of objectionable matters to the fish or fish products; FF (2.7)

2.11 "cryogenic freezer" is a freezer in which heat is extracted from the product by the direct contact with liquified gas or vapour.

Examples are liquid nitrogen and refrigerant R-12 freezers;

2.12 "defrosting" is the process of removing frost and ice from freezer and freezer store refrigerated plates or coils, by the introduction of heat, or by brushing and scraping.

This is done because coatings of frost or ice greatly reduce the efficiency of these cooling surfaces. Contact freezers also require defrosting to allow for efficient loading and unloading;

2.13 "dehydration" is the loss of moisture from frozen products through evaporation.

This may occur if the products are not properly glazed, packaged or stored. Dehydration adversely affects the appearance and surface texture of the product and is commonly known as "freezer burn";

2.14 "denaturation" is the change which takes place slowly in the protein of fish during frozen storage and which adversely affects the appearance, texture and flavour of the product.

The rate at which protein denaturation occurs decreases at lower storage temperatures;

2.15 "disinfection" means the application of hygienically satisfactory chemical or physical agents and processes to clean surfaces with the intention of eliminating micro-organisms; FF (2.8)

2.16 "fillet" is a slice of fish of irregular size and shape removed from the carcass by cuts made parallel to the backbone; FF (2.9)

2.17 "fish" means any of the cold-blooded aquatic vertebrate animals commonly known as such. FF (2.10)

This includes Pisces, Elasmobranchs and Cyclostomes. Aquatic mammals, invertebrate animals and amphibians are not included. It should be noted, however, that many of the recommendations given here also apply to certain invertebrates, particularly Cephalopods;

2.18 "freezing process" is a process which is carried out in appropriate equipment in such a way that the range of temperature of maximum crystallization is passed quickly. The quick freezing process shall not be regarded as complete unless and until the product temperature has reached -18°C (0°F) or lower at the thermal centre after thermal stabilization;

2.19 "freezer" is equipment designed for freezing fish and other food products, by quickly lowering the temperature so that after thermal stabilization the temperature in the thermal centre is the same as the storage temperature;

2.20 "freezer store" is an insulated and refrigerated room specially designed for the storage of frozen products.

Freezer stores have sufficient refrigerating capacity to maintain a temperature of -18°C (0°F) or lower for products already frozen, but are not designed to freeze products or to cool them down to storage temperature.

2.21 "fresh fish" are freshly caught fish which have received no preserving treatment or which have been preserved only by chilling;

2.22 "frozen fish" are fish which have been subjected to a freezing process sufficient to reduce the temperature of the whole product to a level low enough to preserve the inherent quality of the fish and which have been maintained at this low temperature during transportation, storage and distribution up to and including the time of final sale. For the purpose of this Code the terms "frozen", "deep frozen" and "quick frozen", unless otherwise stated, shall be regarded as synonymous;

2.23 "glaze" is a thin protective layer of ice which is formed on the surface of a frozen product by spraying it with, or dipping it into, potable water or potable water with approved additives;

2.24 "gutted fish" are fish from which the guts have been removed; FF (2.12)

2.25 "jacketed freezer store" consists of a room which is maintained at a temperature of -18°C (0°F) or lower by refrigerating the walls, ceiling and floor, usually by forced circulation of cold air through the sealed air space which is included between the insulation and the inner lining of the store;

2.26 "keeping time" refers to the length of time that fish will remain wholesome and acceptable as human food; FF (2.13)

2.27 "packaging materials" are all those materials such as foils, films, waxpaper, cartons and boxes, used for covering and protecting the frozen fish or frozen fish products and which are approved by the official agency having jurisdiction; FF (2.15)

2.28 "potable water" is fresh water fit for human consumption. Standards of potability should not be lower than those contained in the latest edition of the "International Standards for Drinking Water", World Health Organization; FF (2.16)

2.29 "pounds or pens" are areas in the fish hold and on deck divided off by stanchions and portable or fixed board structures, for the storage of fish; FF (2.17)

2.30 "refrigerated brine", used for freezing, is generally a concentrated solution of common salt (sodium chloride) in potable fresh or clean sea water.

It is cooled by a suitable refrigeration system. Salts other than sodium chloride are sometimes used;

2.31 "refrigerated sea water" is a clean sea water cooled by the addition of ice and/or by a suitable refrigeration system. FF (2.19)

Its salt content is normally about 3 percent;

2.32 "rigor mortis" means the stiffening of the muscles of an animal which results from a series of complex changes that take place in the tissues shortly after death. FF (2.20)

Immediately after death, the muscles are soft and limp and can be easily flexed. At this time, the flesh is said to be in pre-rigor condition. Soon the muscles begin to stiffen and harden and no longer contract by stimulation. The animal is then in rigor. After some hours or days, the muscles gradually begin to soften and become limp again. This is called the post-rigor condition;

2.33 "sharp freezer" is a refrigerated room in which fish are laid on shelves or hung on hooks. There should be forced circulation of air.

In some designs, refrigerant is passed through pipes beneath the shelves;

2.34 "suitable corrosion-resistant material" means impervious material, which is free from pits, crevices and scales, is non-toxic and unaffected by sea water, ice, fish slime or any other corrosive substance with which it is likely to come in contact. Its surface must be smooth and it must be capable of withstanding exposure to repeated cleaning, including the use of detergents; FF (2.23)

2.35 "thawing" is a process whereby heat is introduced into the frozen product, in order to raise its temperature above freezing point;

2.36 "white fish" are species of fish with white flesh containing relatively little fat;

2.37 "whole fish" are fish as captured, ungutted. FF (2.24)

3. SECTION III - RAW MATERIAL REQUIREMENTS

3.1 General Considerations

3.1.1 FISH INTENDED FOR FREEZING SHOULD BE OF THE HIGHEST POSSIBLE QUALITY. FF (3.1.2 Adapted)

Although there are many aspects that might be taken into account when defining what is meant by the "highest possible quality" fish, there are two major ones that should concern the fisherman as a primary producer:

1. quality of fish when caught, and
2. quality of fish on delivery to the buyer or the processor.

The first one is determined by the physical condition of the fish, its appearance, size, percentage of fat, amount of feed, presence of disease and of toxic substances. The second one will result from the methods and techniques employed in fishing, practices in handling and freezing, and conditions of storage in the freezer store.

The fisherman should discard any fish that is diseased or is known to contain toxic substances or has undergone deterioration or any process of decomposition or which has been contaminated with foreign matter to an extent which has made it unfit for human consumption.

Freezing and frozen storage cannot improve the quality of fish. At best, the process maintains the fish in much the same condition as it was immediately before freezing. It is therefore essential that the raw material be as fresh as possible.

FREEZING FISH AT SEA

4. SECTION IVA - FISHING VESSEL FACILITIES AND OPERATING REQUIREMENTS

4.1 Fishing Vessel Construction and Sanitary Design

4.1.1 General Considerations

4.1.1.1 THE FISHING VESSEL SHOULD BE DESIGNED FOR RAPID AND EFFICIENT HANDLING AND FREEZING OF FISH, EASE OF CLEANING AND DISINFECTION, AND SHOULD BE OF SUCH MATERIAL AND CONSTRUCTION AS NOT TO CAUSE ANY DAMAGE OR CONTAMINATION OF THE CATCH. FF (4.1.1 Adapted)

In designing a fishing vessel many factors, apart from the vessel's performance as a harvesting unit, should be considered. The fisherman's earnings are determined not only by the quantity of the fish caught but, to a great extent, by the quality of the catch delivered to the processing plant.

Fishing vessels should be designed and constructed so as not to cause contamination of the fish with bilge, water, sewage, smoke, fuel, oil, grease or other objectionable substances. Fish, if not frozen quickly after capture, should be protected against physical damage, exposure to high temperatures and drying effects of sun and wind.

All surfaces with which the fish might come in contact should be of suitable corrosion-resistant material.

A vessel that is to be designed for freezing fish at sea should be large enough to allow for installation of proper processing and freezing equipment and for an adequate freezer store.

Such a vessel, to justify its cost, should be able to fish in more distant areas and remain on the fishing grounds till fully loaded. Fish which is frozen and stored on the vessel should be of the same quality as if it were processed and stored in a shore establishment.

4.1.1.2 CONSTRUCTION AND SANITARY DESIGN OF THE FISHING VESSEL EQUIPPED FOR FREEZING OF FISH AT SEA SHOULD FOLLOW CLOSELY THE GUIDELINES FOR THE DESIGN OF THE FISHING VESSEL SPECIFIED IN THE "CODE OF PRACTICE FOR FRESH FISH".

Most of the requirements for the construction and sanitary design of the vessel equipped to freeze at sea should be the same as for the vessel which delivers fresh fish chilled by ice or refrigerated sea water.

If the vessel is large enough to engage in the processing of fish prior to freezing, then its design, layout, construction and equipment should meet the requirements of shore establishments and the processing should be carried out under similar hygienic and sanitary conditions as detailed in the "Code of Practice for Fresh Fish".

4.1.2 Construction

4.1.2.1 FISHING VESSELS EQUIPPED FOR FREEZING AT SEA SHOULD BE SO DESIGNED AS TO PROVIDE FOR EFFICIENT OPERATION EVEN DURING HEAVY LANDINGS.

Considerable elasticity of operation may be attained by having adequate storage facilities for the incoming fish.

Fish holds or bins where fish can be kept sufficiently chilled before being processed should be incorporated into the design of the boat. Use of refrigerated sea water or refrigerated brine tanks, either as an integral part of the vessel or as separate installable equipment items, may be of value in some fisheries. Such tanks, preferably several in number, could be used for chilling the catch or for bleeding, washing and prechilling of fish just before freezing.

4.1.2.2 ADEQUATE POUND OR PEN STORAGE SPACE SHOULD BE PROVIDED SO THAT THE FISH FROM ONE HAUL WILL NOT BE MIXED WITH THOSE FROM A PREVIOUS HAUL. FIRST-CAUGHT FISH SHOULD ALWAYS BE HANDLED FIRST.

If the storage space for fresh fish is inadequate, fish from a number of hauls may be mixed, with the first-caught fish being buried under subsequent hauls. This can result in the lower lying fish remaining ungutted for long periods, often at fairly high temperatures. Inadequate pre-gutting storage may also lead to fish from later hauls lying on the open deck exposed to sun and wind.

4.1.2.3 DECK POUNDS OR PENS, STANCHIONS AND DIVIDING BOARDS SHOULD BE CONSTRUCTED OF SUITABLE CORROSION-RESISTANT MATERIAL. THEY SHOULD BE ADEQUATE IN NUMBER FF AND HEIGHT TO PREVENT MOVEMENT OF THE FISH, DUE TO THE VESSEL'S MOTION. (4.2.1)

In practice, wood is still used in many fisheries for deck pound boards, and steel for stanchions and other fixtures. Where this is the case, the wood should be treated to prevent moisture from entering the wood and should be coated with a durable, non-toxic paint or other non-toxic surface coating that is smooth and readily cleanable. Steelwork should be coated with anti-corrosion and non-toxic paint. Whenever possible, suitable corrosion-resistant materials should be used.

4.1.2.4 FISH HOLDS WHERE FISH ARE HELD BEFORE PROCESSING AND FREEZING SHOULD BE ADEQUATELY INSULATED WITH A SUITABLE MATERIAL. ANY PIPES, CHAINS OR CONDUITS PASSING THROUGH THE HOLD SHOULD, IF POSSIBLE, BE SUNK FLUSH OR NEATLY BOXED IN AND INSULATED. FF (4.2.3 Adapted)

Adequate insulation will reduce the amount of heat entering the fish hold and consequently the rate of ice meltage. If the quality and structure of the insulation is poor, considerable ice meltage will take place near bulkheads and shipside. This may cause excessive leacking of the fish and if the amount of ice is not sufficient this will allow fish temperatures to rise, and any fish which come in contact with the ship's structure may develop a particularly offensive smell.

4.1.2.5 FISH HOLD LININGS SHOULD BE COMPLETELY WATER-TIGHT. THE INSULATION LAYER SHOULD BE PROTECTED BY A LINING MADE OF CORROSION-RESISTANT METAL SHEETS OR ANY OTHER EQUALLY SUITABLE MATERIAL HAVING WATER-TIGHT JOINTS. FF (4.2.4)

It is most important to prevent water from carrying fish slime, blood, scales and offal to parts of the vessel where effective cleaning is virtually impossible. The melt water seeping through the fish hold lining will also reduce the efficiency of the insulation and this will, in turn, lead to the increase in the temperature of the fish. The insulation should be covered with corrosion-resistant metal sheets, having water-tight joints to ensure protection from such contamination. An effective drainage system should be able to remove the melt water into a sump as fast as it accumulates.

4.1.2.6 WOODEN FISH HOLDS SHOULD BE LINED WITH A SUITABLE MATERIAL. FF (4.2.5)

The lining of wooden fish holds should be similar to that described above. They should be sealed and coated with a suitable impervious and non-toxic material which is easy to keep clean and not difficult to repair.

4.1.2.7 THERE SHOULD BE NO SHARP CORNERS OR PROJECTIONS IN THE HOLD OR TANK, AS THESE WILL MAKE CLEANING DIFFICULT AND MAY DAMAGE THE FISH. FF (4.2.14)

Contamination with fish slime, blood, scales and guts will build up rapidly on surfaces, in corners or around projections which are not smooth and impervious.

Any ledges or projections resulting from the encasement of pipes, wires, chains and conduits, that are passing through the fish hold, should be so constructed as to allow free drainage, ease of cleaning and not to cause any physical damage to the fish.

4.1.2.8 IN ALL SHIPS USING REFRIGERATED SEA WATER FOR CHILLING OR REFRIGERATED BRINE SYSTEMS FOR FREEZING FISH, TANKS, HEAT EXCHANGERS, PUMPS AND ASSOCIATED PIPING SHOULD BE MADE OF, OR COATED WITH SUITABLE CORROSION-RESISTANT MATERIAL. THEY SHOULD BE DESIGNED SO THAT THEY CAN EASILY BE CLEANED AND DISINFECTED. FF (4.2.17 Adapted)

With hard, non-porous surfaces such as stainless steel, aluminium-alleys or plastics, spoilage bacteria, together with all the debris deposited during storage of the fish, can be easily removed, thus reducing the risk of contaminating later catches. It is important to avoid corners and edges in which filth can lodge.

The whole system should be so designed as to allow an easy introduction and effective circulation of the cleaning and disinfecting solutions. There should be no place where a proper cleaning cannot be carried out.

It is important to remember that with ice storage only part of a load may spoil but with refrigerated sea water or brine, any malfunctioning of the system or neglect on the part of operators, can result in the whole catch being rejected for spoilage.

4.1.2.9 WHERE CLEAN SEA WATER OR BRINE AND ICE MIXTURES ARE USED FOR COOLING AND TEMPORARY STORAGE OF THE CATCH, THERE SHOULD BE ADEQUATE CIRCULATION OF THE LIQUID. FF (4.2.18 Adapted)

Effective means of circulating the cold liquid round the mass of fish should be provided. If pumping facilities are inadequate some of the load may not be cooled properly, resulting in fish with highly unpleasant odours and flavours.

4.1.2.10 REFRIGERATED SEA WATER OR REFRIGERATED BRINE TANKS SHOULD BE INSULATED TO MINIMIZE HEAT LEAKAGE FROM THEIR SURROUNDINGS. FF (4.2.19)

The temperature of the refrigerated sea water will be more uniform throughout the tank and more easily controlled if the heat leak from other sources is reduced by effective insulation.

4.1.2.11 REFRIGERATION PLANT AND SEA WATER OR BRINE CIRCULATING EQUIPMENT SHOULD BE ADEQUATE TO MAINTAIN THE TEMPERATURE OF THE FISH AT -1°C (30°F). FF (4.2.20)

At this temperature maximum delay of spoilage is attained in fresh fish. If the temperature is reduced below -1°C (30°F) the fish may be damaged because of partial freezing. In practice it is extremely difficult to control the temperature so precisely, but a range of -1°C to +2°C (30° to 34°F) is achievable.

There should also be a sufficient compressor capacity to prevent a significant rise in temperature of the prechilled sea water or brine solution when the holding tanks are being loaded with the freshly caught fish.

Rapid cooling of fish is the primary task of the system. Once the initial cooling of fish is accomplished, the subsequent maintenance of constantly low temperature requires only a fraction of the compressor's load. Thermal inertia of a large body of chilled fish and brine should prevent sudden and significant fluctuations in temperature.

4.1.2.12 THE FREEZER STORE ON BOARD THE FISHING VESSEL SHOULD BE ADEQUATE FOR THE INTENDED PRODUCTION AND SHOULD BE SO CONSTRUCTED AS TO PROTECT THE FROZEN FISH FROM FLUCTUATION IN TEMPERATURE, DEHYDRATION AND PHYSICAL DAMAGE.

The freezer store should be designed and constructed by experts in the field, taking into consideration species of fish and type of product intended for storage, size of production, duration of fishing trips and the environmental conditions of the area of the boat's activity.

One can hardly overemphasize the importance of the careful and detailed planning that is required in the construction of the vessel's freezer store (see App. I, para 2 "Some General Observations on Freezer Stores").

Adequate size of the storage and capacity of refrigeration system, provision for an emergency, facilities for defrosting, automatic temperature controlling and/or recording devices are some of the most essential requirements.

The frozen fish stored on board the fishing vessel should be kept under the same conditions as the fish in a shore freezer store.

4.1.3 Sanitary Facilities

4.1.3.1 AREAS OF THE DECK WHERE FISH ARE UNLOADED AND HANDLED, OR THE FISH HOLD WHERE FISH ARE STOWED, SHOULD BE USED EXCLUSIVELY FOR THESE PURPOSES. FF (4.3.1)

All such areas should be well defined and should be kept clean or be readily capable of being maintained in a clean condition.

Storage of fuel and other petroleum products, or of different cleaning and sanitizing agents, should be so arranged that there is no possibility of contamination of surfaces with which fish come in contact.

Any exposure, even for a short time, of fish to petroleum products, very often results in rejection and eventual destruction of the whole load. The odour and the taste of fish contaminated with fuel or other similar compounds are very persistent and difficult to remove during the subsequent processing.

4.1.3.2 AN AMPLE SUPPLY OF COLD POTABLE WATER OR CLEAN SEA WATER UNDER ADEQUATE PRESSURE SHOULD BE AVAILABLE AT A SUFFICIENT NUMBER OF POINTS THROUGHOUT THE FISHING VESSEL. ON LARGE VESSELS ENGAGED IN FISH PROCESSING A SUPPLY OF HOT WATER AT A MINIMUM TEMPERATURE OF 82°C (180°F) SHOULD ALSO BE AVAILABLE. FF (4.3.2)

Only clean water should be used on fish and on surfaces with which fish might come in contact. Even if the fish is caught in polluted waters, as occasionally happens, that water should not be used for washing fish or for the preparation of refrigerated sea water or refrigerated brine.

Fish when alive is relatively resistant to a polluted environment but looses its natural defences when it dies after being caught.

4.1.3.3 A SYSTEM FOR INJECTING CHLORINE INTO THE LINES OF SEA WATER WHICH IS USED IN THE PROCESSING OF FISH OR FOR THE CLEAN-UP OF THE VESSEL SHOULD BE PROVIDED WHERE PRACTICABLE. FF (4.3.3)

It has been established in the fish processing industry that the injection of chlorine into a supply of cold water, used for general wash-up, helps to control microbial contamination.

The fishing vessels involved in handling or processing large quantities of fish might gain considerably in sanitation by having chlorine introduced into the water lines. Chlorine dosage should be around 10 ppm during the normal use and 100 ppm of residual concentration during the clean-up.

As a word of caution, the use of strongly chlorinated water in confined spaces such as a vessel's hold could prove objectionable to the operator. For that reason, a system for injecting chlorine should be capable of varying the amount of chlorine delivered.

There are a number of relatively inexpensive and easily operable instruments on the market that will perform this task with the minimum of cost and maintenance.

4.1.3.4 DECK HOSES SHOULD BE SUPPLIED WITH CLEAN SEA WATER, AT ADEQUATE PRESSURE, BY A PUMP USED ONLY FOR CLEAN SEA WATER. FF (4.3.4)

A good supply of clean sea water, at adequate pressure, with an addition of chlorine, if possible, should be available for washing fish and for flushing and rinsing of decks, holds, gear and other equipment which comes in contact with the fish.

The intake for sea water should be well forward of and on the opposite side of the vessel from the toilet waste and engine cooling discharge. Sea water should not be used while the vessel is in harbour nor in areas where there is a danger of it being polluted.

The piping for the clean sea water supply should have no cross-connections with the engine or condenser cooling system. It should be so constructed as to prevent any possibility of backsyphonage from the kitchen sink or toilets.

4.1.3.5 ICE USED IN EVERY FISHERY SHOULD BE MADE FROM POTABLE WATER OR CLEAN SEA WATER AND SHOULD NOT BE CONTAMINATED WHEN MANUFACTURED, HANDLED OR STORED. FF (4.3.5)

Ice made from water which is neither potable nor clean sea water may contaminate the fish with water-borne micro-organisms or other objectionable or even toxic substances. Such contamination will result in the loss of quality, reduced keeping time or might create a definite health hazard.

Some of the larger fishing vessels might have their own ice making machines. The water used in the ice manufacture should be potable or clean sea water. The intake for the pump should be located away from the waste discharge outlet of the boat. Chlorine injection into the lines or water storage tanks, or the use of UV lights for continual flow purification should be provided. Both systems are easy and inexpensive to operate. The water for ice manufacture should only be taken from areas known to be relatively unpolluted and without any visible discolouration or suspension.

The ice making plant should be cleaned regularly and maintained in a clean, sanitary condition at all times.

4.1.3.6 THE VESSEL'S TOILET FACILITIES, ALL PLUMBING AND WASTE DISPOSAL LINES SHOULD BE SO CONSTRUCTED AS NOT TO CONTAMINATE THE FISH. FF (4.3.7)

All the plumbing and waste disposal lines servicing the vessel's toilets, hand wash basins or kitchen sinks should be large enough to carry peak loads, be watertight and preferably should not go through the fish holds where fish is being handled or stored.

4.1.3.7 ON LARGE FISHING VESSELS, ENGAGED IN FISHING AS WELL AS FISH PROCESSING AND FREEZING, SUITABLE WASHING FACILITIES SHOULD BE PROVIDED. FF (4.3.9)

Such facilities should be located in toilets and close to the fish handling or processing areas. They should be supplied with clean water.

4.1.3.8 THE FISHING VESSELS SHOULD BE EQUIPPED WITH BRUSHES, SCRAPERS, WATER HOSES, SPRAY NOZZLES AND OTHER SUITABLE WASHING AND SANITIZING EQUIPMENT. FF (4.3.10)

Although there is a variety of cleaning and sanitizing equipment available on the market, good quality hand brushes of several sizes and shapes are still the most inexpensive and versatile tools for cleaning operations. Brushes should be kept in a clean and sound condition and, when not used, should be stored in a dry state. Brushes could spread dirt and micro-organisms. Micro-organisms will proliferate in a dirty brush when stored in a wet condition. The use of steel-wool for scouring should be avoided as there is a constant danger of introducing small, sometimes hardly visible, bits of wire into the final product. If for some reason cleaning cannot be done effectively with a good brush, then plastic, brightly coloured scouring pads might be used.

The high pressure and high frequency oscillating water or detergent spraying equipment has been found to be quite effective in cleaning, but it usually requires an experienced operator to prevent damage to painted surfaces.

4.2 Equipment and Utensils

4.2.1 ALL FISH STORAGE, HANDLING, CONVEYING, PROCESSING AND FREEZING EQUIPMENT USED ON BOARD FISHING VESSELS SHOULD BE DESIGNED FOR THE RAPID AND EFFICIENT HANDLING OF FISH, BE SUITABLE FOR EASY AND THOROUGH CLEANING AND SHOULD BE CONSTRUCTED SO AS NOT TO CAUSE CONTAMINATION OF THE CATCH. FF (4.4.1 Adapted)

Some of the equipment currently used in the fishing industries is quite unsuitable for the purpose in which it is employed. More thought should be given to the design and layout of fixtures and plant.

4.2.2 MECHANICAL CONVEYORS SHOULD BE INSTALLED, WHENEVER PRACTICAL, TO HANDLE THE FISH DURING PRE-FREEZING OPERATIONS.

Manual methods of moving fish from one process to another, apart from being more costly in labour and less efficient, often result in damage to the skin and flesh, allowing the entry of micro-organisms and thus hastening spoilage.

4.2.3 FISH WASHING AND CONVEYING EQUIPMENT SHOULD BE CONSTRUCTED OF SUITABLE CORROSION-RESISTANT MATERIAL AND SO DESIGNED AS TO PREVENT BRUISING OR OTHER DAMAGE TO THE FISH.

Washers should be designed to give an adequate washing period, and should have a copious and continuous supply of cold clean sea water. In the tank type washer, water should enter the tank through a number of jets, placed so that a water swirl is formed in the washer, allowing dirty water and scum to spill off and drain away. Water used in fish washing and cooling should not be recirculated.

4.2.4 WHERE SIZEABLE QUANTITIES OF FISH ARE HANDLED ON BOARD LARGE FISHING VESSELS, THE USE OF MACHINERY DESIGNED TO CARRY OUT GUTTING AND CLEANING SHOULD BE CONSIDERED. FF (4.4.5)

In many fisheries there is a growing need to save manpower but this cannot be accomplished without the introduction of more mechanical aids for working the fishing gear and handling the catch. These two principal tasks have to be performed by the same crew.

Gutting, which is usually the most time consuming operation, could easily be carried out by a gutting machine. Such machines have been developed and have been used by some fishermen in various countries.

It is advisable, before large expenditure of capital is made, that such machinery should be tested, bearing in mind that it will be operating under extremely rigorous conditions with limited possibilities for proper maintenance or immediate repair.

4.2.5 FREEZING EQUIPMENT SHOULD BE RELIABLE AND SUITABLE FOR THE PARTICULAR FISH SPECIES AND PRODUCT.

It is most important that all freezing be carried out in an orderly manner, using equipment that is of sufficient capacity and is suitable for the product. The freezers should have proper defrosting facilities and be designed so that they are easy to clean. Refrigeration equipment needs to be reliable and of robust construction. It should be capable of running for long periods with little attention, and should have automatic devices for shutting it down in an emergency.

Large blocks of whole fish are usually frozen in vertical contact plate freezers. Horizontal contact plate freezers are generally used to freeze smaller fish, fillet blocks and packages of fish or fillets. Air blast freezing, sharp freezing and freezing in brine are also used at sea. Some vessels rely entirely on blast freezers for freezing blocks of whole fish and fillets, and individual round fish while others use them only for freezing large fish which cannot be accommodated by the contact plate freezers.

Freezing by immersion in refrigerated brine is most commonly used for the preservation of large fish such as tuna, which are intended for canning. With this method it is important that the freezing medium should not impart any objectionable odours or flavours to the product, or affect its quality in any other way. When using sodium chloride brine, care should be taken to minimize salt penetration into the product by removing it from the brine as soon as freezing is completed.

4.2.6 CONTACT PLATE FREEZERS SHOULD INCORPORATE A SYSTEM FOR DEFROSTING THE PLATES TO FACILITATE LOADING AND UNLOADING OPERATIONS. AIR BLAST FREEZER COOLING SURFACES SHOULD ALSO HAVE DEFROSTING FACILITIES.

Defrosting of contact freezers ensures clean, smooth plates for easy loading and unloading and provides for good contact between the fish and the freezing surfaces. A large accumulation of ice and frost on the plate surfaces will seriously reduce the rate of heat transfer from the fish.

In air blast freezers frost can build up rapidly on the cooling surfaces, reducing the heat transfer and restricting the flow of air. Defrosting at frequent intervals is necessary to ensure maximum freezer performance. Defrosting by a built-in warming device is much quicker and more thorough than manual defrosting and does not risk damage to the cooling surfaces.

4.2.7 LIFTS OR CONVEYORS SHOULD BE INSTALLED FOR MOVING THE FROZEN FISH FROM FREEZERS TO FROZEN STORAGE.

If manual handling is used, frozen blocks or individually frozen fish, which are very brittle, may be damaged or broken.

4.2.8 CONTAINERS USED FOR UNLOADING AND TRANSPORTING FROZEN FISH SHOULD BE STRONG AND CONSTRUCTED FROM SUITABLE IMPERVIOUS MATERIALS.

Materials employed should be capable of being thoroughly cleaned and should not present any hygienic hazards.

4.3 Hygienic Operating Requirements

4.3.1 BEFORE ANY FISH COMES ABOARD, AND BETWEEN EACH HAUL OF THE GEAR, DECKS, POUNDS OR PENS, BOARDS AND ALL OTHER DECK EQUIPMENT WHICH WILL COME IN CONTACT WITH FISH SHOULD BE HOSED DOWN WITH CLEAN SEA WATER AND BRUSHED TO REMOVE ALL VISIBLE DIRT, SLIME AND BLOOD. FF (4.5.1 Adapted)

The purpose of this washing is to remove all traces of slime, blood, tar, oil or other contaminating matter which may cause discolouration and offensive odours in the fish. In most fisheries this cleaning can be carried out while the net is in the water.

It is also important to have the surface of the deck and deck pounds well precooled by hosing them down with cold clean water before the fish is unloaded. During the warm weather, the surface temperature of the deck can be very high. It would be bad practice, therefore, to dump the catch on such a deck without any concern for the quality of the fish, especially those from the bottom layer which, in all probability, would remain for a longer time in direct contact with the hot surface of the vessel's deck.

4.3.2 ALL TUBS, TANKS, BARRELS AND OTHER EQUIPMENT USED IN HANDLING, GUTTING, WASHING, FILLETING AND CONVEYING OPERATIONS SHOULD BE THOROUGHLY CLEANED, DISINFECTED AND RINSED AFTER EACH CYCLE OF OPERATIONS. FF (4.5.2)

Any filth, slime, blood or scales allowed to dry and accumulate on surfaces with which fish comes in contact, will be very difficult to remove later, and will thus contaminate the subsequent loads of fish.

4.3.3 DURING FISHING TRIPS THE FISH HOLD BILGE SUMP SHOULD BE DRAINED REGULARLY. THE SUMP SHOULD BE ACCESSIBLE AT ALL TIMES. FF (4.5.3)

Bilge water containing blood and slime, if not regularly pumped out, will provide a perfect medium for the multiplication of micro-organisms and give rise to offensive odours in the fish hold.

4.3.4 SEA WATER WHICH HAS BEEN USED FOR COOLING ENGINES, CONDENSERS OR SIMILAR EQUIPMENT SHOULD NOT BE USED FOR WASHING FISH, DECK, HOLD OR ANY EQUIPMENT WHICH MIGHT COME IN CONTACT WITH FISH. FF (4.5.5)

The water used for cooling engines is usually at a higher temperature than fresh sea water, and might be contaminated with oil or other petroleum products, or contain rust and other by-products of metal corrosion.

Such water, therefore, will accelerate considerably the spoilage of fish by raising their temperature and might impart objectionable taste, odour or undesirable discolouration.

4.3.5 WHERE GUTTING BENCHES ARE INSTALLED THESE SHOULD BE PROVIDED WITH CHANNELS OR CHUTES WHICH HAVE A CONTINUOUS SUPPLY OF CLEAN SEA WATER TO CARRY THE GUTS OVER THE SHIPSIDE.

Where fish are contaminated by offal and filth from the gutting operations, the spoilage rate will be increased and all surfaces with which the guts come in contact will also become contaminated. The installation of gutting benches makes the task easier, but care should be taken to ensure that the benches are kept in a hygienic condition.

4.3.6 FISH GUTS SHOULD NOT BE ALLOWED TO CONTAMINATE OTHER FISH ON DECK

Fish guts contain digestive enzymes and spoilage bacteria. If allowed to foul the rest of the catch, the spoilage rate will be increased. This contamination can be prevented by dropping guts into suitable watertight containers or chutes discharging over the ship side. FF (4.6.12 Adapted)

In disposing of offal into the surrounding water, some consideration should be given to the possibility of a serious pollution problem, especially if this is done in sheltered waters, close to public beaches or inhabited areas.

With bigger boats handling larger quantities of fish, the resulting offal could easily be processed into fish meal. Such machines have been developed for installation on board fishing vessels and are commercially available.

4.3.7 WHEN CLEANING AND HOSING OPERATIONS ARE CARRIED OUT WHILE THE VESSEL IS IN PORT, POTABLE FRESH OR CLEAN SEA WATER SHOULD BE USED. FF (4.5.6)

The water should always be free from objectionable contamination. The total number of bacteria in it should be low, and it ought not to contain any micro-organisms of public health significance. Contamination of the fish by water-borne micro-organisms and other undesirable substances will result in the loss of quality and might become a health hazard. Harbour water is usually heavily polluted, and should never be used for cleaning purposes. This is also true for water in the close vicinity of towns, villages, industrial plants, fish processing establishments and factory ships.

4.3.8 IMMEDIATELY AFTER THE CATCH IS UNLOADED, THE DECK AND ALL DECK EQUIPMENT SHOULD BE HOSED DOWN, BRUSHED, THOROUGHLY CLEANED WITH A SUITABLE CLEANING AGENT, DISINFECTED AND RINSED. FF (4.5.7)

Fish blood, guts, slime and dead fish left on the deck will support bacterial multiplication which may contaminate future catches. If allowed to dry, slime, blood and scales are very difficult to remove.

It is important to realize that thorough cleaning should always precede disinfection especially when chlorine is used as the disinfecting agent. Any organic matter, which if not removed from the surfaces that are to be disinfected, will rapidly combine with and neutralise the micro-organism killing ability of chlorine or any other disinfectant.

4.3.9 IN SHIPS USING REFRIGERATED SEA WATER OR REFRIGERATED BRINE SYSTEMS FOR THE HOLDING, CHILLING AND FREEZING OF THE CATCH, ALL TANKS, PUMPS, HEAT EXCHANGERS AND OTHER ASSOCIATED EQUIPMENT SHOULD BE CLEANED IMMEDIATELY AFTER DISEMBARKING THE CATCH. POTABLE WATER OR CLEAN SEA WATER CONTAINING A SUITABLE CLEANING AGENT SHOULD BE CIRCULATED THROUGH ALL PARTS OF THE SYSTEM. TANKS SHOULD BE INSPECTED CAREFULLY AND CLEANED OUT BY BRUSHING IF NECESSARY. FF (4.5.9)

Since anearobic bacteria are particularly active under tank storage conditions, a very high standard of sanitation is required to avoid their build up and the spread of infection from one tank to another.

Immediately after unloading, when surfaces are still wet, the holding tanks should be washed with clean cold water under adequate pressure, then scrubbed with a brush using an alkaline detergent solution, then followed by a rinse with warm and cold water.

All pumps, pipes and heat exchangers should be thoroughly flushed with clean cold water, then followed by circulating through the sytem either a hot alkaline solution or cold water to which a strong cleaning agent has been added. After rinsing with clean water, a suitable disinfectant should be circulated through the system. It has been regarded by many fishermen as good practice to leave a weak solution of a non-corrosive disinfectant in the system. This of course must be drained and rinsed out thoroughly with clean sea water before filling the tanks.

4.3.10 WHERE REFRIGERATED SEA WATER IS USED FOR HOLDING OR CHILLING OF FISH, ONLY CLEAN SEA WATER SHOULD BE USED AND SHOULD BE CHANGED AS OFTEN AS POSSIBLE TO PREVENT THE ACCUMULATION OF CONTAMINATING MATERIALS. FF (4.5.10)

Use of sea water contaminated with sewage or industrial discharges will affect the quality of the catch or render it unfit for human consumption. It is advisable for fishermen to check with the local authorities which areas are likely to be free of pollution. The intake for the vessel's sea water pump should be located away from sewage, waste discharge and engine cooling water outlets of the boat. Clean sea water should be taken in while the vessel is in forward motion.

4.3.11 ADEQUATE PRECAUTIONS SHOULD BE TAKEN TO ENSURE THAT HUMAN AND OTHER WASTES FROM THE FISHING VESSEL ARE DISPOSED OF IN SUCH A MANNER AS NOT TO CONSTITUTE A PUBLIC HEALTH AND HYGIENIC HAZARD. FF (4.5.11)

With man's increased concern for the protection of his environment, in some countries the disposal of any waste from any boat into the surrounding water is restricted by law.

The fishermen should be fully aware of their responsibilities in this regard. Discharge of animal, human or any other wastes from the fishing vessel into the sheltered waters close to man inhabited areas, or over the shellfish growing areas should not be practised.

4.3.12 EFFECTIVE MEASURES SHOULD BE TAKEN TO PROTECT THE FISHING VESSEL AGAINST INSECTS, RODENTS, BIRDS OR OTHER VERMIN. FF (4.5.12)

Rodents, birds and insects are potential carriers of many diseases which could be transmitted to man by contamination of fish. Fishing vessels should be regularly examined for evidence of infestation and, when required, effective control measures should be taken.

All rodenticides, fumigants, insecticides and other toxic substances should be used only in accordance with the recommendations of the appropriate official agency having jurisdiction.

4.3.13 DOGS, CATS AND OTHER ANIMALS SHOULD BE EXCLUDED FROM AREAS OF THE VESSEL WHERE FISH IS RECEIVED, HANDLED, PROCESSED AND STORED. FF (4.5.13)

Because of public health hazards and for aesthetic reasons, no surface of the fishing vessel and of the equipment thereon which comes in contact with fish should be exposed to contamination with animal hair or excreta.

4.4 Operating Practices and Production Requirements

4.4.1 Handling the Catch before Freezing

4.4.1.1 HANDLING THE CATCH SHOULD BEGIN AS SOON AS IT COMES ON BOARD. ANY FISH UNSUITABLE FOR HUMAN CONSUMPTION SHOULD BE REMOVED FROM THE CATCH AND KEPT SEPARATE FF (4.6.2)

In those fisheries where sorting is done as soon as the fish are taken on board, it should be carried out quickly, to avoid any risk of damage due to abrasion, particularly where the catch contains spiny and rough-skinned species. The fish that are capable of producing distinctive ammoniacal odours on storage should also be separated from the other fish as soon as possible. Fish unsuitable for human food because of small size, spoilage, damage, parasitization, poisonous nature or any other reason should also be quickly removed from the catch.

4.4.1.2 FISH SHOULD NOT BE TRAMPLED OR STOOD UPON, AND SHOULD NOT BE PILED DEEPLY ON DECK. FF (4.6.4)

Any physical damage, whether by crushing, bruising, rubbing or scraping assists spoilage and reduces the value of the fish for subsequent food processing purposes.

4.4.1.3 ALL FISH ON DECK SHOULD BE PROTECTED FROM SUN, FROST, AND THE DRYING EFFECTS OF WIND. FF (4.6.5 Adapted)

It is essential to prevent the fish temperatures from rising. Each degree of rise in temperature increases the rate of spoilage. If the catch is to be on deck for any length of time, it should be protected by an awning, ice, immersion in refrigerated sea water or even a wet, clean canvas or burlap. Drying will lower market value by spoiling the appearance and possibly inducing rancidity. Slow freezing of the catch on deck, in areas where very low temperatures are encountered, should also be avoided.

4.4.1.4 FISH KEPT IN PRE-GUTTING STORAGE FACILITIES SHOULD NOT BE PILED TOO DEEPLY. STANCHION AND DIVIDING BOARDS SHOULD BE ADEQUATE TO PREVENT MOVEMENT AND CRUSHING OF THE FISH DUE TO THE VESSEL'S MOTIONS.

The stowage of fish in depth and in large undivided pounds or pens will result in damage to the catch by pressure and mass movement of fish with the motions of the vessel due to sea or weather conditions.

4.4.1.5 FISH SHOULD BE MAINTAINED AT A TEMPERATURE AS NEAR AS POSSIBLE TO 0°C (32°F) AT ALL TIMES UNTIL LOADED INTO THE FREEZER. CHILLING OF WHOLE OR GUTTED FISH SHOULD BE DONE RAPIDLY BY THE USE OF ICE OR BY IMMERSION IN OR SPRAYING WITH REFRIGERATED SEA WATER. RAPID CHILLING IS PARTICULARLY IMPORTANT IN WARM CLIMATES.

Thorough chilling will retard spoilage and minimize physical and chemical changes in the fish, and will result in the production of frozen products which, when thawed, will be comparable with the quality of the product before freezing. Keeping fish and fillets thoroughly chilled right up to the time they are frozen usually avoids the undesirable effects of rigor mortis.

4.4.1.6 WHEN FISH ARE TO BE BLED, THIS SHOULD BE DONE IMMEDIATELY AFTER THE FISH ARE LANDED ON DECK. FF (4.6.7 Adapted)

Bleeding is usually quicker and more effective when carried out at a relatively low temperature or when the fish are still alive.

It is good practice with some fish to bleed them prior to gutting. On the other hand, in some fisheries, the fish are bled by gutting. In the latter case, the fish will bleed better if they are freshly caught.

If the bleeding and gutting is done on dead or "spent" fish, the fillets cut from such fish will have a pronounced reddish discolouration rather than the appearance of properly bled fish.

The thorough bleeding of white fish results in a frozen product which is whiter after thawing. In the case of cod, bleeding for about 20 minutes at chill temperatures is usally sufficient to produce a satisfactorily white product.

4.4.1.7 GUTTING SHOULD COMMENCE AS SOON AS THE CATCH COMES ON DECK. FF (4.6.8)

The reasons for prompt gutting are, firstly, to sever some of the main blood vessels allowing the fish to bleed and, secondly, to remove the stomach and gut which would otherwise cause a softening of the flesh and accelerate spoilage. Fish in which the guts are full of food, will spoil even more rapidly. Although immediate gutting is desirable with most species, the catch in certain fisheries cannot be handled rapidly enough and advantages gained by gutting may be offset by quality loss resulting from rises in fish temperature. In such circumstances, it would be preferable to get the fish under cover and to chill quickly, rather than delay the chilling operation by gutting.

4.4.1.8 WHERE RAPID GUTTING IS NOT PRACTICABLE, WHOLE FISH SHOULD BE WASHED AND CHILLED AS SOON AS IT COMES ON DECK. FF (4.6.9)

This helps to remove filth, particularly gut contents squeezed out of the fish in the net, and it helps to prevent excessive contamination during subsequent gutting and handling.

A thorough washing of the fish will reduce considerably the number of spoilage microorganisms and remove some of the protein digestive enzymes which come from the viscera of the fish.

4.4.1.9 GUTTING SHOULD BE COMPLETE AND CARRIED OUT WITH CARE. BAD GUTTING MIGHT BE WORSE THAN NO GUTTING AT ALL. FF (4.6.11.)

Pieces of gut or liver, if not completely removed, will act as centres from which spoilage will develop. Enzymes from pieces of gut and liver will digest the flesh and facilitate the entry of bacteria. Careless gutting, for example, cutting beyond the vent of a fish will also allow the entry of bacteria into the flesh. Nevertheless, cuts should be adequate to allow easy access to the belly cavity and complete removal of guts.

4.4.1.10 SEPARATE AND ADEQUATE STORAGE FACILITIES SHOULD BE PROVIDED FOR THE FISH ROE, MILT AND LIVERS IF THESE ARE SAVED FOR LATER UTILIZATION FF (4.6.13)

In some fisheries certain by-products of gutting operation are saved either for human food, like fish roe and milt, or for utilization in pharmaceutical industry, like fish liver used in vitamin extraction.

All these by-products should be stored separately from the fresh fish intended for human consumption and should be kept well chilled and protected from sun, rain, wind and frost. Partial freezing of roe might damage it.

4.4.1.11 IMMEDIATELY AFTER GUTTING, FISH SHOULD BE WASHED WITH COLD CLEAN SEA WATER OR POTABLE WATER. FF (4.6.14 Adapted)

Gutted fish, before being frozen, should be thoroughly washed with cold clean sea water, preferably refrigerated sea water, to remove all blood, slime and pieces of gut. Fish blood coagulates rapidly and washing will facilitate more complete bleeding, which in turn will improve the appearance of the product. If tanks are used for washing gutted fish, a continual flow of clean sea water should be provided to prevent the accumulation of contaminating materials.

4.4.1.12 ON COMPLETION OF WASHING THE FISH, FURTHER HANDLING SHOULD BE CARRIED OUT WITHOUT DELAY.

If freezing cannot be carried out immediately, the fish should be thoroughly iced or immersed in ice water to bring its temperature down to 0°C (32°F) as quickly as possible. FF (4.6.15 Adapted)

At higher temperatures a delay of one hour can have a serious effect on the quality of the final product.

Chilling of fish in bulk by cold air or by top icing only, should be avoided.

4.4.1.13 FISH WHICH ARE WAITING TO BE FROZEN SHOULD BE STOWED UNDER CHILL CONDITIONS AND IN SUCH A WAY THAT THEY WILL NOT BE DAMAGED BY CRUSHING OR BY MOVEMENT DUE TO THE VESSEL'S MOTIONS.

Deep bulk stowage of any fish awaiting freezing is likely to cause considerable damage to the flesh by pressure. If they are not kept chilled at this stage, the fish may quickly go into rigor, resulting in damage.

4.4.1.14 WITH BUFFER STOWAGE OF FISH, IN SOME FISHERIES REFRIGERATED SEA WATER SHOULD BE CONSIDERED INSTEAD OF ICED STOWAGE.

Stowage in ice is, as yet, the most common method of keeping fish in a chilled condition, but chilling by immersion in or even spraying with refrigerated sea water involves less manual handling of the fish.

Large quantities of fish may be chilled more rapidly by immersion in tanks of refrigerated sea water or refrigerated brine than by icing and it is easier to keep them in chilled condition. Care should be taken that they are not packed too densely. It is essential that there is a good circulation of the cooling medium. This type of storage assists the bleeding of white fish prior to freezing. It also avoids pressure damage to fish resulting from deep bulk stowage in ice.

Recommendations on refrigerated sea water and refrigerated brine stowage for maintaining fish in a chilled condition are given in the "Code of Practice for Fresh Fish".

4.4.1.15 WHERE BINS ARE USED TO STOW SMALL QUANTITIES OF FISH AT THE FREEZER LOADING AREA, EACH BIN SHOULD ONLY HOLD ONE SPECIES OR ONE SIZE RANGE OF THAT SPECIES.

It facilitates the freezer loading operation if the fish in each bin or container are of the same species. It will also be advantegeous to the merchant or shore processor since blocks can then be selected to meet special requirements as to size and species of fish.

4.4.1.16 THE PROCESSING SYSTEM SHOULD BE FLEXIBLE ENOUGH TO HANDLE FILLETS AT ANY OF THE RIGOR STAGES.

It is still open to question whether fillets should be frozen before, during or after rigor. None of the rigor stages are clear cut, since it is a gradual process beginning the moment the fish dies. For this reason, therefore, it is advisable to have a system of processing which is flexible enough to handle fish at all stages of rigor and, if necessary, a labelling system which will enable the shore processors to identify fillets frozen under different conditions.

4.4.1.17 IF THERE IS ANY DELAY IN THE FREEZING OF FILLETS THEY SHOULD BE CHILLED BUT PRE-RIGOR FILLETS SHOULD NOT BE HELD IN FRESH WATER OR FRESH WATER ICE PRIOR TO FREEZING

Stowage should be by immersion in, or spraying with refrigerated sea water, since contact with fresh water is known to increase shrinkage of fillets cut from fish in a pre-rigor condition.

4.4.1.18 ALL PIN BONES SHOULD BE REMOVED FROM THE FILLETS THAT ARE USED FOR MAKING BONELESS FROZEN BLOCKS WHICH ARE TO BE CUT INTO CONSUMER PORTIONS.

Pin bones are objectionable in fillet blocks which are not to be further processed before cutting them into consumer portions or fish sticks (fish fingers). Their presence could make such products unacceptable to the consumer.

4.4.2 Freezing of Fish

4.4.2.1 FIRST-CAUGHT FISH SHOULD BE FROZEN FIRST.

The sequence of operations should ensure that fish caught earlier do not accumulate while later-caught fish are being frozen.

4.4.2.2 FISH WHICH ARE IN RIGOR AND STIFFENED IN A BENT POSITION SHOULD NOT BE STRAIGHTENED FORCIBLY WHEN LOADED INTO THE FREEZER.

If fish, deformed because of rigor, are straightened forcibly, the muscle structure will be damaged, causing gaping in subsequent fillets. Fish in rigor should be put aside until the rigor is resolved, or should be frozen in special blocks and marked so that they can be recognized at a later stage.

4.4.2.3 THE FREEZING PLANT SHOULD BE ADEQUATE TO DEAL WITH THE NORMAL CATCHING RATES OF THE VESSEL, SO THAT FISH ARE NOT HELD FOR LONG PERIODS PRIOR TO FREEZING.

Whole or gutted fish are best frozen soon after capture, allowing a bleeding time of at least 20 minutes for gutted white fish. Special care is required when preparing and freezing fillets in order to minimize damage caused by the natural process of rigor mortis (see App. I, para 1, "Factors Affecting the Qaulity of Frozen Fish"). It is very important to maintain all raw material in a chilled condition prior to freezing. Delays in freezing may have serious effects on the quality and appearance of the thawed product.

4.4.2.4 PRECISE FREEZING TIMES FOR FISH PRODUCTS SHOULD BE CAREFULLY DETERMINED.

The freezing time required for different products is influenced by many variables, such as product shape and size, the area exposed to the refrigerated surface or the refrigeration medium, and the temperature of the refrigerant. A calculated freezing time may serve as a rough guide when planning production, but whenever a new product is frozen in a freezer, the exact freezing time should be determined by direct measurements of the product temperatures during the freezing process. In many countries, practical advice on how to measure product temperature accurately can be obtained from fishery research organizations.

4.4.2.5 THE FREEZING PROCESS SHOULD BE RAPID AND THE TEMPERATURE REDUCTION ADEQUATE TO AVOID QUALITY LOSSES ASSOCIATED WITH BADLY FROZEN FISH.

Slow freezing, incomplete freezing and freezing to inadequately low temperatures promote changes in the fish flesh which adversely affect its texture, flavour and keeping time. Since these changes are minimized by quick freezing and rapid reduction of temperature to freezer store level, an adequate freezing capacity of the freezers is necessary for the production of high quality frozen products and it will also avoid build-up of buffer stored fish.

4.4.2.6 FROZEN FISH BLOCKS SHOULD BE OF REGULAR SIZE AND SHAPE.

Frozen blocks which are uniform in size and shape are easier to stow compactly with less likelihood of damage to the fish. They are also easier to discharge. Furthermore, control of temperature and speed of operation in industrial thawing of frozen blocks is more readily obtained if the units are of regular shape and uniform size. It is important that each fish within the block should be carefully arranged without bending, breaking or squashing so that it will retain its normal shape. This is particularly important when it is intended to saw the blocks into consumer portions.

4.4.2.7 IN VERTICAL PLATE FREEZERS, FISH SHOULD BE PACKED BETWEEN THE PLATES WITH AS FEW GAPS AS POSSIBLE. THE FREEZERS SHOULD NOT BE OVERLOADED WITH FISH.

Voids in the block structure could slow down heat transfer and may cause weakness in the frozen blocks which will result in breakage. Fish should be loaded in a manner which will make solid blocks and should never be loaded above the top of the freezer plates. The fish may be gently compressed, but any undue pressure should not be used in an attempt to fit oversize fish into the freezer. Loading above the plates may prevent easy removal of the blocks and oversize blocks may be difficult to stow properly. Very large fish may be headed before freezing into blocks, or they may be frozen by other means, e.g. in a sharp freezer.

4.4.2.8 IN USING HORIZONTAL PLATE FREEZERS, FISH OR FILLETS SHOULD BE PACKED IN TRAYS OR OTHER FORMS TO PRODUCE UNIFORM COMPACT BLOCKS OR PACKAGES.

It is important that there should be no voids in blocks and that surfaces should be uniform and flat. Overfilling trays will cause damage to the fish by excessive pressure while underfilling will result in bad contact with the plates and poor heat transfer conditions. Distorted or damaged trays or forms should not be used.

4.4.2.9 THE DEFROSTING TIME FOR CONTACT PLATE FREEZERS SHOULD BE JUST LONG ENOUGH TO ALLOW EASY LOADING AND UNLOADING OF THE BLOCKS FROM SECTIONS.

Frozen fish blocks should be removed from vertical plate freezers immediately after adhesion to the plates is broken by defrosting; otherwise, the blocks will warm up and their surfaces will begin to thaw. Before reloading the freezers, both refrigeration and defrosting valves should be closed so that the plates are neither heated nor chilled during the operation.

If the refrigerant is allowed to circulate during loading, fish may stick to the plates, and it will be difficult to obtain compact blocks. Tearing of the skin and flesh may also result. If the defrosting operation is continued during loading, the temperature of the fish will rise considerably. After the freezer has been loaded, the refrigerant should be allowed to circulate immediately.

Horizontal plate freezers, in which fish are usually frozen in trays or packages, should be defrosted as often as necessary to prevent a build-up of ice and frost on the plates.

4.4.2.10 BLAST FREEZERS SHOULD BE LOADED IN SUCH A WAY THAT THERE IS A SUFFICIENT FLOW OF COLD AIR AROUND THE PRODUCT.

In this process, heat is transferred from the fish to a cold air stream and carried to the cooling surfaces of the freezer. Adequate air circulation is essential and any obstruction to the flow of air around the product will result in poor freezing rates and variable product quality. If fish are placed too close together because of overloading the freezer, cold air circulation around the surfaces of individual fish will be obstructed and freezing times may be greatly increased. Wrapping fish or placing it in cartons will also slow down the rate of freezing.

4.4.2.11 LARGE FISH SUCH AS TUNA, WHICH ARE TO BE CANNED, SHOULD PREFERABLY BE FROZEN BY IMMERSION IN REFRIGERATED BRINE.

In order to minimize salt penetration and because it is impracticable to work with brine temperatures lower than -18°C (0°F), fish frozen in this way should have their temperature at the centre lowered as rapidly as possible to between -12°C (10°F) and -15°C (5°F). The temperature should then be lowered further to -18°C (0°F) or below in storage. During freezing there should be a rapid circulation of the cooling medium to ensure effective heat transfer. An upward circulation will assist in keeping the fish in suspension and all their surfaces in contact with the cooling medium. To avoid unnecessarily high salt penetration, the fish should be either removed from the brine or the brine pumped out as soon as freezing is completed.

4.4.2.12 ALL FREEZING PROCESSES SHOULD BE COMPLETED IN THE FREEZER BY ALLOWING THE FULL TIME FOR EACH CYCLE.

The manufacturer of the refrigeration equipment should provide all necessary information for the correct operation of the plant, including the time required for each freezing cycle. If the plant is functioning properly and loading and unloading is done according to instructions, fish coming out of the freezers should be properly frozen. There is always a temptation to reduce the freezing time, or overfill freezers during periods of heavy catching. This should be avoided. If the freezing time is too short, the centre of the block will not be frozen, even though the surface may be hard. Blocks of fish which are not completely frozen are easily broken during unloading and storing. If many partly frozen blocks are stored, the freezer store temperature may rise, placing an extra load on the refrigeration equipment and also causing temperature fluctuations that will adversely affect the quality of all the fish in storage.

On the other hand, if fish are left in the freezers long after they are properly frozen, freezer capacity is wasted and unnecessary delays in the freezing of fish will occur. In the case of air blast or sharp freezers, there will also be quality losses due to dehydration of the fish surfaces.

4.4.2.13 FILLETS SHOULD BE FROZEN RAPIDLY TO ENSURE A HIGH QUALITY PRODUCT.

Freezing of fillets should be carried out in contact or blast freezers. The use of brine is not recommended for the freezing of fillets because of salt penetration into the product.

4.4.2.14 FREQUENT CHECKS SHOULD BE MADE ON THE PRESSURES AND TEMPERATURES IN THE REFRIGERATION SYSTEM TO ENSURE CORRECT OPERATION.

If frequent checks are made and records of these maintained, there will be little chance of the refrigerant's temperatures being too high or the equipment not functioning correctly. Any defects noted should be rectified quickly. It is important to watch the temperature gauges for superheating at the compressor's delivery side and sub-cooling of the liquid before the expansion valves. Sometimes, these two readings will indicate leaks of refrigerant before there is any serious loss of freezing capacity.

4.4.2.15 ACCURATE RECORDS OF ALL FREEZING OPERATIONS SHOULD BE KEPT.

An accurate record of all loading and unloading times of the freezer and number of blocks frozen, including size and species, will greatly assist in efficient management and control of the operations.

4.4.2.16 A SYSTEM OF LABELS OR COLOUR CODES SHOULD BE USED WHEN LOADING FISH INTO A FREEZER TO ASSIST IN THE LATER IDENTIFICATION OF FROZEN PRODUCTS.

Some system of identification is required to indicate the species, size, condition of fish and its suitability for further processing and handling.

The label should indicate location of catch, date of freezing, quality and state of raw material. Pre-rigor frozen fillets, for example, require careful thawing and are not suitable for smoking. If the shore processor could readily identify these fish, he would be able to overcome difficulties with appearance and texture and would also avoid using such a fish in processes for which it unsuitable.

4.4.3 Glazing and Storing

4.4.3.1 FROZEN PRODUCTS SHOULD BE GLAZED OR WRAPPED IMMEDIATELY AFTER FREEZING TO PROTECT THEM FROM DEHYDRATION AND OXIDATION IN THE FREEZER STORE.

Present practices of protecting frozen fish during storage on board the fishing vessel vary widely and depend, among other things, on species, freezing method and storage temperature. Blocks of fish or single fish are usually glazed, and smaller blocks of fish or fillets may either be glazed or packed in wrappers or cartons of suitable material to protect them from dehydration and oxidation and also to safeguard their hygienic condition. Glaze and protective wrapping conserve the quality of frozen fish and should be used wherever practical.

4.4.3.2 FROZEN FISH OR BLOCKS SHOULD BE CONVEYED TO THE FREEZER STORE IMMEDIATELY AFTER GLAZING OR WRAPPING. THEY SHOULD BE HANDLED WITH CARE TO AVOID BREAKAGE OR DAMAGE TO THE GLAZE OR PROTECTIVE WRAPPER.

Any delay at this stage will allow the surface of the product to warm up and will affect its quality. Frozen fish or fish blocks with soft surfaces are easily damaged if roughly handled, If much fish is allowed to warm up, this will put an extra load on the freezer store's refrigeration system. Wherever possible, frozen products should be transferred to the freezer store by conveyors rather than by rough manual methods.

4.4.3.3 FROZEN BLOCKS SHOULD BE STOWED IN THE FREEZER STORE IN SUCH A WAY THAT THEY WILL NOT BE BROKEN OR DAMAGED.

Frozen fish products should be stowed carefully to avoid damage during the stowing and discharging or as a result of the vessel's motions. Broken blocks and loose frozen fish should be stowed separately from whole blocks.

4.4.3.4 FROZEN FISH AND FISH PRODUCTS SHOULD BE STORED ON BOARD THE VESSEL AT TEMPERATURES APPROPRIATE FOR THE SPECIES AND END PRODUCT.

It should be borne in mind that although frozen fish may only be stored for relatively short periods aboard ship, the same frozen products may be stored for much longer periods ashore. Deterioration during the initial storage at sea cannot be corrected by later storage at a lower temperature. It is thus recommended that storage aboard fishing vessels be at the temperature needed to retain the intrinsic quality during the envisaged storage period but it should be at -18°C (0°F) or lower.

However, in some cases, higher temperatures may be tolerable, as for example, in the storage of brine frozen tuna destined for canning. Whatever procedure followed it is of vital importance that the designated storage temperature be maintained at all times, as fluctuations in temperature can affect product quality.

4.4.3.5 A STOWAGE PLAN OF THE FREEZER STORE SHOULD BE KEPT TO FACILITATE LOCATING PRODUCTS OF DIFFERENT SPECIES, SIZE AND RAW MATERIAL CONDITION.

A well prepared stowage plan will assist, during unloading, in separating blocks of different species and size of fish and blocks of different quality or intended for different purposes.

4.4.4 Unloading the Catch

4.4.4.1 WHEN UNLOADING THE CATCH, CARE SHOULD BE TAKEN TO AVOID BREAKAGE OF FROZEN FISH OR FISH BLOCKS.

Present methods of unloading often still require much manual handling of the product and this, apart from being less efficient, frequently results in breakage of blocks and damage to fish. The methods of unloading need to be reviewed periodically and mechanical equipment should be introduced wherever practical so that the catch may be unloaded more quickly and without damage.

4.4.4.2 FROZEN FISH SHOULD BE QUICKLY TRANSFERRED FROM THE SHIP'S FREEZER STORE TO THE SHORE BASED FREEZER STORE.

There should be no delay after unloading; suitable transport should be available to transfer quickly the fish to frozen storage ashore. If there is any delay the temperature may rise considerably, and the surface of the frozen products may thaw. This can result in physical damage when blocks are being handled and also cause adverse changes in the quality, texture and flavour of the fish.

Ideally, shore based freezer stores should be situated at the quayside near the unloading area to facilitate discharging directly from the vessel into the freezer store e.g. with conveyors.

4.5 Sanitary Control Programme

4.5.1 IT IS DESIRABLE THAT EACH FISHING VESSEL SHOULD DEVELOP ITS OWN SANITARY CONTROL PROGRAMME BY INVOLVING THE WHOLE CREW AND BY ASSIGNING TO EACH MEMBER A DEFINITE FF TASK IN CLEANING AND DISINFECTING THE BOAT. (4.8.1)

A permanent cleaning and disinfection schedule should be drawn up to ensure that all parts of the boat and equipment thereon are cleaned appropriately and regularly.

The fishermen should be well trained in the use of special cleaning tools, methods of dismantling equipment for cleaning and should be knowledgeable in the significance of contamination and the hazards involved.

FREEZING FISH ON SHORE

5. SECTION IVB - PLANT FACILITIES AND OPERATING REQUIREMENTS

5.1 Plant Construction and Layout

5.1.1 General Considerations

5.1.1.1 FISH FREEZING OPERATIONS INCLUDING THE STORAGE SHOULD BE DESIGNED TO PRODUCE SAFE AND WHOLESOME FROZEN PRODUCTS FOR EITHER FURTHER PROCESSING OR DIRECT MARKETING.

The decision to commence a fish freezing operation should be based on reasonable assurances that there will be sufficient fish supplies to sustain the operation, that the frozen product will be of good quality, remaining stable during the prolonged storage, and that it could be easily and profitably marketed.

It is important that the costs of processing, freezing and freezer storage be carefully assessed to ensure that the whole operation will be economically practical.

The proposal to handle any non-fish food products together with the fish should also be carefully assessed before the decision is taken. Fish, as opposed to meats and vegetables, require a higher rate of freezing and considerably lower freezer storage temperatures to safeguard their quality. The handling and processing of fish should also be conducted in separate buildings or areas which are physically separated to prevent any contamination of fish or fishery products.

5.1.1.2 FISH PROCESSING AND FREEZING OPERATIONS SHOULD BE PLANNED AND DESIGNED TO HAVE SUFFICIENT CAPACITY TO PROCESS, FREEZE AND STORE FROZEN FISH AND FISH PRODUCTS AT THE FORESEEABLE AVERAGE RATE OF DAILY DELIVERY AND SHOULD NOT BE OPERATED BEYOND THEIR FULL RATED CAPACITY FOR ANY EXTENDED PERIOD.

Where supplies of fish are known to fluctuate considerably, and particularly where fisheries are seasonal, it may be difficult to decide on what the capacity of a plant and freezer store should be.

If the operation is to be self-sustaining, provision of a large reserve capacity which is seldom fully used is difficult to justify. On the other hand, the reserve capacity should be large enough to process quickly the expected peaks in a fluctuating fish supply without overtaxing the facilities of the plant for any extended period.

If a plant is operated above its designed capacity, its efficiency will decline and delays in processing, which will have an adverse effect on the quality of the product, are likely to occur. Furthermore, there is a serious risk that shutdowns through failure or overloaded equipment may necessitate a lengthy suspension of the freezing operation.

There should be sufficient standby replacement for all the processing and freezing equipment to allow for servicing and in case of an emergency. This requirement is of paramount importance in the operation of the freezer store where any malfunctioning or breakdown in refrigeration equipment could result in serious financial losses.

5.1.1.3 PLANTS FOR THE PROCESSING AND FREEZING OF FISH SHOULD BE DESIGNED AND EQUIPPED SO THAT ALL HANDLING, PROCESSING AND FREEZING OPERATIONS CAN BE CARRIED OUT EFFICIENTLY AND THE FISH CAN PASS FROM ONE STAGE OF PROCESSING TO THE NEXT IN AN ORDERLY MANNER AND WITH MINIMUM DELAY.

To conserve their quality, fish destined for freezing should be handled, processed and frozen as soon as possible after they have been brought in. A great deal of care should be taken in planning the layout and equipment of a plant to ensure that there is sufficient space and suitable facilities to carry out each operation efficiently and to move products through the various stages in an orderly manner.

The location of the freezer store should also be taken into account when arranging the equipment, positioning the freezers and elaborating the flow diagram for the whole operation.

In designing the freezer store and depending on the requirements of the operation, the following additions and modifications might be worthwhile considering:

(a) separate glazing room for glazing operations;
(b) tempering room where fish blocks can be held at a slightly higher temperature for conditioning prior to cutting into sticks or portions; and
(c) buffer freezer store where small batches of the product can be held for a short period of time either before shipment or for further processing.

It is also often the case with the freezer store operation that a certain amount of frozen fish processing, such as steaking, portioning, trimming, consumer packaging and labelling, has to be done before distribution. A provision should be made therefore for a separate area or a room where these operations could be carried out without exposing the frozen fish to the high ambient temperature of the fresh fish processing plant.

Use should be made of conveyors and other mechanical moving devices wherever these are economically practical.

Considerable elasticity of operation could be achieved by having adequate storage facilities for the incoming raw material. Fish which could not be immediately processed and frozen should be kept chilled and protected from contamination and damage.

5.1.2 Construction

5.1.2.1 FISH PROCESSING AND FREEZING PLANT SHOULD BE SPECIALLY DESIGNED FOR THE PURPOSE — FF 5.1.1

Raw fish spoils considerably faster than raw meat of warm blooded animals or other common foods like milk, fresh fruits or green vegetables. The keeping time of the fish delivered to the processing plant has been already reduced by time and conditions of handling and storage on the fishing vessel. There is little that could be done by the processing and freezing to improve the quality of fish delivered. With the best of treatment the fresh fish, depending on species and physical conditions of the animal when caught, after ten to twelve days in ice will be considered, in most cases, as unfit for human consumption.

Because of this highly perishable nature of fish, the processing plant demands special facilities and materials which, as compared to other food processing establishments, are in some cases rather unique.

The technological and hygienic operating and production requirements also differ in being often more demanding and critical.

The processing and freezing plant therefore should meet the same requirements for construction and sanitary facilities as the fresh fish processing establishment detailed in the "Code of Practice for Fresh Fish" and repeated in this Code under sub-sections 5.1.2 and 5.1.3 respectively.

5.1.2.2 THE PLANT AND SURROUNDING AREA SHOULD BE KEPT REASONABLY FREE FROM OBJECTIONABLE ODOURS, SMOKE, DUST OR OTHER CONTAMINATION. THE BUILDINGS SHOULD BE SUFFICIENT IN SIZE WITHOUT CROWDING OF EQUIPMENT OR PERSONNEL, WELL CONSTRUCTED AND KEPT IN GOOD REPAIR. THEY SHOULD BE OF SUCH DESIGN AND CONSTRUCTION AS TO PROTECT AGAINST THE ENTRANCE AND HARBOURING OF INSECTS, BIRDS OR OTHER VERMIN AND TO PERMIT READY AND ADEQUATE CLEANING. — FF 5.1.2.1

The location of a plant, its design, layout, construction and equipment, should be planned in detail with considerable emphasis on the hygienic aspect, sanitary facilities and quality control.

National or local authorities should always be consulted in regard to building codes, hygienic requirements of the operation and sanitary disposal of sewage and plant waste.

The food handling area should be completely separate from any part of the premises used as living quarters.

5.1.2.3 FLOORS SHOULD BE HARD SURFACED, NON-ABSORBENT AND ADEQUATELY DRAINED. FF (5.1.2.2)

Floors should be constructed of durable, waterproof, non-toxic, non absorbent material which is easy to clean and disinfect. They should be non-slip and without crevices and should slope evenly and sufficiently for liquids to drain off to trapped outlets fitted with a removable grill.

If floors are ribbed or grooved to facilitate traction, any grooving of this nature should always run towards the drainage channel.

The junctions between the floors and walls should be impervious to water and, if possible, should be coved or rounded for ease of cleaning.

Concrete, if not properly finished, is porous and can be affected by animal oils, strong brines, various detergents and disinfectants. If used, it should be dense, of a good quality and with a well finished waterproof surface.

5.1.2.4 DRAINS SHOULD BE OF AN ADEQUATE SIZE, SUITABLE TYPE, EQUIPPED WITH TRAPS AND WITH REMOVABLE GRATINGS TO PERMIT CLEANING. FF (5.1.2.3)

Suitable and adequate drainage facilities are essential for removal of liquid or semiliquid wastes from the plant. There should not be any floor area where water might collect in stagnant pools. Drains should be constructed of smooth and impervious material and should be designed to cope with the maximum flow of liquid without any overflowing and flooding. Drainage systems should be provided with deep seal traps which are appropriately located and easy to clean.

Drainage lines carrying waste effluent except for open drains should be properly vented, have a minimum internal diameter of 10 cm (4 inches) and, if required, run to a catch basin for removal of solid waste material. Such a basin should be located outside the processing area and should be constructed of waterproof concrete or other similar material, designed to the local specifications and approved by the local authority having jurisdiction.

5.1.2.5 INTERNAL WALLS SHOULD BE SMOOTH, WATERPROOF, RESISTANT TO FRACTURE, LIGHT COLOURED AND READILY CLEANABLE. FF (5.1.2.4)

Acceptable materials for finishing walls inside are cement render, ceramic tiles, various kinds of corrosion-resistant metallic sheeting such as stainless steel or aluminium alloys and a variety of non-metallic sheetings which have adequate impact resistance, desirable surface qualities and are easily repairable.

All sheeting joints should be sealed with a mastic or other compound resistant to hot water, and cover strips should be applied where necessary.

Wall-to-wall and wall-to-floor junctions should be coved or rounded to facilitate cleaning.

Walls should be free from projections and all pipes and cables should be sunk flush with the wall surface or neatly boxed in.

5.1.2.6 WINDOW SILLS SHOULD BE KEPT TO A MINIMUM SIZE, BE SLOPED INWARD AT 45° AND BE AT LEAST 1 METRE (3 FT) FROM THE FLOOR. FF (5.1.2.5)

Window sills and frames should be made of a smooth, waterproof material and, if of wood, should be kept well-painted. Internal window sills should be sloped to prevent storage of miscellaneous materials or accumulation of dust and should be constructed to facilitate cleaning.

Windows should be filled with whole panes and those which open should be screened. The screens should be constructed so as to be easily removable for cleaning and should be made from suitable corrosion-resistant material.

5.1.2.7 ALL DOORS THROUGH WHICH FISH OR THEIR PRODUCTS ARE MOVED SHOULD BE SUFFICIENTLY WIDE, WELL CONSTRUCTED OF A SUITABLE MATERIAL AND SHOULD BE OF A SELF-CLOSING TYPE. FF (5.1.2.6)

Doors through which fish or their products are moved should be either of a corrosion-resistant metal or sheated with a corrosion-resistant metal, or made from other suitable material with adequate impact resistance and, unless provided with an effective air screen, should be of self-closing type.

Both the doors and the frames of the doorways should have a smooth and readily cleanable surface.

Doors through which the product is not moved, such as those providing staff access, should be appropriately surfaced, at least on the processing area side, to allow for ease of cleaning.

5.1.2.8 CEILINGS SHOULD BE DESIGNED AND CONSTRUCTED TO PREVENT ACCUMULATION OF DIRT AND CONDENSATION AND SHOULD BE EASY TO CLEAN. FF 5.1.2.7

Ceilings should be at least 3 metres (10 ft) in height, free from cracks and open joints and should be of a smooth, waterproof, light coloured finish.

In buildings where beams, trusses, pipes or other structural elements are exposed, the fitting of a suspended ceiling just below is desirable.

Where the roof beams and trusses cannot be covered, the underside of the roof may constitute a satisfactory ceiling providing all joints are sealed and the supporting structures are of a smooth, well-painted and light coloured surface, easily cleanable and constructed to protect the fish products from falling debris, dust or condensate.

5.1.2.9 A MINIMUM ILLUMINATION OF 220 LUX (20 FOOT CANDLES) IN GENERAL WORKING AREAS AND NOT LESS THAN 540 LUX (50 FOOT CANDLES) AT POINTS REQUIRING CLOSE EXAMINATION OF THE PRODUCT SHOULD BE PROVIDED AND SHOULD NOT ALTER COLOURS. FF 5.1.2.8

Light bulbs and fixtures suspended over the working areas where fish is handled in any step of preparation should be of the safety type or otherwise protected to prevent food contamination in the case of breakage.

5.1.2.10 PREMISES SHOULD BE WELL VENTILATED TO PREVENT EXCESSIVE HEAT, CONDENSATION AND CONTAMINATION WITH OBNOXIOUS ODOURS, DUST, VAPOUR OR SMOKE. FF 5.1.2.8

Special attention should be given to the venting of areas and equipment producing excessive heat, steam, obnoxious fumes, vapours or contaminating aerosols. The air-flow in the premises should be from the more hygienic areas to the less hygienic areas. Good ventilation is important to prevent condensation and growth of moulds in overhead structures. Ventilation openings should be screened and, if required, equipped with proper air filters. Windows which open for ventilation purposes should be screened. The screens should be made easily removable for cleaning.

5.1.2.11 THE FREEZER STORE SHOULD BE ADEQUATE FOR THE INTENDED PRODUCTION, TIME AND TEMPERATURE OF STORAGE, DESIGNED BY AN EXPERT AND CONSTRUCTED BY CRAFTSMEN COMPETENT AND EXPERIENCED IN THIS FIELD.

The freezer store should be designed taking into account the size of intended production, the type of fish and fishery products, the intended time of storage and the optimal temperature requirements.

It is also desirable that the location and the design of the freezer store should be integrated into the general layout of the whole establishment and its operation should be incorporated into the flow pattern of the overall operation. The freezer boats or the incoming trucks should be able to transfer their frozen fish into the on-shore freezer store with the minimal exposure to ambiant temperature and with the least possible handling. The same requirements should also apply to the loading of refrigerated vehicles or railway cars.

It is also often the case with the freezer store operation that a certain amount of frozen fish processing, such as steaking, portioning, trimming, consumer packaging and labelling, has to be done before distribution. A provision should be made therefore for a separate area or a room where these operations could be carried out without exposing the frozen fish to the high ambiant temperature of the fresh fish processing plant.

5.1.2.12 A GOOD VAPOUR SEAL IS REQUIRED ON THE OUTSIDE SURFACES OF THE FREEZER STORE AND PRECAUTIONS SHOULD BE TAKEN TO AVOID DANGER OF FROST HEAVE FROM THE SUBSOIL.

It is extremely important to have an effective water vapour barrier totally enveloping the warm face of the insultation layer in the freezer store walls, ceiling and floor. In the absence of such a barrier, the water vapour from the warm outside air will diffuse into the insulating material and freeze upon reaching the 0°C (32°F) boundary. Freezing of this kind will bring about a gradual build-up of ice within the insulation layer, thus reducing its insulating efficiency and eventually could result in a serious structural deterioration of the whole building.

5.1.2.13 THE INFLOW OF OUTSIDE AIR INTO THE FREEZER STORE SHOULD BE MINIMIZED AS MUCH AS POSSIBLE. WHERE A FREEZER STORE DOOR MUST BE OPENED FREQUENTLY, THE FLOW OF AIR THROUGH THE DOOR SHOULD BE RESTRICTED BY THE USE OF AN AIR LOCK CHAMBER, A COLD AIR CURTAIN, SELF CLOSING SHUTTERS OR SOME OTHER SIMILAR DEVICE.

When a freezer store door is opened to the outside atmosphere, a strong convection current will rapidly exchange the cold air in the store with warm air from outside. This in turn will raise the temperature of the store appreciably and put an additional load on the cooling equipment. The moisture brought in with the outside air will also freeze on the cooling surfaces and reduce their efficiency. If a freezer store has more than one entrance, only one door should be open at a time; otherwise, air currents may greatly increase the inflow of warm outside air.

The proper installation and use of air lock chambers, cold air curtains, self closing shutters or similar devices will greatly reduce the flow of warm air into a freezer store during loading and unloading operations.

5.1.2.14 TEMPERATURE DIFFERENCE BETWEEN THE PRODUCT AND THE FREEZER STORE COOLING SURFACES SHOULD BE AS SMALL AS POSSIBLE AND EXCESSIVE AIR CIRCULATION SHOULD BE AVOIDED.

The bigger the difference between the temperature of the store and the product, the faster dehydration will be. The drying of products in a freezer store is, however, a complex matter depending on many factors, such as movement of air, its humidity, incidental leakage of heat into the store (frequent opening of the doors), fluctuation in storage temperature and condition of the glaze or type of packaging material used for the products. Even with the best conditions of storage and packaging, frozen fish will dry slowly if held too long.

5.1.2.15 PROVISION SHOULD BE MADE FOR AN EFFECTIVE AND REGULAR DEFROSTING OF THE FREEZER STORE COOLING SURFACES.

All freezer store cooling surfaces should be regularly defrosted in order to prevent an excessive build-up of ice or frost which could seriously affect the efficiency of the cooling system and may unnecessarily overload refrigeration equipment.

Defrosting in modern plants is done automatically while in some older installations it could be done either manually by scraping and brushing off, or by a hot defrost.

During the defrosting operation care should be taken to prevent any frost, ice or melt water falling on to the stored fish or fish products.

5.1.2.16 ALL FREEZER STORES SHOULD BE FITTED WITH AN ALARM DEVICE, OPERATED FROM INSIDE, SO THAT ANYONE TRAPPED INSIDE CAN OBTAIN ASSISTANCE QUICKLY.

It should always be possible to open freezer store doors from within. An efficient system of signalling for aid is however necessary in case a person is trapped inside a freezer store. The alarm should sound in an area of the plant where there is always someone on duty. Workers should not enter freezer stores alone without advising someone else of their intention to do so.

Doors leading to the freezer store should preferably be of a sliding type and mechanically operated. A gasket heater should be present to facilitate the opening of the door.

5.1.3 Sanitary Facilities

5.1.3.1 AREAS WHERE FRESH FISH ARE RECEIVED OR STORED SHOULD BE SO SEPARATED FROM AREAS IN WHICH FINAL PRODUCT PREPARATION OR FREEZING IS CONDUCTED AS TO PREVENT CONTAMINATION OF THE FINISHED PRODUCT. FF (5.1.3.1)

Separate rooms, or preferably well defined areas of adequate size, should be provided for receiving and storing raw materials and for operations like washing, gutting, filleting, steaking or other processing and freezing.

Manufacture or handling of edible products should be entirely separate and distinct from the areas used for inedible materials.

The food handling area should be completely divorced from any part of the premises used as living quarters.

Receiving and storage areas should be clean and readily capable of being maintained in a clean condition and should provide protection for the raw fish from deterioration and contamination.

5.1.3.2 A SEPARATE REFUSE ROOM OR OTHER EQUALLY ADEQUATE OFFAL STORAGE FACILITIES SHOULD BE PROVIDED ON THE PREMISES. FF (5.1.3.2)

If offal or other refuse is to be collected and held before removal, adequate precautions should be taken to protect it against rodents, birds, insects and exposure to warm temperatures.

A separate refuse room for storing waste in water-tight containers or offal bins should be provided. The walls, floor and ceiling of such a storage room, and the area under the elevated bins, should be constructed of impervious material which can be readily cleaned. Where waste material is held in containers outside the establishment, the containers should be lidded. A separate enclosure should be provided for their storage with easy access for vehicles loading and unloading. Stands for the containers should be of solid hard and impervious material which can be easily cleaned and properly drained. If containers are used in large numbers, a mechanical washing plant might be advisable to provide for routine washing. Containers should be capable of withstanding repeated exposure to normal cleaning processes.

5.1.3.3 ANY BY-PRODUCT PLANT SHOULD BE ENTIRELY SEPARATE FROM THE PLANT WHICH IS PROCESSING FISH FOR HUMAN CONSUMPTION. FF (5.1.3.3)

The layout and construction of a plant processing fish for human consumption should be such as to ensure that the areas in which fish are held and processed are used for these purposes only.

Any processing of by-products or non-fish products not intended for human consumption should be conducted in separate buildings or in areas which are physically separated in such a way that there is no possibility for contamination of fish or fish products.

5.1.3.4 AN AMPLE SUPPLY OF COLD AND HOT WATER OF POTABLE QUALITY UNDER ADEQUATE PRESSURE SHOULD BE AVAILABLE AT NUMEROUS POINTS THROUGHOUT THE PREMISES AT ALL TIMES DURING THE WORKING HOURS. FF (5.1.3.4)

All water available for use in those parts of establishments where fish is received, held and processed should be of potable quality. If sea water is used, it must be clean sea water.

An adequate supply of hot water of potable quality at a minimum temperature of 82°C (180°F) should be available at all times during the plant operation.

The cold water supply used for cleaning purposes should be fitted with an inline chlorination system allowing the residual chlorine content of the water to be varied at will in order to reduce multiplication of micro-organisms and prevent the build-up of fish odours.

Water used for washing or conveying raw materials should not be re-circulated.

5.1.3.5 WHEN INPLANT CHLORINATION OF WATER IS USED THE RESIDUAL CONTENT OF FREE CHLORINE SHOULD BE MAINTAINED AT NO MORE THAN THE MINIMUM EFFECTIVE LEVEL FOR THE USE INTENDED FF (5.1.3.5)

Chlorination systems should not be relied upon to solve all sanitation problems. The indiscriminate use of chlorine cannot compensate for unsanitary conditions in a processing plant.

5.1.3.6 ICE SHOULD BE MADE FROM WATER OF POTABLE QUALITY AND SHOULD BE MANUFACTURED, HANDLED AND STORED SO AS TO PROTECT IT FROM CONTAMINATION. FF (5.1.3.6 Adapted)

Ice used in the operation of the fish processing establishment or for supplying the fishing vessels should be made from water of potable quality.

5.1.3.7 WHERE A NON-POTABLE AUXILIARY WATER SUPPLY IS USED, THE WATER SHOULD BE STORED IN SEPARATE TANKS AND CARRIED IN SEPARATE LINES IDENTIFIED BY CONTRASTING COLOUR AND WITH NO CROSS-CONNECTIONS OR BACK-SIPHONAGE WITH THE LINES CARRYING POTABLE WATER. FF (5.1.3.7)

Non-potable water may be used for such purposes as producing steam, cooling heat exchangers and fire protection.

It is very important that the systems of storage and distribution of potable and non-potable water are entirely separate and there is no possibility for cross-connection or for inadvertent usage of non-potable water in the fish processing areas. Only potable quality water should be used for the supply of hot water.

5.1.3.8 ALL PLUMBING AND WASTE DISPOSAL LINES, INCLUDING SEWER SYSTEM SHOULD BE LARGE ENOUGH TO CARRY PEAK LOADS AND SHOULD BE PROPERLY CONSTRUCTED. FF (5.1.3.8)

All lines should be watertight and have adequate deep seal traps and vents. Disposal of waste should be effected in such a manner as not to permit contamination of potable water supplies.

Sumps or solid matter traps of the drainage system should preferably be located outside the processing area and so designed as to allow them to be emptied and thoroughly cleaned at the end of each working day.

The plumbing and the manner of waste disposal should be approved by the official agency having jurisdiction.

5.1.3.9 PROPER FACILITIES FOR WASHING AND DISINFECTION OF EQUIPMENT SHOULD BE PROVIDED. FF (5.1.3.9)

Facilities should be present in the fresh fish processing area for cleaning and disinfection of trays, removable cutting or filleting boards, containers and other similar equipment and working implements. Such facilities should be located in a separate room or in a designated area in the work rooms where there is an adequate supply of hot and cold water of potable quality, under good pressure, and where there is proper drainage.

Any containers and equipment used for offal or contaminated materials should not be washed in the same area.

5.1.3.10 ADEQUATE AND CONVENIENTLY LOCATED TOILET FACILITIES SHOULD BE PROVIDED. FF (5.1.3.10)

Toilet rooms should have walls and ceilings of a smooth washable, light coloured surface and floors constructed of impervious and readily cleanable material. Toilet facilities should be well lit, ventilated and kept in a sanitary condition at all times. An adequate supply of toilet paper should be available in each toilet cubicle.

The doors leading to the facilities should be of a self-closing type and should not open directly into the fish processing areas.

The hand washing facilities in the toilet rooms should be of a type not requiring operation by hand and should have an adequate supply of hot and cold water of potable quality and liquid or powder soap should be provided. Suitable hygienic means of drying the hands such as single use towels should be available. Where paper towels are used, a sufficient number of dispensers and receptacles for used towels should be provided.

Notices should be posted requiring personnel to wash their hands after using the toilets.

The following formula could be used as a guideline in assessing the adequacy of toilet facilities in relation to the number of employees:

1 to 9 employees = 1 toilet
10 to 24 employees = 2 toilets
25 to 49 employees = 3 toilets
50 to 100 employees = 5 toilets
for every 30 employees over 100 = 1 toilet

5.1.3.11 FACILITIES SHOULD BE AVAILABLE IN THE PROCESSING AREAS FOR EMPLOYEES TO WASH AND DRY THEIR HANDS AND, IF REQUIRED, FOR DISINFECTION OF PROTECTIVE HAND COVERINGS. FF (5.1.3.11)

In addition to hand washing facilities available in toilet rooms, a number of sanitary washbasins with an adequate supply of hot and cold water of potable quality and liquid or powdered soap should be provided whenever the process demands. They should be located in full view of the processing floor and should be of a type not requiring operation by hand or be fed by a continuous flow of potable fresh or clean sea water. Single use towels are recommended, otherwise the method of drying hands should meet the requirements of the official agency having jurisdiction. The facilities should be kept in a sanitary condition at all times.

5.1.3.12 STAFF AMENITIES CONSISTING OF LUNCHROOMS, CHANGING-ROOMS OR ROOMS CONTAINING SHOWER OR WASHING FACILITIES SHOULD BE PROVIDED. FF (5.1.3.12)

Where workers of both sexes are employed, separate facilities should be present for each except that the lunchrooms may be shared. As a general guide, the lunchrooms should provide seating accommodation for all employees and the changing-rooms should provide enough space for lockers for each employee without causing undue congestion. Clothing and footwear not worn during working hours must not be kept in any processing area.

5.1.3.13 STORAGE FACILITIES SHOULD BE AVAILABLE FOR THE PROPER DRY STORAGE OF PACKAGING MATERIALS. FF (5.1.3.13)

Separate facilities for the storage of cartons, wrappings or other packaging materials should be provided in order to protect them against moisture, dust or other contamination.

5.1.3.14 ALL POISONOUS MATERIALS, INCLUDING CLEANING COMPOUNDS, DISINFECTANTS, SANITIZERS AND PESTICIDES, SHOULD BE STORED IN A SEPARATE ROOM DESIGNED OR MODIFIED SPECIFICALLY FOR THIS PURPOSE. FF (5.1.3.14)

All such materials must be prominently and distinctly labelled so that they can be easily identified.

5.2 Equipment and Utensils

5.2.1 EQUIPMENT AND UTENSILS FOR THE HANDLING, STORING, FILLETING OR SIMILAR PROCESSING OF THE FRESH FISH PRIOR TO FREEZING SHOULD BE AS RECOMMENDED IN THE "CODE OF PRACTICE FOR FRESH FISH".
ALL WORK SURFACES AND ALL CONTAINERS, TRAYS, TANKS, VATS OR OTHER EQUIPMENT USED FOR PROCESSING FISH SHOULD BE OF SMOOTH, IMPERVIOUS, NON-TOXIC MATERIAL WHICH IS CORROSION-RESISTANT AND SHOULD BE DESIGNED AND CONSTRUCTED TO PREVENT HYGIENIC HAZARDS AND PERMIT EASY AND THOROUGH CLEANING. FF (5.2.1 Adapted)

Contamination of fish during processing can be caused by contact with unsatisfactory surfaces. All food contact surfaces should be smooth, free from pits, crevices and loose scale, non-toxic, unaffected by salt, fish juices or other ingredients used, and capable of withstanding repeated cleaning and disinfection. Wood could be used for cutting surfaces only when no other suitable material is available.

Machines and equipment should be so designed that they can be easily dismantled to facilitate thorough cleaning and disinfection.

Fish boxes used for holding fish should preferably be constructed of plastic or corrosion-resistant metal and if of wood, they must be treated to prevent moisture entering the wood and coated with a durable, non-toxic paint or other surface coating that is smooth and readily washable. Wicker baskets should not be used.

Stationary equipment should be installed in such a manner as will permit easy access and thorough cleaning and disinfection.

Equipment and utensils used for inedible or contaminated materials should be identified as such and should not be used for handling of fish and products intended for human consumption.

5.2.2 THE USE OF PROPERLY DESIGNED MACHINES FOR GUTTING, WASHING, FILLETING, SKINNING, STEAKING AND SIMILAR OPERATIONS IS TO BE ENCOURAGED. FF (5.2.8)

Where large quantities of fish are processed, properly designed machines will simplify the production of fillets and similar products in quantity, with consistently low bacterial counts. This is mainly because well designed machines have impervious and corrosion-resistant working surfaces, are easy to clean and are capable of handling the fish with a minimum of delay.

It is essential that the installation of new machinery should be well researched, economically justified and the units should be rigorously tested before being put into commercial use, otherwise costly failures may arise.

5.2.3 THE FILLETING LINE SHOULD BE DESIGNED AS A CONTINUAL PROCESSING UNIT WITH ALL THE OPERATIONS ARRANGED SEQUENTIALLY IN SUCH A WAY THAT THE FISH COULD MOVE UNIFORMLY FAST THROUGH THE LINE WITHOUT ANY STOPPAGES OR SLOW DOWNS. FF (5.2.7)

A properly designed filleting line means saving in the cost of processing and will result in a better quality of the final product. When the fish or fillets are moved through the line by a conveyor, the conveyor should be provided with scrapers and spray-washers at least at its two terminal pulleys. If the fish are flumed, no recirculation of the fluming water should be allowed. Offal chutes should be located as close as possible to the filleters' stations but in such a way that there is no possibility for a splash-back. Each filleter's station should have a line of potable water with a tap to regulate the flow of water over the surface of the filleting board.

The filleting line should be easy to dismantle for cleaning purposes and should be constructed from a corrosion-resistant material such as stainless steel or marine grade aluminium. There should be an easy access to every part of the line.

5.2.4 FILLETING BOARDS AND OTHER SURFACES ON WHICH FISH ARE CUT SHOULD BE MADE OF IMPERVIOUS MATERIALS WHICH MEET THE PHYSICAL REQUIREMENTS FOR CUTTING SURFACES. FF (5.2.6)

Considerable bacterial contamination of fillets and steaks is caused by contact with the filleting and cutting boards. Wooden cutting surfaces are porous and quickly become water-logged and are practically impossible to clean thoroughly. They are not recommended as suitable for this type of work.

If in the absence of other materials, wood has to be used, a single board of a well finished and smooth surface is recommended. Once the surface becomes badly worn then the board should be reconditioned or discarded.

The use of plywood or other boards of laminated structure should be discouraged.

5.2.5 DIP TANKS USED FOR FILLETS OR FISH STEAKS SHOULD BE MADE OF IMPERVIOUS CORROSION-RESISTANT MATERIAL AND SHOULD BE EASY TO CLEAN. DIP TANKS SHOULD BE EMPTIED, THOROUGHLY CLEANED AND DISINFECTED BETWEEN EACH CYCLE OF USE. FF (5.2.10)

Where it is desired and permissible to use such dips as anti-oxidants or polyphosphates, the dangers of contamination must be fully appreciated. Bacterial numbers will increase rapidly during use, and this requires that the tanks be frequently and thoroughly cleaned and refilled with new solutions. The use of sprays instead of dips has been found by many operators as a more efficient method for treatment of fillets or fish steaks. It eliminates an additional contamination with bacteria, provides a continuously uniform solution strength and lends itself to a better temperature control. No recirculation of the solution should be permitted except if the solution is filtered, pasteurized and cooled.

5.2.6 MECHANICAL CONVEYORS SHOULD BE INSTALLED WHENEVER PRACTICAL TO HANDLE THE FISH DURING PRE-FREEZING OPERATIONS.

Manual methods of moving fish from one process to another, apart from being inefficient and costly in manpower, often result in damage to the skin and flesh, allowing the entry of microorganisms and thus hastening spoilage.

5.2.7 LIFTS OR OTHER CONVEYORS SHOULD BE INSTALLED FOR MOVING FROZEN FISH FROM FREEZERS TO FROZEN STORAGE.

If rough handling methods are used, frozen blocks could be broken and the fish damaged.

Any fish conveying equipment, as for example fork lifts used in the fresh fish processing area or for the disposal of offal, should not be employed in the handling of frozen fish or fish products.

5.2.8 FREEZING EQUIPMENT SHOULD BE SUITABLE FOR THE PARTICULAR PRODUCT AND SHOULD HAVE AN ADEQUATE CAPACITY TO DEAL WITH THE EXPECTED PEAKS IN FLUCTUATING FISH DELIVERIES.

It is most important that all freezing be carried out in an orderly manner, using equipment that is of sufficient capacity and is suitable for the product. The freezers should have proper defrosting facilities and be designed so that they are easy to clean. Refrigeration equipment needs to be reliable, capable of running for long periods with little attention and should have an automatic device for shutting it down in an emergency. An expert in this field should be consulted.

Large blocks of whole fish are usually frozen in vertical contact plate freezers. Horizontal contact plate freezers are generally used to freeze smaller fish, fillet blocks and packages of fish or fillets. Airblast freezing, sharp freezing and freezing in brine are also used. Some operations rely entirely on blast freezers for freezing blocks of whole fish or fillets and individual whole fish. Sharp freezers may be installed to freeze large fish which cannot be accommodated by the contact plate freezers.

Freezing by immersion in refrigerated brine is most commonly used for the preservation of large fish such as tuna which are intended for reprocessing into canned foods. With this method it is important that the freezing medium should not impart any objectionable odours or flavours to the product or affect its quality in any other way. When using sodium chloride brine, care should be taken to minimize salt penetration of the product by removing it from the brine as soon as freezing is completed.

5.3 Hygienic Operating Requirements

5.3.1 HYGIENIC OPERATING REQUIREMENTS IN FISH FREEZING OPERATIONS SHOULD BE SIMILAR TO THOSE RECOMMENDED FOR FRESH FISH PROCESSING PLANTS.

All fish and all surfaces, equipment and containers which come in contact with fish should be treated in a sanitary and hygienic manner as recommended in the "Code of Practice for Fresh Fish".

Fish, because of its highly perishable nature, requires strict adherence to specific sanitary requirements which should become a part of a daily operational routine of the plant.

All operations should be carried out in a manner and condition suitable for the handling of food for human consumption.

5.3.2 THE BUILDING, EQUIPMENT, UTENSILS AND OTHER PHYSICAL FACILITIES OF THE PLANT SHOULD BE KEPT CLEAN, IN GOOD REPAIR AND SHOULD BE MAINTAINED IN AN ORDERLY AND SANITARY CONDITION. FF (5.3.2)

All surfaces which come in contact with fish should be hosed down with cold or hot potable water or clean sea water as frequently as necessary to ensure cleanliness. It is important that the cleaning method used will remove all residues and the disinfecting method will reduce the microbial population of the surface being cleaned.

The use of cold or hot water alone is generally not sufficient to accomplish the required result. It is desirable, if not essential, that aids such as suitable cleaning and disinfecting agents together with manual or mechanical scrubbing, wherever appropriate, be used to assist in achieving the desired objective.

After the application of cleaning and disinfecting agents the surfaces which come in contact with fish should be rinsed thoroughly with potable or clean sea water before use.

Cleaning agents and disinfectants used should be appropriate for the purpose and should be so used as to present no hazard to public health and should meet the requirements of the official agency having jurisdiction.

5.3.3 FILLETING AND CUTTING BOARDS SHOULD BE FREQUENTLY AND THOROUGHLY SCRUBBED AND TREATED WITH DISINFECTANT. WHEREVER PRACTICABLE THE BOARDS SHOULD BE CONTINUOUSLY FLUSHED WITH CLEAN RUNNING WATER DURING USE. THE FLUSHING WATER SHOULD CONTAIN 4 PPM OF RESIDUAL CHLORINE. FF (5.3.3)

It is recognized that the amount of bacterial contamination on fillets and similar products is related to the amount of bacterial contamination of the working surfaces. Clean surfaces become contaminated as soon as they are used, and consequently each fish that is filleted, after the first one, increases the surface contamination. Filleting and cutting surfaces should therefore be cleaned during meal breaks and before resumption of production following other work stoppages.

Filleting and cutting surfaces should be cleaned frequently. If they are not thoroughly scrubbed and disinfected, at least at the end of each working day, there may be a serious day-to-day carry-over of bacterial contamination.

It has been proved that this contamination of both fillets and boards can be considerably reduced by continuous flushing with clean cold water. A further reduction in contamination has been observed when using chlorinated water for flushing.

5.3.4 IF BARRELS OR OTHER CONTAINERS ARE USED ON THE FILLETING LINE FOR THE COLLECTION AND DISPOSAL OF OFFAL, THEY SHOULD BE LOCATED BELOW THE LEVEL AT WHICH THE FISH ARE PROCESSED AND IN SUCH A WAY THAT THERE IS NO SPLASH-BACK ON THE PROCESSING LINE. FF (5.3.4)

If individual offal containers are used close to a processing line instead of the flumes or shutes connected to a common line, they should be located in such a way that there is no possiblity of splash-back. Placement of the filleting boards or the fillet containers on the rims of the offal barrels should not be practised.

If the containers are not being used then they should be lidded. In general, much could be gained in efficiency and cleanliness of an operation if flumes or other equally effective methods are employed for the disposal of the fish offal.

5.3.5 ALL MACHINES USED FOR GUTTING, WASHING, FILLETING, SKINNING, STEAKING OR SIMILAR OPERATIONS SHOULD BE THOROUGHLY CLEANED AND DISINFECTED DURING REST OR MEAL BREAKS AND BEFORE RESUMPTION OF PRODUCTION FOLLOWING OTHER WORK STOPPAGES. FF (5.3.5)

The use of machinery reduces the risk of contamination from human sources. If, however, these machines are not properly maintained and cleaned at least once every day, they can become a serious source of contamination.

5.3.6 REMOVAL OF SOLID, SEMI-SOLID OR LIQUID WASTES FROM FISH UNLOADING, HOLDING AND PROCESSING AREAS SHOULD BE ON A CONTINUOUS OR NEAR CONTINUOUS BASIS USING WATER AND/OR APPROPRIATE EQUIPMENT SO THAT THESE AREAS ARE KEPT CLEAN AND THERE IS NO DANGER OF CONTAMINATING THE PRODUCT. FF (5.3.10)

All waste materials resulting from the operation of a fish processing plant should be disposed of as soon as possible in a way that they cannot be used for human food and in a manner that they cannot contaminate food and water supplies or offer harbourage or breeding places for rodents, insects or other vermin.

Containers, flumes, conveyors, bins or storage bays used for removal, collection or storage of fish offal and other waste should be cleaned frequently with potable fresh or clean sea water containing an appropriate amount of free chlorine.

All waste material from containers and vehicles should be removed in such a way as not to cause any contamination and not to create a nuisance.

Arrangements for the disposal of trade refuse and inedible waste should be approved by the appropriate official agency having jurisdiction.

5.3.7 FREEZER STORES SHOULD BE FREE FROM ODOURS AND SHOULD BE MAINTAINED IN A GOOD HYGIENIC CONDITION.

The freezer store should be subject to the same sanitary requirements as any other food handling establishment. A regular clean-up procedure should be maintained to ensure a good hygienic environment. Frozen products of questionable quality should not be stored with products of good quality unless they are well separated and easily identified. Products which may have strong natural odours should be packaged to prevent these odours from contaminating other products. Any motorized transportation that is producing odours should not be used inside the freezer store.

5.3.8 EFFECTIVE MEASURES SHOULD BE TAKEN TO PROTECT AGAINST THE ENTRANCE INTO THE PREMISES AND THE HARBOURAGE ON THE PREMISES OF INSECTS, RODENTS, BIRDS OR OTHER VERMIN. FF (5.3.11)

An effective and continuous programme for the control of insects, rodents, birds or other vermin within the establishment should be maintained. The plant and surrounding area should be regularly examined for evidence of infestation. Where control measures are necessary, treatment with chemical, biological or physical agents should meet the requirements of the official agency having jurisdiction and should be under the direct supervision of personnel with a thorough understanding of the hazards involved, including the possibility of toxic residues being retained by the fish, or their products.

The use of insecticides, during the plant operation, without any provision for collection of dead insects, should be discouraged. Instead, the use of adhesive insect traps or very efficient "black light insecticutor" lamps with the attached collecting trays, is recommended. Insect traps should not be located directly over the processing areas.

All rodenticides, fumigants, insecticides or other toxic substances should be of an approved type and should be stored in separate looked rooms or cabinets and handled only by properly trained personnel.

5.3.9 DOGS, CATS AND OTHER ANIMALS SHOULD BE EXCLUDED FROM AREAS WHERE FISH IS RECEIVED, HANDLED, PROCESSED OR STORED. FF (5.3.12)

Dogs, cats and other animals are potential carriers of diseases and should not be allowed to enter or to live in rooms or areas where fish or their products are handled, prepared, processed or stored.

5.3.10 ALL PERSONS WORKING IN A FISH PROCESSING AND FREEZING PLANT SHOULD MAINTAIN A HIGH DEGREE OF PERSONAL CLEANLINESS WHILE ON DUTY AND SHOULD TAKE ALL NECESSARY PRECAUTIONS TO PREVENT THE CONTAMINATION OF THE FISH OR THEIR PRODUCTS OR INGREDIENTS WITH ANY FOREIGN SUBSTANCE. FF (5.3.13)

All employees should wear, appropriate to the nature of their work, clean protective clothing including a head covering and footware, all of which articles are either washable or disposable.

Gloves used in the handling of fish should be maintained in a sound, clean and sanitary condition, and should be made of an impermeable material except where their usage would be incompatible with the work involved. Hands should be washed thoroughly with soap or another cleansing agent and warm water before commencing work on every occasion after visiting a toilet, before resuming work and whenever necessary. The wearing of gloves does not exempt the operator from having thoroughly washed hands.

Eating, smoking, chewing of tobacco or other materials and spitting should be prohibited in any part of the fish handling areas.

5.3.11 NO PERSON WHO IS KNOWN TO BE SUFFERING FROM, OR WHO IS A CARRIER OF ANY COMMUNICABLE DISEASE OR HAS AN INFECTED WOUND OR OPEN LESION SHOULD BE ENGAGED IN THE PREPARATION, HANDLING OR TRANSPORTING OF FISH OR FISH PRODUCTS. FF (5.3.14)

Plant management should require that any person afflicted with infected wounds, sores or any illness, notably diarrhoea, should immediately report to management. Management should not allow any person known to be affected with a disease capable of being transmitted through food, or known to be a carrier of such a disease, or while afflicted with infected wounds, sores or any illness, to work in any area of a fish plant in a capacity in which there is a likelihood of such a person contaminating fish or fish products with disease-causing micro-organisms.

Minor cuts and abrasions on the hands should be immediately treated and covered with a suitable waterproof dressing. Adequate first-aid facilities should be provided.

5.3.12 CONVEYANCES USED FOR TRANSPORTING FISH SHOULD BE CLEANED AND DISINFECTED IMMEDIATELY AFTER EACH USE AND SHOULD BE SO MAINTAINED AS NOT TO CONSTITUTE A SOURCE OF CONTAMINATION FOR THE PRODUCT. FF (5.3.15)

The cleaning of vehicles, together with receptacles and equipment thereon, should be planned to a regular routine. Hosing, scrubbing and cleaning with water of potable quality to which a suitable detergent and/or disinfectant has been added is usually necessary.

5.4 Operating Practices and Production Requirements

5.4.1 Handling of Fish before Freezing

5.4.1.1 ON SHORE HANDLING OF FRESH FISH INTENDED FOR FREEZING SHOULD BE IN ACCORDANCE WITH THE RECOMMENDATIONS GIVEN IN THE "CODE OF PRACTICE FOR FRESH FISH" OR IN THE CHAPTER OF THIS CODE "FREEZING FISH AT SEA".

The need for careful and rapid handling of fresh fish and the reasons for maintaining chill temperature have already been fully explained. The following sections deal particularly with processes carried out in shore freezing establishments.

Since most of the fillets frozen on shore will be cut from post-rigor fish, problems concerning rigor are less likely to arise than when freezing at sea. Fillets taken from post-rigor fish should be of uniformly good quality, provided the whole fish have been properly handled and chilled prior to and during rigor. Any fish which are in rigor, however, should be dealt with in the manner already described.

5.4.1.2 FRESH FISH SHOULD ALWAYS BE TREATED IN A SANITARY AND HYGIENIC MANNER. FF (5.4.1.2 Adapted)

Evisceration, filleting and other operations in the handling of fish should be clean and sanitary. Precautions should be taken to protect the fish from contamination by animals, insects, birds, chemical or microbiological contaminants or other objectionable substances during processing, handling and storage.

Preparatory operations leading to the finished product and the freezing operations should be so timed as to permit expeditious handling of consecutive batches in production within the time and temperature range that will prevent deterioration and spoilage and will allow for proper freezing.

5.4.1.3 NO FISH SHOULD BE USED FOR PROCESSING WHICH HAS UNDERGONE DETERIORATION OR ANY PROCESS OF DECOMPOSITION OR WHICH HAS BEEN CONTAMINATED WITH FOREIGN MATTER TO AN EXTENT WHICH HAS MADE IT UNFIT FOR HUMAN CONSUMPTION. FF (5.4.1.4)

The fresh fish should be rejected if it is known to contain toxic, decomposed or extraneous substances which will not be removed to an acceptable level by normal procedures of sorting or preparation. Fish in a diseased condition should be discarded or the diseased portion removed. Only clean, sound fish should be used for further processing and freezing.

5.4.1.4 IT IS ADVISABLE TO MAKE THE CANDLING OF FILLETS OF CERTAIN SPECIES OF FISH A ROUTINE PRACTICE. FF (5.4.3.7)

If the fish is known to be highly parasitized, it pays to fillet and candle a few which are picked at random in order to decide whether to proceed with the processing.

Although most types of parasites found in fish are harmless to humans, nevertheless the presence of parasites in fish or fish products is highly objectionable to the majority of the consuming public.

Proper and careful candling will not only remove the undesirable parasites but will also detect and remove the blood spots, pieces of skin on the skinless fillets and any other defects which otherwise might reduce the overall quality of the product.

5.4.1.5 FISH WHICH CANNOT BE PROCESSED IMMEDIATELY ON ARRIVAL AT THE PLANT SHOULD BE WELL ICED IN CLEAN CONTAINERS AND STORED IN SPECIALLY DESIGNATED AREAS WITHIN THE PLANT WHERE THEY WILL BE PROTECTED FROM HEAT AND WEATHER CONDITIONS AND WILL NOT BE CONTAMINATED BY DUST, INSECTS OR VERMIN. WHERE POSSIBLE, THE ICED FISH SHOULD BE STORED IN A CHILL ROOM, THE TEMPERATURE OF WHICH IS JUST ABOVE THAT OF MELTING ICE, 0°C (32°F). FF (5.4.3.1)

In order to produce good quality frozen products, the quality of the raw fish must be maintained by protecting it from heat, contamination from other sources and physical damage.

It must be stressed again that placing quantities of fish in a chill room does not remove the need for adequate icing. Chill rooms are designed to maintain a chill temperature and to keep already cool fish from warming up. The refrigeration machinery used in chill room operations is not adequate to lower the temperature of a mass of fish in a short time. The initial cooling must be done by the addition of ice.

It is poor practice, therefore, to load the chill room with large quantities of fresh fish that were not prechilled effectively to the temperature of melting ice.

The chill room should be equipped with a recording thermometer and an automatic temperature control and should be so designed that it can be kept in a clean sanitary condition at all times.

5.4.1.6 IF THE FISH ARE TO BE DIPPED OR SPRAYED WITH FOOD ADDITIVES, THE ADVICE OF AN EXPERIENCED FOOD TECHNOLOGIST OR AN OFFICIAL AGENCY HAVING JURISDICTION SHOULD BE SOUGHT. FF (5.4.3.8)

Undoubtedly, any additive or additional treatment of fish during the processing increases its cost and, therefore, should be measured against the benefits gained. An additive permitted in one country might not be allowed in another. Any additive, if used, and its concentration should be declared on the label of the final product.

5.4.1.7 WHERE PRODUCTS ARE PACKAGED BEFORE FREEZING THIS SHOULD BE DONE RAPIDLY TO AVOID UNDUE RISE IN TEMPERATURE.

Fish temperatures may rise during packaging. Temperatures of 10°C (50°F) and above are not unusual in processing factories and the spoilage rate will increase if the fish are held for long at these higher temperatures.

5.4.1.8 WHERE FISH FILLETS ARE TO BE FROZEN IN BLOCKS THEY SHOULD BE FITTED NEATLY INTO THE FORMING TRAYS OF ALUMINIUM OR SIMILAR MATERIAL.

The frozen products will then be uniform in shape and size, allowing good overall contact in plate freezers. The product can easily be removed from the trays, after freezing, by quickly dipping in or spraying with potable water.

5.4.1.9 PLANT PRODUCTION SHOULD BE GEARED TO THE CAPACITY OF THE FREEZERS.

The rate of packaging or sorting in trays should not exceed the rate of freezing to such an extent that processed fish are delayed more than an hour before entering the freezers.

5.4.2 Freezing of Fish

5.4.2.1 ONLY GOOD QUALITY FRESH FISH AND FRESH FISH PRODUCTS SHOULD BE FROZEN.

Freezing and frozen storage cannot improve the quality of fish. At best, the process maintains the fish in much the same condition as it was immediately before freezing. It is therefore essential that the raw material be as fresh as possible.

Ideally, fish should be frozen soon after capture, but this is hardly the case with shore-based freezing plants, unless the vessels operate only a few miles away and return to port at frequent intervals.

5.4.2.2 THE RECOMMENDATIONS FOR FREEZING FISH ON SHORE SHOULD BE THE SAME AS THOSE GIVEN IN THIS CODE FOR FREEZING FISH AT SEA.

Good commercial practices and proper equipment are essential factors for producing good quality frozen fish and fish products irrespective of whether the fish are frozen at sea or on shore. All the recommendations given in the previous chapter of this Code, Subsection 4.4.2 should also apply to on-shore operations. Some of the most important things to remember when freezing the fish are the following:

(a) Freezing should be fast enough to prevent development of adverse quality changes in the product.

(b) In vertical plate freezers, fish should be carefully packed between the plates so that there are as few air spaces as possible.

(c) Defrost heating of vertical plate freezers should be just long enough to loosen the frozen blocks for unloading.

(d) In horizontal plate freezers, fish and fish products should be packed in trays or other forms to produce uniform and well compacted blocks.

(e) Air-blast freezers should be loaded in such a way that there is always a sufficient flow of cold air around the product.

(f) Sharp freezers should not be overloaded with fish.

(g) In brine freezing, there should be rapid circulation of the cooling medium and the ratio of fish to brine should be carefully controlled.

(h) Freezing processes should be allowed to run their full allotted time to ensure their completion.

(i) Frequent checks should be made of refrigerant pressures and temperatures and accurate records maintained.

5.4.2.3 WITH RAPID FREEZING TECHNIQUES, WHERE THE PRODUCT IS IMMERSED IN OR SPRAYED WITH LIQUIFIED GASES, CARE MUST BE TAKEN THAT THE PRODUCT DOES NOT BECOME DEFORMED OR CRACKED.

Although cryogenic freezing methods (freezing with liquified gases) have not, as yet, been very widely adopted in the fishing industry, they are used to some extent particularly in the production of fairly high-cost individually frozen sea foods. Cryogenic freezers freeze the product by spraying it with liquid nitrogen or refrigerant R-12. Care must be taken that the product is not cracked or deformed by freezing it too quickly and that the compounds used as freezing media meet the approval of the official agency having jurisdiction or the requirements of the importing country.

5.4.2.4 WHERE CONVEYORS ARE USED TO FEED THE PRODUCT THROUGH THE FREEZERS, THE SPEED SHOULD BE ADJUSTED SO THAT THE PRODUCT IS PROPERLY FROZEN BY THE TIME IT REACHES THE END OF THE FREEZING CHAMBER.

Both the load on the conveyor and the speed at which it passes through the freezer must be taken into account so that the product remains in the freezer long enough to reduce its average temperature to the frozen storage level.

5.4.2.5 FREEZING SHOULD BE COMPLETED IN THE FREEZER AND SHOULD NEVER BE CARRIED OUT BY PLACING UNFROZEN OR PARTIALLY FROZEN PRODUCTS IN A FREEZER STORE.

Fish will suffer serious quality losses, due to an extremely slow freezing rate, if frozen in a freezer store. Refrigeration equipment of freezer stores have not sufficient capacity to cope with the extra heat load. Warm products placed in a freezer store will not only take a very long time to freeze but may also warm up other products already in the store.

5.4.2.6 DISTORTION OF BLOCKS OR PACKAGES DURING FREEZING SHOULD BE AVOIDED.

Where uniformity of the dimensions of the final product is important, as for example with retail packages of fillets or fish blocks destined for further processing, freezing is best done in trays or moulds under pressure in a horizontal contact plate freezer.

5.4.3 Glazing and Packaging

5.4.3.1 FROZEN FISH OR FISH PRODUCTS SHOULD BE GLAZED, WRAPPED OR PACKAGED TO PROTECT THEIR QUALITY DURING STORAGE AND DISTRIBUTION.

The quality of frozen fish and fish products will decline rapidly during storage and distribution if they are not adequately protected against the effects of dehydration and oxidation as well as against physical damage and contamination by foreign matters. The surfaces of large whole fish or irregularly shaped portions are generally protected by glazing, or wrapping, or by glazing and wrapping, or by the use of wrapping material which can be shrunk against the surface. There are many kinds of materials available which have good protective properties and which are suitable for the packaging of frozen fish and fish products.

In general, ice glazing is used on fish intended for further processing or for restaurant or institutional trade, rather than on consumer packaged fish or fishery products. Water derived from the melting of ice glaze has been often regarded unfavourably by the average consumer.

It is advisable to control glazing as much as possible so that the thickness of the glaze deposited on fish is uniform and the amount of glaze, expressed as a percentage of the total fish weight, is fairly constant.

5.4.3.2 FISH PRODUCTS THAT ARE NOT PACKAGED OR WRAPPED SHOULD BE GLAZED AS SOON AS THEY ARE REMOVED FROM THE FREEZER.

Glazing will prevent dehydration and will also decrease rancidity. In fatty fish, the reaction of oxygen from the air with various components of the fish flesh, mainly fat, will result in rancid odours and flavours. Such fish as herring, sardine, mackerel, salmon and tuna are particularly prone to oxidation. If they are properly glazed, oxidation is retarded because the oxygen must then diffuse through the layer of ice before it can act upon the fats in the flesh. In some areas a modified glazing procedure is adopted whereby these fish are frozen in a block of ice. Occasionally, blocks of fish wrapped in parchment paper before freezing are glazed immediately on removal from the freezer. Since ice glaze is brittle and may flake away during handling, agents such as sugar, starch, sodium alginate or carboxymethylcellulose are sometimes added to improve its durability.

When additives are used in the glazing solution, care should be taken that the resulting glaze will in no way detract from the appearance of the product. An opaque glaze would be more appropriate for fish like halibut or fish fillets where it might enhance the natural whiteness of the skin or of the flesh. On the other hand, the bright silvery appearance of salmon will benefit more by complete translucency of the glaze film.

5.4.3.3 THE TEMPERATURE OF GLAZING SOLUTIONS SHOULD NOT BE ABOVE 5°C (41°F).

Glaze should be applied to frozen fish or fish products by brushing quickly or spraying with potable water or a solution containing an approved glaze additive or by immersing them therein. The temperature rise should be kept to a minimum. Salmon, halibut and fresh water fish are often glazed in a refrigerated room.

It has been noted that only fish which have been properly frozen will take glaze readily and uniformly, in particular when they are dipped in the glazing medium several times in succession as is usually done to increase the thickness of the protective ice film.

5.4.3.4 FROZEN PRODUCTS SHOULD BE TRANSFERRED TO THE FREEZER STORE IMMEDIATELY AFTER REMOVAL FROM THE FREEZER OR AFTER GLAZING.

Any warming effect may thaw the surface glaze and will also introduce unnecessary heat into the freezer store.

Transfer of frozen products to the freezer store should be done quickly with the minimum of damage to the product. Water glaze is brittle and therefore any rough handling of glazed fish in transfer or in stacking might break the protective film and thus nullify the benefit of glazing.

5.4.3.5 ON PROLONGED STORAGE, THE GLAZED FISH SHOULD BE CHECKED PERIODICALLY FOR THE DETERIORATION OF GLAZE.

Glaze deteriorates with time as the water evaporates and condensates on the refrigerating surfaces of the freezer store. If this is noted and the fish is to remain in storage for an undetermined time, it is advisable to reglaze the fish as soon as possible to protect it from dehydration (freezer burn) and oxidative rancidity.

5.4.3.6 PACKAGING SHOULD BE DESIGNED AND MATERIALS CHOSEN TO CREATE AN ATTRACTIVE, CONVENIENT AND ECONOMICAL PACKAGE WHICH WILL PROTECT THE PRODUCT ADEQUATELY.

There are many factors to consider in designing packages for frozen fish products. It is important that the product be presented in a package that is attractive to the buyer and which is convenient to handle. Labels should be clearly printed and must comply with the labelling laws of the country where the product is marketed.

In addition, the packages of frozen fishery products should bear clear indication as to how they should be kept from the time they were bought at the retailer to that of their use.

When selecting materials, it is necessary to consider the whole packaging plan to ensure that all the required protective qualities are adequately provided. For example, the materials used for inner wraps and the way they are applied will, to some extent, determine the properties that will be required for the carton.

Since packaging materials vary considerably in cost, they will usually be selected in a manner that meets the requirements most economically. In this regard, it is important to consider the labour entailed in packaging. In some instances, it may be advantageous to choose a more costly material if less labour is involved in its use.

The lack of standardization in naming and defining the properties of materials used in the packaging industry causes considerable confusion. It is often difficult to determine which are basic and which are composite materials or to recognize some of the more popular and widely used materials, because manufacturers frequently give special names to their own products. Lack of standardization in test methods can also make it difficult to compare properties of materials.

Since the problems involved in planning the packaging and marketing of frozen fish are often complex, it may be desirable to seek the advice of experts in the packaging and marketing fields.

5.4.3.7 WRAPPERS, BAGS AND POUCHES SHOULD BE OF MATERIALS THAT MEET THE REQUIREMENTS FOR THE PRODUCT, THE PROCESSING AND PACKAGING METHODS, THE MARKET AND THOSE OF THE OFFICIAL AGENCY HAVING JURISDICTION.

Many types of flexible wrapping and packaging materials are available, usually in several grades and thicknesses. These include various types of vegetable parchments and treated papers, aluminium foil and films of regenerated cellulose, polyethylene, polyvinyl chloride (PVC), vinylidene chloridevinyl chloride-copolymer (PVAC-PVC), polyester, polyamide and polypropylene.

These materials differ considerably in their cost and in their ability to exclude water vapour and gases. Some can be sealed by heat while others require the use of adhesives. They also differ in their physical properties at low temperatures and in their suitability for mechanical wrapping.

Laminated wrappers are often used to take advantage of desirable properties of two or more materials. For example, regenerated cellulose film, which has low gas permeability, high shear strength, is completely transparent and takes print well, is frequently bonded with polyethylene film which has low water vapour permeability, is flexible and has good mechanical properties at low temperatures.

There are many factors to consider in choosing wrapping material for frozen fish products such as the protective properties required for the particular product, the cost of the material, labour and equipment involved and consumer preferences.

5.4.3.8 CONSUMER PACKAGES FOR FROZEN PRODUCTS SHOULD BE SUFFICIENTLY STRONG, WATERPROOF AND STAIN RESISTANT. THEY SHOULD HAVE WATER VAPOUR AND GAS BARRIER PROPERTIES TO MEET THE REQUIREMENTS OF THE PARTICULAR PRODUCT AND SHOULD BE OF THE PROPER SIZE AND SHAPE.

A large proportion of frozen fish products intended for retail sale are packed in paperboard cartons with or without an inner wrapping. To provide the required water and stain resistance and barrier properties the paperboard is usually coated on one or both sides with wax, plastic or a wax and plastic combination, or it is varnished.

The packages should be sufficiently sturdy to protect the product from physical damage during handling, transport and retailing. They should be sufficiently water repellent to avoid staining or weakening when wet. Cartons for fatty products should not be susceptible to grease stains. If there is no inner wrapper or if the wrapper is not a good water vapour and gas barrier, this protection should be provided by the carton.

Packages should be of proper size and shape for the product to fit snugly so that the air space within the package will be as small as possible. Large air spaces within the carton increase the risk of dehydration or rancidity. The contents of loosely filled packages are also more easily damaged during handling. Furthermore, a product which is to be frozen after packaging will freeze much quicker if there is no air space in the package.

Retail packages should be preserved intact up to the time of final sale.

5.4.3.9 PACKAGING MATERIALS SHOULD NOT CONTAMINATE THE PRODUCT IN ANY WAY.

Since foreign odours and flavours will adversely affect the acceptability of the product, all wrappings, adhesives and printing material likely to come into contact with it should be odourless. The packaging should ensure that the original product flavour and odour are retained. Furthermore, there should be no risk that substances likely to be harmful to health will be transferred from the packaging material to the food.

5.4.3.10 PACKAGING MATERIALS SHOULD NOT UNDULY INCREASE THE TIME REQUIRED FOR FREEZING.

In practice, it is often necessary to consider the type of packaging used in the light of its effect on the freezing time. The thicker and more elaborate the packaging material, the longer the freezing time required.

5.4.3.11 PACKAGES SHOULD HAVE LOW WATER VAPOUR PERMEABILITY.

Packaging material with a low water vapour permeability is necessary to reduce product dehydration. The permeability of such materials depends on both temperature and relative humidity. Water vapour permeability of fish packages should not exceed 0.2 $g/m^2/24$ h at -20°C (-4°F) at a relative humidity of 80 percent.

5.4.3.12 PACKAGES SHOULD HAVE LOW PERMEABILITY TO GASES AND ODOURS.

Packing materials should resist the penetration of oxygen and other gases and should be properly sealed in order to minimize rancidity and prevent the absorption of odours during storage. Films and foils used for packaging should not be easily pin-holed during processing and handling. This is especially important if the packages are vacuum packed or flushed with inert gas. Outer paperboard containers may be necessary in some instances for additional protection.

5.4.3.13 PACKAGING MATERIALS SHOULD BE SUFFICIENTLY STRONG AND DURABLE TO WITHSTAND STRESSES DURING PROCESSING, HANDLING, STORAGE AND DISTRIBUTION.

The package should be able to withstand stresses during assembly, filling, machine closing, freezing, storage, transport and thawing. Wet-strength and impermeability to moisture are necessary as products may be wet when packed. Low temperature flexibility of the packaging material will prevent it from rupturing or tearing during storage or transportation. Laminated materials should not separate when damp.

5.4.3.14 PACKAGES SHOULD BE IMPERMEABLE TO FATS AND OILS.

The impermeability and resistance of the packaging material to fats and oils is an important property, especially where pre-cooked or fatty fish are packed. If the packaging material becomes impregnated with oil, rancidity will develop during storage and the appearance of the product will suffer.

5.4.3.15 PACKAGING MATERIALS SHOULD NOT STICK TO THE WET OR FROZEN SURFACE OF THE PRODUCT.

Packaging materials which stick to wet or frozen products are a source of annoyance to the consumer.

5.4.3.16 SUITABLE MATERIAL SHOULD BE USED FOR PACKAGING BOIL-IN-THE-BAG PRODUCTS.

Packaging material used in this type of product should be capable of withstanding long exposure to the temperature of 100°C (212°F) when immersed in boiling water. Leak and waterproof features are essential for boil-in-the-bag packs. In addition, the presence of air spaces or excessive voids in boil-in-the-bag products should be avoided as the package will float on the surface of the boiling water.

5.4.3.17 THE USE OF SHRINK WRAPPING IS RECOMMENDED WHERE GOOD SURFACE CONTACT WITH PRODUCTS SUCH AS WHOLE FROZEN FISH OR IRREGULARLY SHAPED FROZEN PORTIONS IS REQUIRED.

A number of wrapping materials have the property of shrinking when heated. These are usually made up to form bags into which the frozen product is placed. The package is evacuated and sealed and then shrunk by a few seconds' exposure to hot air or hot water. After shrinking, the package fits tightly against the enclosed contents, thus greatly reducing the voids that are otherwise encountered in the packaging of irregularly shaped products. Precautions should be taken to avoid penetration of the wrapping film by sharp points of the contents.

5.4.3.18 MASTER CARTONS FOR WHOLESALE PACKAGING SHOULD BE LIGHT, STRONG AND SHOULD PROVIDE GOOD PROTECTION FOR THE FROZEN PRODUCTS.

Fibreboard and corrugated paperboard have been found to be satisfactory materials for master cartons which usually enclose a number of consumer cartons or packages. To facilitate handling, these containers should not be too large. A good wet strength and bursting strength are required. Master containers may be strapped with wire or bands to provide additional strength.

5.4.4 Storage and Distribution

5.4.4.1 DURING FREEZING, THE TEMPERATURE OF THE PRODUCT SHOULD BE LOWERED TO SUCH AN EXTENT THAT AFTER THERMAL EQUALIZATION, THE TEMPERATURE OF THE PRODUCT IS THAT OF THE FREEZER STORE OR BELOW.

Products should not be placed in frozen storage until their temperature has been brought down to that of the freezer store.

The freezer store is designed to hold products at the proper frozen storage temperature and should not be used either for freezing fish or for reducing the temperature of a frozen product to the temperature level of the freezer store.

5.4.4.2 IF PARTIALLY THAWED PRODUCTS ARE RECEIVED FOR FROZEN STORAGE, THEY SHOULD BE RE-FROZEN IN PROPER FREEZING EQUIPMENT PRIOR TO THEIR STORAGE IN THE FREEZER STORE.

In some cases, frozen products may become partially thawed during transfer or shipment. If these products are still considered to be of an acceptable quality for human food, they should be re-frozen rapidly in a proper freezing plant. Tuna, for example, may show signs of surface thaw after unloading from the fishing vessel, but may be re-frozen and stored ashore without any significant change in its suitability for canning.

5.4.4.3 FROZEN FISH PRODUCTS SHOULD BE STORED AT TEMPERATURES APPROPRIATE FOR THE SPECIES, TYPE OF PRODUCT AND INTENDED TIME OF STORAGE.

Inevitably, some deterioration of frozen fish products will occur during frozen storage, but if proper temperatures and conditions are maintained, these changes will be slight, even after a relatively long time of storage.

Temperature during storage is the most important factor affecting the quality of the product. Lower temperatures retard adverse quality changes; in other words the rate of quality loss is a function of temperature and time of storage. Temperature fluctuation during the storage should be kept to the minimum.

Another factor influencing the choice of storage temperature is the capacity of air to hold moisture. The higher the temperature, the more moisture air can carry without becoming saturated. At higher temperatures therefore there is a faster transfer of water vapour from the product to the cooling surfaces and thus a greater degree of product dehydration.

The table in Appendix II shows the approximate keeping times for some species of fish and fish products when stored at various temperatures.

5.4.4.4 THE TEMPERATURE OF THE FREEZER STORE SHOULD BE CONTROLLED CAREFULLY TO AVOID FLUCTUATIONS.

Excessive product temperature fluctuations either in range or frequency are undesirable. Fluctuations of more than 2°C (4°F) in the freezer store temperature should be avoided. Moisture transfer from the product to the colder refrigeration surfaces is accelerated as the temperature difference is increased. Consequently, fluctuations of the freezer store temperature promote dehydration of the stored products. The air velocity in cold freezer stores should be moderate and no higher than necessary to achieve sufficiently uniform temperature within the store.

5.4.4.5 FREEZER STORE TEMPERATURES SHOULD BE CHECKED OFTEN, PREFERABLY BY THE USE OF TEMPERATURE RECORDING DEVICES, AND RECORDS SHOULD BE MAINTAINED.

Frequent checks of store temperature allow prompt action to correct any malfunctioning. When deviations occur, the refrigeration equipment should have sufficient reserve capacity to regain quickly the correct temperature level.

Accurate temperature measurements by recording devices will quickly indicate whether proper conditions are being maintained. Care should be taken to place the sensitive element of the recording device in such a position that the reading obtained will be indicative of the actual store temperature. Usually it is necessary to fit a number of such elements and recording devices to obtain a more representative reading.

5.4.4.6 THE PRODUCTS SHOULD BE STACKED IN THE FREEZER STORE SO THAT THERE IS ALWAYS A SPACE FOR COLD AIR TO CIRCULATE ALONG THE WALLS AND FLOOR.

Although distances of 5-10 cm (2-4 in) from walls and floors are sometimes regarded as adequate, occasionally large gaps may be required. Where possible, pallet storage should be practised, allowing air spaces below and around the outside of the stacked products. If this is done, then heat which might leak into the room will be absorbed by the circulating cool air instead of being absorbed by the product.

5.4.4.7 WHEREVER POSSIBLE, FREEZER STORES SHOULD MOVE THE LONGEST STORED PRODUCTS INTO DISTRIBUTION FIRST.

Products held in frozen storage should be clearly identified and records should be kept to prevent older stocks from being allowed to deteriorate in quality through lengthy storage while newer stocks are being passed into distribution channels. A first-in, first-out principle should be followed.

5.4.4.8 ALL VEHICLES USED IN THE TRANSPORT OF FROZEN FISH SHOULD BE CAPABLE OF MAINTAINING THE LOW TEMPERATURE REQUIRED TO PRESERVE THE QUALITY OF THE PRODUCT.

Under ideal conditions the temperature of frozen fish during transport should be the same as the freezer storage temperature. It is recommended that vehicles transporting frozen fish should be capable of maintaining temperature at -18°C (0°F) or lower by means of mechanical refrigeration systems, dry ice, or liquified gases.

Frozen products should not be stacked directly against the floor, walls or roof of the carrier unless the carrier has a body of the jacketed type, but should be stacked in such a manner that cold air can circulate around the load to absorb heat which leaks into the vehicle. A minimum distance of 5 cm (2 in) between the load and the vehicle's floor, roof and walls is suggested.

Local multiple-stop deliveries from distributing warehouses to shops or restaurants may present problems quite different to those encountered in long distance transport between coastal and inland freezer stores. In the absence of mechanical refrigeration, insulated containers with dry ice may be used to keep the temperature of the product from rising. Loading for multiple-stop deliveries should be planned in accordance with the delivery route. The opening of vehicle doors should be kept to a minimum to prevent loss of cold air. Such a loss may be further reduced by use of flexible self-closing inner doors.

Low temperature deliveries of small orders may also be made in individual insulated boxes which are packed in the freezer store prior to loading for distribution.

5.4.4.9 CARE SHOULD BE TAKEN THAT FROZEN FISH PRODUCTS ARE NOT EXPOSED TO HIGH TEMPERATURES DURING LOADING AND UNLOADING OF TRANSPORT VEHICLES.

Frozen fish warm very quickly. The effects of any temperature fluctuations, even of short duration, are cumulative and detrimental.

The load should be assembled in the freezer store on pallets, and mechanical methods of loading should be used wherever possible. It is important that the products should not be allowed to stand in non-refrigerated areas. Vehicles should be pre-cooled to+10°C (50°F) or lower prior to loading and should be equipped with devices to record temperatures during transport. Loading into and unloading from vehicles and into and from freezer stores should be as fast as practicable and the methods used should minimize the rise in product temperature.

Some recently constructed freezer stores provide low temperature loading bays, with flexible connecting loading tunnels that fasten directly to the doors of transport vehicles.

5.4.4.10 THE OPERATION OF THE REFRIGERATION UNITS ON TRANSPORT VEHICLES SHOULD BE CHECKED FREQUENTLY EN ROUTE.

A temperature rise of the product during transport from one freezer store to another to -15°C due to unforeseen circumstances may be tolerated. Otherwise, any rise in temperature of the product higher than -18°C should be reduced to this temperature or lower without unnecessary delay.

Every frozen product transport vehicle should be fitted with a properly installed thermometer so that the temperature in the cargo space can be checked regularly without having to open doors and a record of these temperature readings should be kept for future reference. An insulation test should be carried out at regular intervals; tests every two years are recommended in some countries.

5.4.4.11 THE SUITABILITY OF REFRIGERATED TRANSPORT VEHICLES AND THE CARE WITH WHICH THEY ARE LOADED, OPERATED AND MAINTAINED SHOULD BE CHECKED OCCASIONALLY BY MEASURING PRODUCT TEMPERATURES AT THE BEGINNING AND END OF A JOURNEY.

Occasional checks should be made by measuring the temperature of the product at the bottom, sides and top of the load when the vehicle is being loaded and again when it is unloaded. If any excessive warming has occurred, the cause should be determined and the fault corrected.

Specially designed thermometers are used for this purpose.

5.5 Thawing of Frozen Fish

5.5.1 ONLY VERY HIGH QUALITY FROZEN FISH SHOULD BE SELECTED FOR FURTHER PROCESSING WHICH INVOLVES THAWING AND REFREZING.

Substantial quantities of frozen fish products are now being manufactured from fish which has been frozen at sea or on shore, stored, thawed, processed and then refrozen. Even under the best of circumstances the quality of the final product will be affected by each of

these operations and if they are not carefully performed the decline in quality may be quite serious. It follows then that in order to produce a good quality product out of fish which has been subjected to thawing and refreezing, it is necessary to use only high quality raw material and to carry out the handling, freezing, storing, thawing, processing and refreezing in accordance with the best of accepted practices.

5.5.2 EXPOSURE OF FISH TO ELEVATED TEMPERATURES DURING THAWING SHOULD BE CAREFULLY CONTROLLED.

When frozen fish has been thawed, it is susceptible to spoilage in the same manner as fresh fish. The rate of spoilage increases as temperature is increased appreciably above that of melting ice. It is important therefore that the temperatures to which the fish are exposed during thawing should be no higher than is necessary to carry out the operation reasonably quickly and that the fish should be either processed or thoroughly chilled as soon as they are thawed. It is generally desirable to commence processing or return the fish to a chilled environment a little before thawing is complete, since the centres will continue to thaw until the temperatures within the fish have been equalized.

For some types of product it may be practical and desirable to carry out the processing operations such as cutting, breading, cooking or packaging, using fish which have been only partly thawed. Frozen blocks of fish or fish portions may, in some circumstances, require thawing only to the stage at which the individual pieces can be separated without damage.

It should be borne in mind that under similar conditions small fish will thaw much sooner than large fish or large fish blocks. Fish frozen in blocks can therefore be thawed more rapidly if the individual fish are separated as soon as thawing has proceeded far enough to do so. Where fish of various sizes are thawed together care should be taken that the smaller fish are removed and chilled as soon as they are thawed.

5.5.3 THE THAWING METHOD CHOSEN SHOULD SUIT THE VOLUME AND TYPE OF PRODUCT THAT IS TO BE PROCESSED AND SHOULD BE ECONOMICALLY PRACTICAL.

The methods most commonly used by the industry to thaw fish for further processing have been described in the Appendix I, Chapter No. 3 entitled "Some General Observations on Thawing". It is difficult to make general recommendations as to which thawing method is most suitable for a particular product. The processor, in making his decision, should consider the capital, maintenance, operating and labour costs, as well as the volume and particular requirements of the product to be thawed. It is felt that a technologistwho is familiar with the thawing practices should be consulted on such matters.

5.5.4 ALL THAWING OPERATIONS SHOULD BE CARRIED OUT UNDER SANITARY AND HYGIENIC CONDITIONS.

Since thawed fish are subject to the same risks of contamination and spoilage as fresh fish, it is essential that all areas, equipment, tanks and other facilities used in thawing, and all handling practices, should meet the same high standards for sanitation and hygiene as set out in the "Code of Practice for Fresh Fish".

5.5.5 FILLETS WHICH HAVE BEEN FROZEN PRE-RIGOR OR DURING RIGOR SHOULD BE THAWED CAREFULLY AT A LOW TEMPERATURE.

Fish which have been frozen prior to or during rigor and thawed quickly after only a short time in frozen storage, may be subject to "thaw rigor". Under these circumstances fillets may become badly distorted and drip excessively. The effects of "thaw rigor" on frozen fillets can be greatly reduced by thawing slowly at a low temperature.

5.5.6 WHERE FISH ARE THAWED IN STILL AIR, THE AMBIENT TEMPERATURE SHOULD NOT EXCEED 18°C (65°F).

When fish are thawed very slowly in still air, the surfaces of large fish might reach ambient temperature a long time before the centres are thawed. Since the rate of fish spoilage increases greatly at elevated temperatures, it is important that still air thawing should take place in a clean environment and that the air temperature should not exceed 18°C (65°F). It should be said however that the thawing temperature to be chosen should depend on the size of the product, the species and the intended process. The fish should be either processed immediately, or thoroughly chilled, as soon as they have thawed sufficiently for the intended purpose.

5.5.7 WITH AIR BLAST THAWING, THE AIR SHOULD BE HUMIDIFIED AND ITS TEMPERATURE SHOULD NOT EXCEED 21°C (70°F).

Although fish thaw much more quickly in rapidly moving air than in still air, thawing is still relatively slow. The surfaces of large fish will be thawed much sooner than the centres and to avoid loss of quality, the air temperature should not exceed 21°C (70°F). It is also important that the circulated air should be humidified so that the surfaces of the fish do not dry out and thus spoil their appearance. Humid air will also assist in the thawing process by adding a little more heat to the fish when its water vapour condenses on their cool surfaces.

In batch thawing with air blast, care should be taken to ensure that the air is circulated uniformly around all the fish and that the fish are removed to chilled storage as soon as they are sufficiently thawed.

5.5.8 THE WATER USED FOR THAWING FISH SHOULD BE EITHER CLEAN SEA WATER OR FRESH WATER OF POTABLE QUALITY AND ITS TEMPERATURE SHOULD NOT EXCEED 21°C (70°F).

It is important that the fish should not be contaminated by the use of unsanitary water. Potable water is recommended for use in thawing although clean sea water might be used.

Since fish will thaw in well circulated water in about the same time as they would in an air blast, the maximum temperature recommended is the same, 21°C (70°F). Care should also be taken to remove the fish from the water as soon as they are sufficiently thawed.

When water is circulated in the thawing tank, adequate precautions should be taken to avoid its becoming badly contaminated with blood, slime and micro-organisms. The tanks should be drained and thoroughly cleaned at regular intervals.

5.5.9 WHERE DIELECTRIC THAWING OR ELECTRICAL RESISTANCE THAWING IS USED, PRECAUTIONS SHOULD BE TAKEN TO AVOID OVER-HEATING IN PARTS OF THE PRODUCT.

Both these methods depend on the conversion of electrical energy into heat within the flesh of the fish. It is necessary that the absorption of energy should be uniform throughout in order to avoid damage by overheating and cooking in parts of the product. This is difficult to achieve in products which are not regular in shape and which have voids. At present, this limits the usefulness of these methods to certain types of products like regular shaped fillet blocks, in the case of electrical resistance thawing and regular shaped fillets or whole fish blocks in the case of dielectric thawing. The latter method may also be used in thawing individual whole fish if damage to tail sections and fins is not important. Both of these thawing techniques are rapid and satisfactory if properly used. Nevertheless, it is recommended that the advice of an experienced technologist should be sought before either method is undertaken.

5.5.10 IMMEDIATELY AFTER THAWING THE FISH SHOULD BE EITHER PROCESSED AND REFROZEN OR THOROUGHLY CHILLED AND MAINTAINED IN A CHILLED CONDITION UNTIL IT IS PROCESSED OR DISTRIBUTED TO THE CONSUMER.

As stated earlier, thawed fish will suffer quality loss and spoil in the same manner as fresh fish and should therefore be kept thoroughly chilled and otherwise handled and stored as recommended in the "Code of Practice for Fresh Fish".

5.6 Sanitary Control Programme

5.6.1 IT IS DESIRABLE THAT EACH FISH PROCESSING AND FREEZING PLANT IN ITS OWN INTEREST DESIGNATES A SINGLE INDIVIDUAL WHOSE DUTIES ARE PREFERABLY DIVORCED FROM PRODUCTION, TO BE HELD RESPONSIBLE FOR THE CLEANLINESS OF THE ESTABLISHMENT. FF (5.5.1)

Such a person or his staff should be a permanent part of the organization or employed by the organization and should be well trained in the use of special cleaning tools, methods of dismantling equipment for cleaning and in the significance of contamination and the hazards involved. A permanent cleaning and disinfection schedule should be drawn up to ensure that all parts of the establishment are cleaned appropriately and that critical areas, equipment and material are designated for cleaning and/or disinfection daily or more frequently if required.

5.7 Laboratory Control

5.7.1 IN ADDITION TO ANY CONTROL BY THE OFFICIAL AGENCY HAVING JURISDICTION, IT IS DESIRABLE THAT EACH FISH PROCESSING AND FREEZING PLANT IN ITS OWN INTEREST SHOULD HAVE ACCESS TO LABORATORY CONTROL TO ESTABLISH SANITARY QUALITY OF THE PRODUCTS PROCESSED. FF (5.6.1)

The extent and type of such control will vary with the food product as well as the needs of management. Such control should reject all foods that are unfit for human consumption.

Analytical procedures used should follow recognized standard methods in order that the results may be readily interpreted.

6. SECTION V - END PRODUCT SPECIFICATIONS

6.1 Appropriate methods should be used for sampling and examination to determine the compliance with the following specifications:

A. Fishery products should be, to the extent possible in good manufacturing practice, free from objectionable matter and parasites.

B. Fishery products should be free from micro-organisms in amounts harmful to man, free from parasites harmful to man and should not contain any toxic substances produced by micro-organisms in amounts which represent a hazard to health. FF (6.1)

C. Fishery products should be free from chemical pollutants in amounts which may represent a hazard to health.

D. Fishery products should comply with the requirements set forth by the Codex Alimentarius Commission on pesticide residues and food additives as contained in permitted lists of Codex commodity standards, or should comply with the requirements on pesticide residues and food additives of the country in which the fish will be sold.

E. Specifications A, B, C and D should, to the extent possible, also apply to frozen fish.

7. SECTION VI - RETAIL DISPLAY

7.1 FROZEN FOODS SHOULD BE OFFERED FOR SALE FROM REFRIGERATED CABINETS DESIGNED FOR THE PURPOSE.

Display cabinets used for frozen fish and fish products in retail stores or other outlets should be capable of maintaining the low temperatures required to preserve the quality of the product.

Retail display cabinets are usually kept at a higher temperature than is recommended. The cabinets should be capable of maintaining a temperature of -18°C (0°F) or lower, but during sale operations, some fluctuation seems unavoidable and a slight rise of temperature may be tolerated for short periods but the product temperature should not be allowed to become higher than -15°C (5°F) except for the top layer where a higher temperature may be tolerated. The temperature should be carefully controlled and all cabinets should be equipped with reliable thermometers where bulbs are in contact with the top layers of product so that temperatures can be readily checked several times daily.

In order to ensure constant temperature and for reasons of economy, cabinets should not be exposed to warm air currents, direct sunlight, heating or lighting equipment. The cabinets should be covered at night and over the weekend. The stocking of cabinets should be carried out quickly to minimize the time during which the product is exposed to ambient temperature. It is advantageous to arrange storage space for new stock prior to its delivery. The temperature of products at the time they are delivered should be checked occasionally.

Although the air temperature in a cabinet can be readily checked, the actual temperature of the product should be measured occasionally. Advice on how to measure frozen product temperatures accurately may be obtained from a frozen product technologist or from various fishery research organizations. A special type of thermometer is required for this purpose.

7.2 THE CONTENTS OF THE CABINET SHOULD NEVER BE STACKED ABOVE THE DESIGNATED LOAD LINE MARK.

The cabinet refrigeration system is not designed to maintain the temperature of products stacked higher than the load line marked on the cabinet. Packages should be stored close together but not too tightly packed. If displays are packed too tightly they take longer to stock, customers have difficulty in removing packages and damage often results. Simple dividers may be of assistance in stocking the cabinet and creating an orderly display. Stocks should not be removed from and returned to the cabinet except when absolutely necessary. Unpacked products are subject to risks of contamination and dehydration and should be stored and displayed in compartments separate from those used for packaged frozen foods.

7.3 FROZEN FISH SHOULD NOT BE STORED IN RETAIL CABINETS FOR LONG PERIODS.

Refrigerated retail display cabinets are designed to hold frozen products for short periods only. Long term storage should be in low temperature freezer stores.

Merchants should avoid holding stock in retail display cabinets for much longer than one week and this should be borne in mind when ordering supplies. New supplies should be placed under or behind the stock of that particular item, so that the packages which were delivered first will be sold first. Large stocks of frozen fish products with a slow turn-over should be avoided.

7.4 DISPLAY CABINETS SHOULD BE DEFROSTED AT LEAST ONCE A WEEK.

Defrosting cycles should be programmed in such a way that, as much as possible, defrosting takes place outside the normal shopping hours.

If the cabinet is not defrosted regularly, the effectiveness of its refrigeration system will be seriously reduced by accumulation of frost and ice on the cooling surfaces. This can adversely affect running costs and operating temperature. For efficient operation, the inner walls and floor of the cabinet should be kept clean and free from thick frost. Unless it has an automatic defrost, the cabinet should be emptied for defrosting and during this time the product temperature should not be allowed to rise unduly. It is also advisable to have the cabinet checked from time to time by a competent refrigeration service man.

7.5 RETAIL DISPLAY CABINETS SHOULD BE USED TO STORE ALREADY FROZEN PRODUCTS AND NOT TO FREEZE THEM.

Unfrozen or partially thawed fish or fish products should never be placed in a frozen food cabinet for freezing or chill storage. These cabinets neither are designed nor do they have the refrigeration capacity for quick freezing.

7.6 FROZEN FISH WHICH HAS BEEN PARTLY OR COMPLETELY THAWED FOR RETAIL SALE SHOULD NEVER BE RETURNED TO A FROZEN FISH CABINET.

Fish merchants occasionally might sell frozen fish in a partly or completely thawed condition. This fish may be delivered from the wholesale distributor under such conditions that it gradually defrosts during transport, to be ready for sale as thawed fish. The product may also be taken from the frozen fish display cabinet to be prepared for subsequent sale as a thawed product. The quantity removed should be limited to the immediate demand and under no circumstances should the thawed product be returned to the low temperature storage.

APPENDIX I

1. Factors Affecting the Quality of Frozen Fish

Only good quality fresh or thawed fish should be used for the preparation of quality frozen products. It has been stated in the "Code of Practice for Fresh Fish" that spoilage can be slowed down for a short period by maintaining the fish in a chilled condition at the temperature of melting ice, 0°C (32°F).

The purpose of freezing is to lower the temperature of the fish to well below that of melting ice and eliminate microbial spoilage. If freezing is carried out correctly and the fish are stored in the proper freezer store at a constantly low temperature, deterioration can be arrested for long periods, resulting in a thawed product almost equal in quality to fresh fish.

However, undesirable changes will often occur if the raw material is not handled properly or is frozen too slowly or if the frozen product is not adequately protected against dehydration, oxidation and physical damage or is stored at too high a temperature or for too long a time.

The natural process of rigor mortis can adversely affect the quality of frozen products produced from some species of fish such as cod, if certain precautions in handling the fish prior to freezing are not observed.

It is difficult to give a specific rule as to how rapidly fish must be frozen to avoid this slow freezing effect. In some cases freezing times of several hours to as long as one day do not appear to have a significant effect. Indeed it may not be possible under the best of circumstances to freeze some large fish in less than 24 hours.

However, in some instances, freezing times in excess of 2 hours might have an adverse effect on the appearance of a product and on the suitability of fish for subsequent filleting and smoking. There are studies which indicate that when the freezing is carried out without delay and rapidly and the temperatures to which the product is cooled and at which it is held are adequately low, the quality of the final product will be better.

For these reasons and to avoid backlogs of unfrozen fish, freezing should be done as rapidly as possible. Since there will be a substantial temperature gradient in a rapidly frozen product, it will generally be found that if the temperature of the warmest part (usually near the centre of the fish or fish block) is brought down to -21°C (-5°F) in the freezer, the average temperature on removal from the freezer may approach close to the recommended freezer store temperature of -29°C (-20°F).

There are many factors that affect freezing rates. Since the temperature gradient, the heat conductivity of the product and other parameters change as freezing progresses, the rate of freezing will also change. Specifications therefore which state freezing times as so many centimetres of thickness per hour, may be unrealistic and misleading.

Freezing times of about 3 to 4 hours for 100 mm (4 in) fish blocks are general on freezer vessels using vertical plate freezers while some horizontal plate freezers will freeze packages of fillets 22 mm (7/8 in) thick in about one hour or 34 mm (1 3/8 in) packages in about the same time.

There is a number of ways in which quality deterioration can occur in frozen fish that have not been properly protected and stored.

Dehydration will occur through the evaporation of moisture from products during frozen storage if they are not properly glazed or packaged, or if the freezer store is not properly designed or operated. This loss of moisture causes product surfaces to become dry and dull and sometimes discoloured. Since the evaporated water eventually condenses and freezes on the cooling surfaces of the freezer store, the transfer of moisture from the product will be continuous, unless adequate precautions are taken. Evaporation from the product can be greatly reduced, or even prevented, by proper glazing or packaging with a good water vapour barrier. Furthermore, the rate of moisture transfer to the cooling surfaces can be greatly decreased by preventing, as far as possible, fluctuations in the freezer store temperature or marked differences between the temperature of the product and that of the store's cooling surfaces.

Fatty fish which are improperly frozen or stored may also develop rancid odours and flavours. These result from the combination of oxygen from the air with the fat of the fish. Rancid fish sometimes have an odour similar to that of oil paint. Rancidity due to oxidation from the air can be greatly retarded by adequate glazing or by sealing the product in a package which is impermeable to oxygen or by storage at low temperatures.

The temperature at which frozen fish is stored has an important effect on the quality of the product. A temperature of -23°C (-10°F) has been recommended in some areas, -26°C (-15°F) in others, while in one particular fishery the standard temperature is -29°C (-20°F) especially for long periods of storage. Even at this latter temperature, changes in the flesh due to protein denaturation occur slowly and at higher frozen storage temperatures they take place much more rapidly.

Frequently frozen fish which are initially intended for short-term storage, remain in the freezer store for much longer periods and therefore a temperature of storage such as -29°C (-20°F) or lower is strongly recommended.

The length of time, according to one source, that some species of fish will remain acceptable in frozen storage at different temperatures is given in Appendix II.

If fish are cooled to about 0°C (32°F) soon after capture, kept chilled and not handled roughly, the effect of rigor on the final frozen product will not be too serious. At a higher temperature, the rigor process is much more intense and may have a serious effect on quality.

As fish go into rigor the muscle tissues contract, the carcass becomes stiff and the flesh rubbery. Intense rigor also results in changes in the flesh which will cause it to be much tougher after freezing and to drip excessively on thawing.

The time fish remain in the state of rigor mortis depends on a number of factors and may vary from a few hours to several days. In general, however, the lower the temperature at which the fish are held the slower the onset of rigor and the longer it will endure, but the less will be its intensity and consequently its effect on the quality of the final product. Freezing relieves the physical stresses of the rigor process but these may be resumed in what is known as "thaw rigor" if frozen storage is only of short duration and if thawing is done too rapidly.

As rigor mortis resolves, the tensions in the muscle tissue relax, the carcass becomes limp and the flesh soft.

When whole or gutted fish go into rigor the contractions of the muscle tissues are resisted by the skeleton and connective tissue. At temperatures close to 0°C (32°F) the contractive strains are usually small and the flesh is held in place without damage. At higher temperatures, however, rigor is more intense and strong muscular contractions may cause tears and separations (gaping) in the flesh. Fillets cut from the fish where this occurs will be ragged and torn.

It also follows that rough handling of fish during rigor puts additional strains on the connective tissues which may then give way and cause gaping in the flesh. Attemps to straighten the fish that have gone into rigor in a bent position or have been bent by the uneven onset of rigor, will almost certainly damage the flesh.

Fillets removed from a fish in the pre-rigor state will themselves pass through the rigor process, but as the tissues are no longer supported by the skeleton, shrinkage will occur and the fillets may become distorted. The extent of shrinkage depends largely on the temperature at which the fillets are kept. Immediate freezing is the only safe way to avoid shrinkage, but if some delay in freezing is necessary, the fillets should be maintained at chill temperature.

The effect of rigor on the toughness and drip loss of frozen fillets is the same as for frozen whole or gutted fish. The warmer the fish when they go into rigor, the greater the drip loss and the tougher the final product.

If filleting is delayed until after the fish have gone into rigor at chill temperature, most of the problems of shrinkage are avoided, but there are some disadvantages. Mechanical filleting is often difficult when fish are in rigor and even hand filleting may give slightly lower yields compared with fish that are soft and flexible.

Frozen fillets cut from post-rigor gutted fish are normally of uniform good quality provided the gutted fish have been handled carefully and kept chilled.

At present, the most reliable method of avoiding the undesirable effects of rigor is to keep the fish or fillets chilled at every stage before freezing. Provided they pass through rigor in a chilled condition, the effect on quality should not be serious.

The time which is taken to freeze fish and reduce its temperature to that of the freezer store may have an important bearing on the quality of the frozen product. It has been observed that if fish are frozen very slowly the ice crystals which form in the flesh will be relatively large. When such slowly frozen fish are thawed, there will be a large drip loss and the fish could have a poor appearance, texture and flavour.

If, on the other hand, good fish which have been properly handled are frozen very quickly, the ice crystals will be small and if it is not stored too long, the product will be almost undistinguishable from fresh fish.

At one time it was thought that the formation of large ice crystals was the principal reason for the loss of quality by slow freezing, but more recent studies have shown that the factors involved are much more complex.

Protein denaturation, as the name implies, is a slow irreversible change in the nature of the protein constituents of the flesh which alters the appearance, texture and flavour of frozen fish and increases the amount of thaw drip. Its effects are most notable in white fish which contain little fat. The flesh becomes dull and opaque and after cooking has a tough, dry texture. It may also develop the unpleasant flavours characteristic of badly stored fish and it often becomes unsuitable for smoking because it will not take on the glossy appearance desirable in such cures.

2. Some General Observations on Freezer Stores

The proper design and installation of freezer stores is a matter of great importance, requiring the services of trained and experienced engineers. It is difficult to deal comprehensively here with the complex problems that are involved, but some general points are offered for guidance.

It is important that insulation should be of a suitable material, adequate in thickness, and properly sealed against the entry of water vapour from the warm side. Inadequate insulation will allow too much heat to enter the store, placing an unnecessary load on the refrigeration system and probably resulting in large fluctuations in the store temperature during peak periods. Indeed it is possible that a badly constructed freezer store may never be able to attain the low temperature originally intended. The insulation of a freezer store will deteriorate rapidly if it is not made impermeable to the water vapour from the outside air. If moisture is allowed to permeate the insulation it will freeze as it reaches the colder side thus reducing insulating efficiency and ultimately causing the material to disintegrate.

The type and capacity of the refrigeration equipment to be used will be determined by many factors including the size of the store, its temperature of operation and whether the store is to be cooled by grids, by forced air circulation or by some other means.

The decision as to which method of cooling to use, is a critical matter and should be taken only after careful consideration of many factors, such as capital, cost of operation and performance. Serious mistakes may be avoided at this stage by obtaining the advice of a competent engineer.

The cooling system should be designed so that temperature differences throughout the store are minimized without creating a low relative humidity which will cause stored products to dehydrate rapidly. If there is rapid circulation of air in the store, there should be some means of maintaining a high humidity. In general, it may be said that there should be adequate cooling surface, the difference in temperature between the cooling surface and the rest of the store should be small, and the storage temperature should be low.

3. Some General Observations on Thawing

Frequently frozen fish is thawed so that it can be processed into other fishery products. The thawing of fish requires considerable care, because thawed fish is subject to the same risks of contamination and spoilage as fresh fish.

Both the temperature at which the heat for thawing is provided and the length of time that the product is exposed to this temperature should be carefully controlled. If the thawed product is not to be processed immediately, it should be held at the temperature of melting ice.

Frozen fish will thaw when the heat energy, which was extracted during freezing, is returned. There are two general ways of doing this: the heat may be allowed to flow into the product from a warmer surrounding medium such as air or water, or it may be provided as electrical energy which is converted into heat in the flesh itself.

Methods of thawing which involve the transfer of heat through the fish surfaces are relatively slow because the thawed outer layer of flesh, which is a relatively poor conductor of heat, restricts its flow to the frozen core. Therefore, a fairly high temperature gradient is required to thaw fish reasonably quickly and, in the case of large fish or fish blocks, this means that the outer layers may be exposed to temperatures conducive to fairly rapid spoilage for some hours while the centre is still thawing.

Electrical methods of thawing are much faster than heat conduction methods and there is no need for part of the product to be exposed to temperatures much higher than that of melting ice. However, both dielectric and resistance thawing depend on the absorption of energy by matter which will conduct electricity. Since the electrical conductivity of fish flesh improves with increase of temperature, there is some risk, unless proper precautions are taken, that uneven absorption of energy will occur and "runaway heating" will cause cooking in some parts of the product.

The following is a brief description of the methods of thawing fish that are now in general use:

Still Air Thawing. The fish are allowed to thaw in a moderately cool ambient temperature. This method is very slow and requires considerable space, but it may be the most practical way of thawing if it is done infrequently and the volumes are small. In some instances it may be convenient to thaw fish overnight for processing the following day. Capital costs are low but the labour required in laying out fish and collecting them may be excessive.

Air Blast Thawing. The heat is supplied to the surfaces of the fish by means of circulating warm, moist air. Both batch and continuous air blast thawers are in use. Thawing time is, in some instances, less than half that of still air thawing. Capital and labour costs will depend very much on the type of equipment used.

Water Thawing. The fish are held in trays or baskets suspended in tanks and heat is supplied to their surfaces by circulated water. Water thawing is not generally considered suitable for frozen fillets because these tend to absorb moisture and lose flavour. It is suitable for whole fish, although lean fish may lose some skin pigments and perhaps some flavour. Thawing time is about the same as that of air blast thawing.

Contact Plate Thawing. This method requires special equipment and is only suitable for blocks that were frozen by a contact plate freezer. The blocks are sandwiched between plates which are in tiers and through which water is circulated to hold a temperature of about 20°C (68°F). This equipment is said to thaw 10 cm (4 in) cod blocks sufficiently in 5 hours for filleting after 3½ additional hours in chilled storage.

Electrical Resistance Thawing. This method is presently only recommended for frozen fillet blocks up to 5 cm (2 in) in thickness. Heat is generated in the flesh by the resistance to a low voltage current which passes between two electrode plates in contact with the opposite large faces of the block. To ensure an even flow of electricity and thus avoid localised over-heating, the average temperature of the block should be no lower than -4°C (25°F). Fillet blocks can be raised to this temperature by immersion in water for a short time. Electric resistance thawing is two or three times faster than is possible with air blast or water thawing.

Dielectric Thawing. The product is conveyed without contact between electrode plates which are charged by a high voltage and a high frequency generator (about 5 000 volts and 40 megahertz). Heat is generated in the flesh by the effect of the rapidly changing electric field. Since warmer parts of the flesh will be more conductive and hence will absorb more energy, there is danger of runaway heating and consequent cooking in some parts of the product if proper precautions are not taken. This may also occur if a block is not solid throughout or is uneven in shape.

Runaway heating can generally be avoided in fish blocks if they are immersed in water to fill the voids before being placed in the dielectric thawer. Some economy in power may also be achieved by warming the water with the waste heat from the high frequency generator.

Dielectric thawing is the most rapid method of thawing fish in current use, but capital and power costs are generally considered to be too high unless substantial volumes of fish are thawed. The method is suitable for blocks of whole fish or of fillets. Individual fish may also be thawed by this method although there is some danger that small sections, such as fins or tails, will be damaged by runaway heating.

Microwave Thawing. Thin layers of fish may be thawed very rapidly by absorption of energy from very high frequency electrical field (about 1 000 megahertz or more). However, the method is not considered to be commercially practical at the present time because of the high cost of the equipment and the serious limitation on the thickness of fish which can be thawed.

APPENDIX II

COLD STORAGE LIFE OF FROZEN FISH

Type of fish	Storage Temperature					
	*-9.5°C (15°F)		-20°C (-5°F)		-29°C (-20°F)	
	Good	Inedible	Good	Inedible	Good	Inedible
Gutted white fish	1 month	4 months	4 months	15 months	8 months	More than 4 years
Gutted fatty fish	1 month	3 months	3 months	6 months	6 months	1½ years
Smoked white fish	1 month	3 months	3½ months	10 months	7 months	1 year
Kippers	3 weeks	2 months	2 months	5 months	4½ months	9 months

* This temperature is not recommended for the storage of frozen fish products; it is given here only for comparison purposes.

The figures given in the above table are based upon the results of experiments carried out at Torry Research Station, Aberdeen, Scotland, over a number of years. All the samples were from very fresh fish, stored in ice for not more than 24 hours between catching and freezing. All but the smoked fish were well glazed, packed in wooden boxes lined with parchment paper and kept at temperatures within 0.6°C (1°F) of those stated. Samples were tasted and compared with corresponding fresh fish at regular intervals.

Figures in the columns headed "Good" give the period in which the stored product is for all intents and purposes as good as fresh. The columns marked "Inedible" indicate the time when the product becomes so distasteful to a consumer accustomed to fresh fish as to be inedible.

The figures cannot be more than approximations of the limiting periods.

APPENDIX III

References to Related Codes and Standards

FAO 1975	Code of Practice for Fresh Fish	ALINORM 76/13A, Appendix II (not revised) (FAO Fish Circ. No. C318)
FAO 1975	Code of Practice for Canned Fish	ALINORM 76/13A, Appendix III (not revised) (FAO Fish Circ. No. C315)
FAO 1975	Code of Practice for Smoked Fish	CX/FFP 75/6 (not revised) (FAO Fish Circ. No. C321)
FAO 1975	Code of Practice for Shrimps or Prawns	CX/FFP 75/7 (not revised) (FAO Fish Circ. No. C322)
FAO 1975	Code of Practice for Lobsters and Related Species	CX/FFP 76/16 (FAO Fish Circ. No. C330)
FAO/WHO	Recommended International Code of Practice - General Principles of Food Hygiene	CAC/RCP 1-1969 (to be revised)
WHO	International Standards for Drinking Water	

*FAO/WHO Food Standards for:

- Quick Frozen Fillets of Flat Fish	ALINORM 76/18, Appendix II
- Quick Frozen Shrimps or Prawns	ALINORM 76/18A, Appendix III
- Quick Frozen Lobsters, Rock Lobsters and Spiny Lobsters	ALINORM 76/18, Appendix III
- Quick Frozen Blocks of Cod, Haddock, Hake and Ocean Perch	CX/FFP 75/5

* Presently under revision and not available for official distribution.

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