SECRETARIAT OF THE ACP GROUP OF STATES
SFP-ACP/OCT MANAGEMENT UNIT

SFP- ACP/OCT

STRENGTHENING FISHERY PRODUCTS
HEALTH CONDITIONS IN ACP/OCT COUNTRIES

Design of Sanitary Standards for Landing Sites

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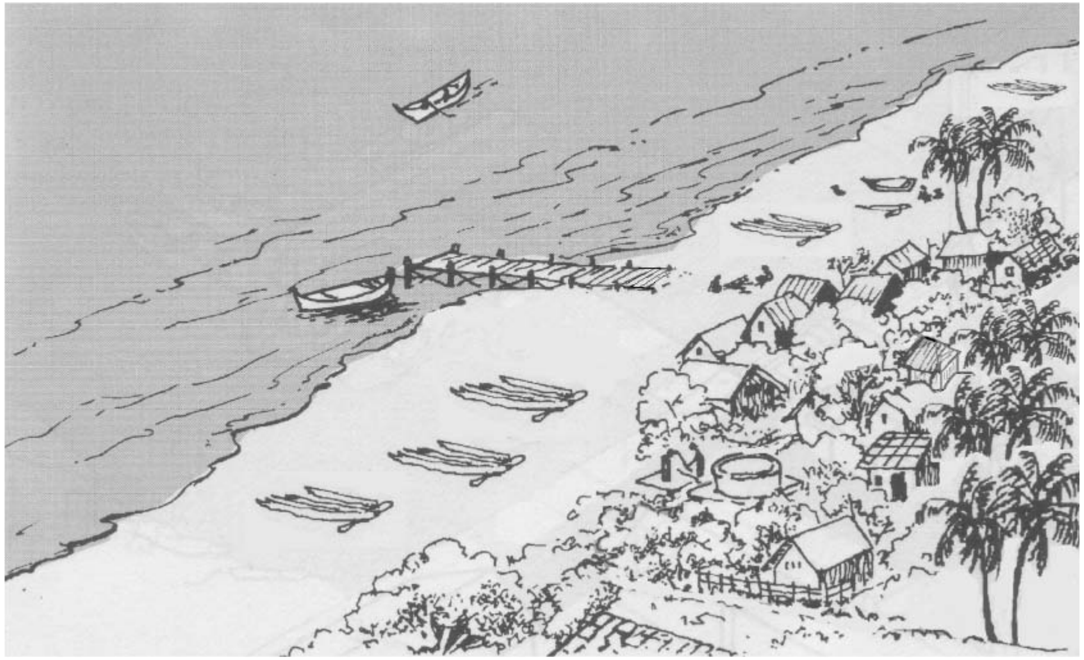
CONTENTS

INTRODUCTION

In the artisanal fisheries sector, limitations or deficiencies in infrastructure at the landing sites mean that individual productivity is low and levels of spoilage and waste are high. Although many governments mention the need to support the artisanal fisheries sector, their efforts to do so in infrastructure investments have not been reflected by the funding priorities set by the individual governments.



Typical artisanal landing site

Past experiences of international donors and inspections demonstrate that a considerable number of artisanal landing sites are not meeting even the most basic international requirements for hygiene. These landing sites are a crucial point in the fish processing chain since it is here that the catch will be landed and where it should be inspected, weighed, iced and prepared for onward transportation either directly to the local markets or to the processing industries. Fish passing through these landing sites is often contaminated by improper handling practises as result of poor infrastructure or lack of proper management. Fish thus contaminated poses a health hazard and even approved national food processing industries (with strict quality assurance in place) sometimes find it difficult to source their health-hazard-free raw materials locally.

Artisanal fisheries in developing countries are now providing a substantial amount of fish as raw material for human consumption. Although the bulk of the fish landed by the artisanal fisheries in developing countries is destined for the local markets, it is every country's wish to export its landed catch to more lucrative overseas markets.

The Fisheries and Agriculture Organization of the United Nations published a number of technical papers to assist governments and local authorities in their quest to improve landing an handling infrastructure in order to minimise post-harvest losses. The first major infrastructure publication entitled "Community fishery centres: Guidelines for establishment and operation [1]" was published in 1985. This was the first comprehensive guide on artisanal landing sites. The second publication on landing site infrastructure entitled "Construction and maintenance of artisanal fishing harbours and village landings [1]" was published in 1995 and was the first publication to tackle infrastructure in a holistic way and included the prevention of pollution in landing sites. The third publication, entitled "Fishing harbour planning, construction and management [1]", due for publication towards the end of 2009 is an all-encompassing enlarged volume covering amongst other things, The Code of Conduct for Responsible Fisheries, international conventions, importing country directives, environmental auditing of sites, needs assessment and the specific engineering topics that together make up the construction of the facility.

This publication, "Design for sanitary standards for landing sites" is designed to compliment "Fishing harbour planning, construction and management [1]" Both publications are designed to assist policy makers and local consultants in their work to develop modern and efficient landing sites capable of landing and handling fish to the required standards. Unlike previous publications, "Design for sanitary standards for landing sites" is divided into two parts; the first part dedicated to government departments and donor agencies, and the second part dedicated to the local consultants called upon to implement the physical infrastructure. This publication is ideal for assessing existing sites destined for rehabilitation. New sites should be assessed via established environmental impact assessment along internationally accepted guidelines.

This publication is not intended as a replacement of national standards, but rather as a guide to the basic hygiene infrastructure required by the importers of the fish to ensure that the product is health-hazard free. Should the national standards of a developing country not meet the standards set out in this manual, it is up to the individual country concerned to ensure that the required standards are met.

1 Text listed in the bibliography in Appendix 3

SCOPE AND OBJECTIVE OF THIS MANUAL

These guidelines for the design, construction or rehabilitation of existing small fish landing sites are global in nature, and are directed towards all persons, whether technical or non-technical, involved in this sector, whether from a Donor Agency, a Non-Governmental Organisation, in Government or the private sector.

The objective of this manual is to set out the basic minimum hygiene standards for the infrastructure and management of the landing sites to ensure that the landed fish is passed on to the consumer health-hazard free.

Part 1 is designed as a screening tool to determine the suitability of an existing site to handle fish meant for human consumption along internationally accepted sanitary guidelines.

Part 2 lists and explains the basic infrastructure required to rehabilitate an existing site.

EXECUTIVE SUMMARY

This manual on the Design for sanitary standards for landing sites is intended as a reference for both non-technical staff in Government Departments, Donor Agencies and Non-Governmental Organizations and engineers and architects involved in the design and rehabilitation of existing artisanal landing sites.

This manual covers all the relevant aspects of fish handling, from the landing of the fish to the handling on site and forwarding to potential processors or exporters. The infrastructure illustrated is required to ensure the best post-harvest handling with the minimum loss of fish through spoilage and waste.

The use of Part 1 of this guide should enable non-technical staff in Government Departments, Donor Agencies and Non-Governmental Organizations to zero-in on sites that require investment, whether major or minor, as a priority to improve productivity.

To consultants, engineers and architects involved in the rehabilitation of existing sites, it provides a handy reference on how to get the job done with the least possible fuss. This manual does not replace the text books or national standards to which the landing site elements have to be designed for.

The products illustrated in the text are taken from the public domain and are meant purely as examples.
They do not imply endorsement of the individual product brand by the SFP Module. Additional product sources are listed in Appendix 3.

This manual is divided into two parts: Part 1 is an existing site assessment tool and Part 2 is an illustrated technical manual to enable the shortcomings highlighted in Part 1 to be remedied.

Part 1, the existing landing assessment tool consists of 5 Frames:

Frame 1 assesses the environment that the landing site sits in.

Frame 2 assesses the potential sources of pollution within the land site

Frame 3 assesses the quality of services and utilities at the landing site

Frame 4 is a summary of the findings which in turn leads to a grading of the landing site for acceptability

Frame 5 outlines the assessment criteria utilised in Frames 1 to 3 and the type of remedial measures to be followed.

Part 2, the remedial measures consists of 9 Frames:

Frame 6 illustrates examples of basic infrastructure on how to improve access to a landing site through improved sea access.

Frame 7 highlights typical road sections to improve connectivity of the existing landing site and the importance of good road access to increasing productivity.

Frame 8 describes the basic requirements for the provision of sanitary water in a landing site.

Frame 9 analyses the typical power requirements in a small landing and suggests ways to ensure sustainability.

Frame 10 lists the potential options available for the provision of ice at the landing site.

Frame 11 outlines the major items of building infrastructure required for the operational management of a landing site.

Frame 12 describes the best methods of handling and treating liquid wastes typically generated at a landing site.

Frame 13 tackles the problems arising from unwanted pests that may invade the landing site and suggests Best Practise Options for dealing with each one.

Frame 14 outlines the basic equipment required for the shore handling of the landed fish, from working surfaces to fish boxes.

HOW TO USE THIS MANUAL

This manual is divided into 2 Parts: Part 1 is an evaluation tool to assess the suitability of an existing landing site to handle fish in a health-hazard free way and Part 2 covers typical remediation measures for the problems encountered in Part 1.

Part 1 is designed as a log-book and each and every landing site in the country under study should be equipped with a copy of the manual with Part 1 duly compiled by an authorised/competent fisheries expert. Part 1 consists of 5 Frames, the first one, carrying the name of the landing site, is dedicated to the environment in which the landing is situated, the second one identifies the major potential sources of pollution and the third one assess the standard of services and utilities available. Each Frame has a system of scores which are to be filled-in and carried forward to Frame 4 for a final summary, Table 4-1, and evaluation of the site, Table 4-2.

A site that scores less than 50 points in Table 4-2 should not be allowed to handle fish meant for the export market for fear of contaminating other fish or fishery products that may come into contact with its fish in the packaging or processing operations.

A site that scores 90 and above in Table 4-2 should be classed as a safe landing and acceptable for handling fish meant for export. However, even if a site is judged as “acceptable”, it does not infer full compliance with all the sanitary standards.

A site that scores above 50 but below 90 should be monitored closely to determine the material deficiencies responsible for the low score. Sites with major deficiencies should be earmarked for early rehabilitation.

The grading of the landing site should then be entered in Table 4-3 by the competent inspector as witnessed by a member of the fisheries department responsible for landing sites.

Frame 5 describes the assessment criteria used in the various steps to arrive at the final score.

Part 2 lists all the types of measures available to remedy the shortcomings identified in Part 1. Once rehabilitation or upgrading is complete, the site should be re-assessed and the new grading annotated in Table 4-1 and Table 4-3.

PART 1

EVALUATION OF AN EXISTING SITE

Part 1 consists of 5 Frames
Follow Steps 1 to 6 and then proceed to Step 7

FRAME 1	Description of the surrounding environment of the landing site
FRAME 2	Identification of potential sources of pollution
FRAME 3	Assessment of the standard of services and utilities
FRAME 4	Summary of scores for the landing site
FRAME 5	Assessment criteria and remedial measures

FRAME 1

DESCRIPTION OF THE SURROUNDING ENVIRONMENT OF LANDING SITE

ISOLATED COASTLINE

No habitations Score 25

INHABITED COASTLINE

Village lightly populated Score 20

URBAN

Moderately populated or urban Score 15

INDUSTRIAL

Industrial Score 10

OVER-POPULATED

Over-populated Score 5

STEP 1
NAME OF LANDING SITE

____

Enter score 5 to 25
5 for over-populated and
25 for isolated pristine coastline

TOTAL SCORE FOR FRAME 1

Which scene best describes the existing landing named in Step 1 ?

ISOLATED COASTLINE	INHABITED COASTLINE	SEMI-URBAN	INDUSTRIAL	OVER-POPULATED	

FRAME 2

IDENTIFICATION OF POTENTIAL SOURCES OF POLLUTION

AIRBORNE PARTICULATES

Is the landing site near a:

- Petrochemical plant
- Cement plant
- Power station
- Mineral stockpile
- Saw mill
- Quarry
- Mine

Enter score 2 to 10
2 for immediate vicinity (less than 1 km) and,
10 for very distant (at least 5 Km away)

If score is less than 4 consider moving landing elsewhere

CHEMICAL POINT SOURCES

Is the landing site near a:

- Petrochemical plant
- Ship breaker's yard
- Heavy workshops
- Leather tannery
- Dyeing factory
- City sewage outfall
- Rubbish dump
- Cemetery
- Ore mine

Enter score 2 to 10
2 for immediate vicinity (less than 1 km) and,
10 for very distant (at least 5 Km away)

If score is less than 4 consider moving landing elsewhere

SEWAGE

If the site is inhabited, where does the sewage go?

- Don't know
- Dumped on beach
- Pit latrine
- Septic tank
- Piped away

Enter score 2 to 10.
2 for Don't know and
10 for piped away

ICE

If ice is in use, where does it come from ?

- Don't know
- Households No control
- Households Controlled
- Local plant
- City plant

Enter score 2 to 10
2 for Don't know and
10 for city ice plant

ANIMALS

Are animals present at the landing site ?

- Vermin - Rats
- Pests - Flies
- Nesting birds
- Domestic animals
- None of the above

Enter score 2 to 10.
2 for vermin and
10 for none

STEP 2

TOTAL SCORE FOR FRAME 2

AIRBORNE PARTICULATES	CHEMICAL POINT SOURCES	SEWAGE	ICE	ANIMALS	

FRAME 3

ASSESSMENT OF THE STANDARD OF SERVICES AND UTILITIES

ELECTRICITY

Does the site have electricity ?

- Mains + standby Gensets [5]
- Mains only
- Gensets only
- Solar Power
- No Electricity [1]

Enter score 1 to 5
1 for No Electricity and 5 for Mains and Standby equipment

WATER SUPPLY

Does the site have water ?

- Piped supply [5]
- Rain water
- Deep well
- Shallow well
- No water [1]

Enter score 1 to 5
1 for No Water and
5 for Piped supply

ROAD ACCESS

How is the landing site accessed

- Paved road [5]
- Unpaved accessible by car all year round
- Unpaved, accessible by car dry season
- Accessible by 4x4 vehicle only
- Track, no cars [1]

Enter score 1 to 5
1 for Track and
5 for Paved Road

SEA ACCESS

Is the site connected by transport vessel ?

- More than once daily [5]
- Once daily
- Once weekly
- Other
- No connection [1]

Enter score 1 to 5
1 for no connection 5 for more than once daily

BUILDING INFRASTRUCTURE

Is building infrastructure present ?

- Complete – [5]
- As above but minus chilled storage
- Hangar, stores and slipway only
- Hangar only
- None of the above [1]

Enter score 1 to 5
1 for none and
5 for complete

STEP 3 TOTAL SCORE FOR FRAME 3

ELECTRICITY	WATER SUPPLY	ROAD ACCESS	SEA ACCESS	BUILDING INFRA	

FRAME 4

	DATE	DATE	DATE	DATE	DATE	DATE
FRAME NUMBER						
FRAME 1 - ENVIRONMENT						
FRAME 2 – CONTAMINATION POTENTIAL						
FRAME 3 – SERVICES & UTILITIES						
TOTAL						

STEP 4 Table 4-1 Summary of scores (enter the individual scores in this Table)

CONDEMNED[1]	MAJOR DEFICENCIES[2]	MINOR DEFFICENCIES	ACCEPTABLE[3]
Score less than 50	50 < Score < 70	70 < Score < 90	Score greater than 90

1 No fish destined for export or processing should be sourced from this site
2 Borderline case where investments should be directed first
3 If site is judged as “acceptable”, it does not infer full compliance with all the sanitary standards

STEP 5 Table 4-2 Grading of landing site (grade the site according to above criteria)

DATE	ASSESSED BY	WITNESSED BY	GRADING

STEP 6 Table 4-3 Annotation (note down the date and grade)

FRAME 5

ASSESSMENT CRITERIA AND REMEDIAL MEASURES

The checklists in Frames 1 to 3 cover the major concerns associated with health and hygiene in landing sites and are drawn from the author's extensive experience in a wide range of West African countries and scenarios. These checklists are to be used as a screening tool to determine the suitability of a site to handle fish meant for human consumption along internationally accepted guidelines. The range and type of each checklist are such that subjective judgements are not required and the final aggregation process is designed to expose the judgement to decision-making scrutiny, both by Government and Donor Agencies.

FRAME 1 - The description of the surrounding environment required in Frame 1 is meant to highlight the state of stress on the environment where the site is located. An over-populated (highly stressed) environment typical of many unplanned coastal communities poses a greater health hazard than a lightly populated village even if utilities are present in the former. Sites located in a planned urban environment should score high if they are connected to a town's utilities.

FRAME 2 -The potential sources of pollution listed in Frame 2 cover the five main routes through which contaminants may come into contact with fish, either directly through airborne particulates and domestic animals or indirectly through contaminated sea water (rinsing with harbour water), sewage leaks (in well water) and contaminated ice (made with water of dubious origin). The sixth, water, is handled under utilities in Frame 8 as more often than not, fresh water is not available in the first place. Airborne particulates and chemical point sources are easily identified. Due consideration should be given to sites that are downwind or downdrift from such sources. Sites that are less than 2 km away from these point sources should not be handling fish. Pollution by fuel is considered to be a management/housekeeping issue and is dealt with in Frame 9.
Sewage, ice and animals are categorised in descending order of hazard and hence ease of remediation.

FRAME 3 - The services and utilities listed in Frame 3 are required to ensure that the landed fish is handled properly and fish spoilage kept to a minimum. In this context, road and/or sea access to a marketing or processing chain are given due importance. The services are categorised in descending order of availability and hence increased cost of remediation.

FRAMES 6 to 14 – These frames provide tested, ready-made solutions to most of the problems encountered in artisanal landing sites.

ASSESSMENT CRITERIA AND REMEDIAL MEASURES

STEP 7

FOR PROBLEMS WITH	GO TO FRAME
Sea access	6
Road access	7
Water supply	8
Electricity supply	9
Ice supply	10
Building infrastructure deficiencies	11
Sewage and waste water treatment	12
Animals and pests	13
Fisheries handling equipment	14

Table 5-1 Remedial measures

PART 2

REMEDIATION MEASURES

Part 2 consists of 9 Frames
Proceed to the required Frame from to Step 7

FRAME 6	Sea access
FRAME 7	Road access
FRAME 8	Water supply
FRAME 9	Electricity supply
FRAME 10	Ice supply
FRAME 11	Building infrastructure
FRAME 12	Sewage treatment
FRAME 13	Animals inside the landing site
FRAME 14	Fisheries Equipment

FRAME 6 – SEA ACCESS

INTRODUCTION

Sea transport, together with road access, forms one of the major links between isolated fishing villages and major towns. It is not uncommon for clusters of small landing sites to be connected via sea transport to a landing site that is itself connected by road to a major centre. Much of West Africa's coastline is intersected by large river systems and this lends itself well to organised sea transport.

OBJECTIVES

Frame 6 should be assessed in conjunction with Frame 7 (road access) when evaluating a landing site's potential link to the outside world. There is no clear cut solution to the access problem but generally speaking, investments in landing jetties for seaborne transport are more modest and affordable.

SEA ACCESS

Artisanal landing sites may be broadly divided into two groups:

1. Sites that have access to a sheltered area or lagoon inside a river mouth
2. Sites that face the ocean and are subject to wave action

Both groups may also be subject to large tidal variations. The easiest infrastructure to install is a solid jetty but this type of jetty must only be installed on rocky formations. Sandy beaches lend themselves to piled structures. Piled jetties do not interfere with the littoral movement of the sand.

TYPE OF EXPOSURE	TYPE OF FOUNDATION	RECOMMENDED STRUCTURE
Sheltered site, lagoon or estuary	Soft sea bed, sand, clay or mud	Floating pontoon
Sheltered site, lagoon or estuary	Solid rocky sea bed	Solid quay
Exposed site	Sandy beach	Piled quay
Exposed site	Rocky coastline	Solid quay

Table 6-1 Recommended landing structures for sea transport

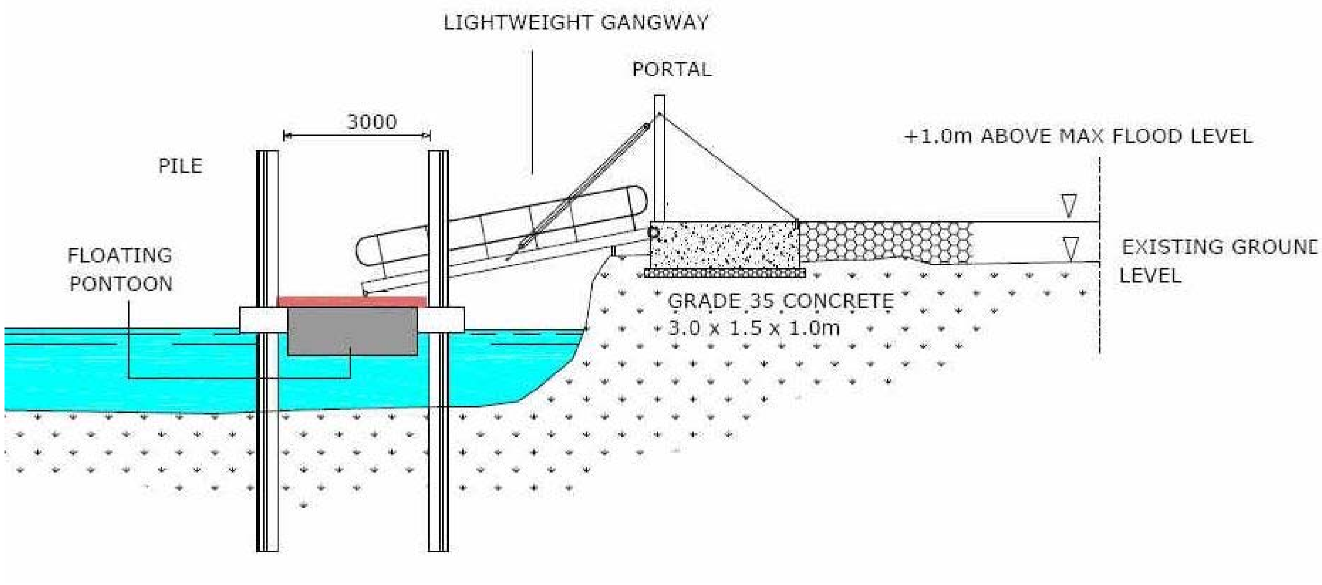


Figure 6-1 Floating pontoon in cross section

The floating pontoon is best made from good quality lightweight concrete. The ideal dimensions of a pontoon are 3.0 m x 10.0 m long and two or more Pontoons may be joined together. Pontoons are best anchored by vertical piles driven into the soft seabed and running through pile guides, see Figure 6-7.

Two or more pontoons may be joined together if a longer berthing face is required. The cross section and freeboard should be such that the pontoon does not overturn when loaded over one half its width.

Figure 6-2 illustrates a concrete pontoon used as a ferry terminal in a protected bay.

Figure 6-2 Floating pontoon ferry landing

SHELTERED OR EXPOSED SITE ON ROCK

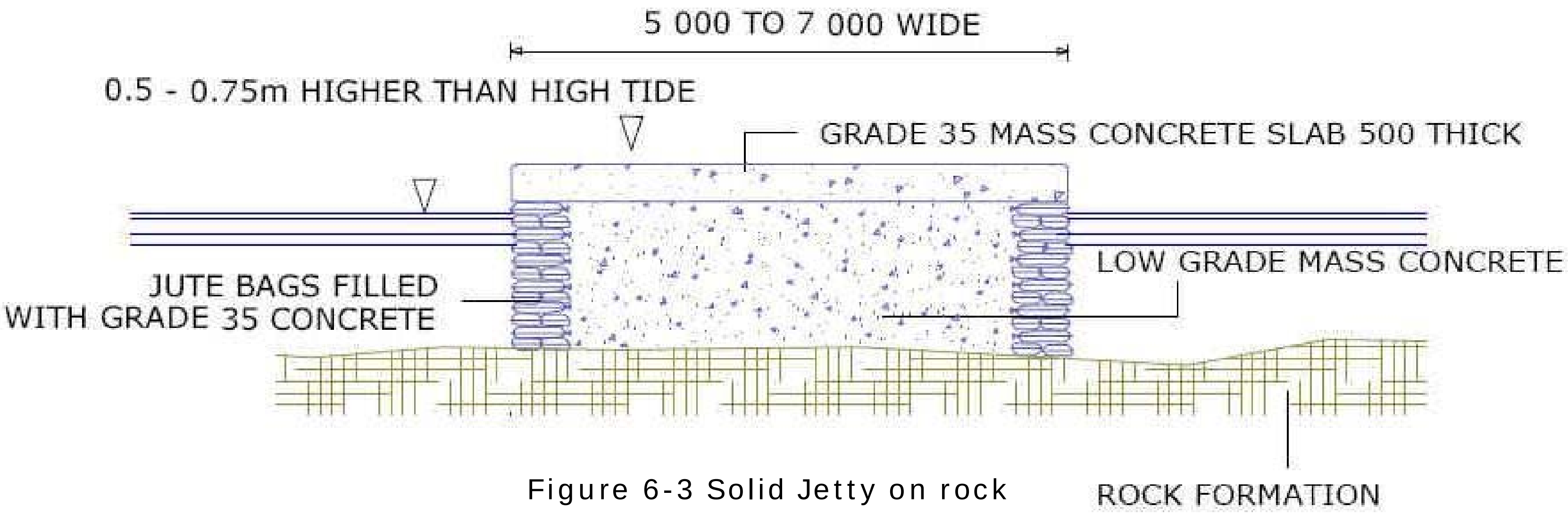


Figure 6-3 Solid Jetty on rock

Solid jetties should only be attempted on a rocky coastline or rocky outcrop (reef) to prevent erosion downdrift or updrift of the jetty. The jetty sides may be constructed from concrete-filled jute bags and then backfilled with low grade mass concrete. A high grade mass concrete slab, in Grade 35 concrete, should be cast over the structure for added durability. Formwork may also be placed in the water and concrete pumped directly into it, Figure 6-4 below.

Figure 6-4 (opposite)

The figure opposite illustrates a small solid jetty built over rock for use by small fishing boats. The ideal draft is 1.0 to 1.5 m below lowest tide level. Expert advice should be sought for deeper drafts.

Typical mooring fittings consist of 150mm diameter mooring rings and a small ladder. The quay should be kept free of obstructions at all times. Solar-powered night-time illumination may be required.

SEMI-EXPOSED TO EXPOSED SITE ON SAND OR SOFT FORMATIONS

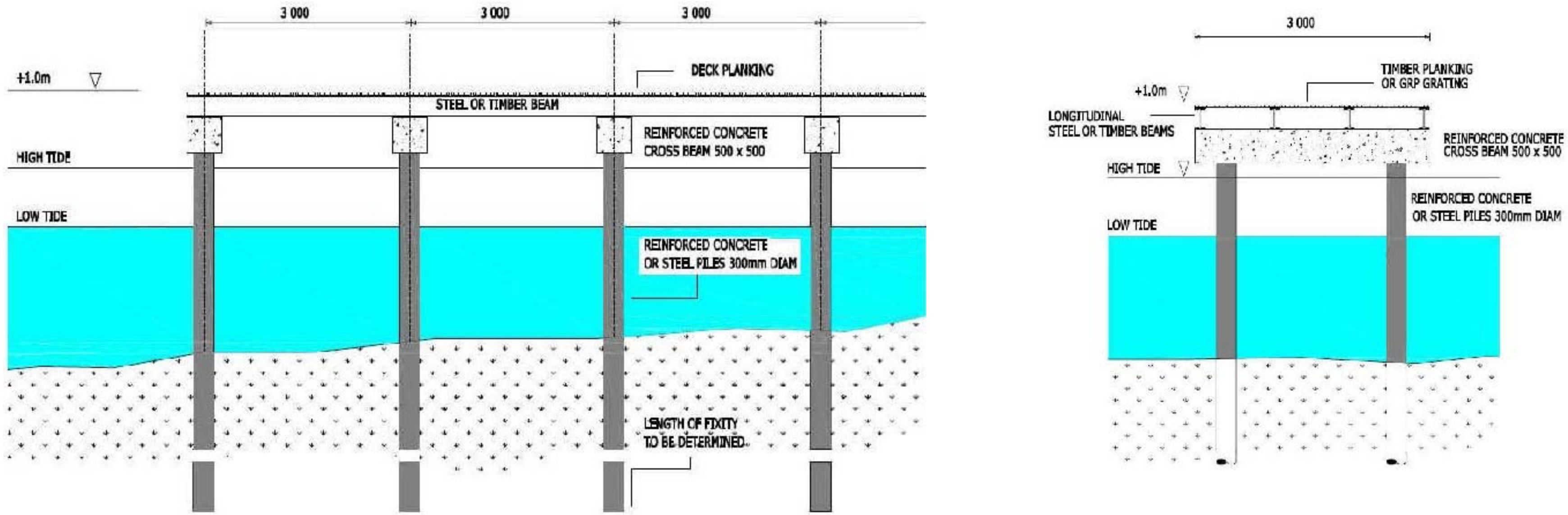


Figure 6-5 Piled jetty in elevation (left) and cross section (right)

TYPE OF EXPOSURE	LONGITUDINAL BEAM	RECOMMENDED DECK PLANKING
Sheltered site, no wave action	Precast concrete beams or timber beams	Precast concrete planks or hardwood timber
Semi-sheltered site, spray reaches deck	Precast concrete beams	Precast concrete planks
Exposed site, green water reaches deck	Steel beams	GRP grating
Exposed site, waves impact deck	Steel beams	GRP grating

Table 6-2 Recommended deck structures

Piled jetties consist of a steel, concrete or timber deck supported on steel, concrete or timber piles. Nowadays, however, the use of timber piles should be discouraged on environmental grounds due to the fact that only tropical rainforest hardwoods are suitable for a marine environment. The timber deck, on the other hand, may be in any one of the commercially planted hardwood species or better still, in Glass Reinforced Polyester or GRP.

The piles should be at least 300mm in diameter and may consist of open-ended steel pipe piles or reinforced concrete piles. The latter should be designed for a minimum concrete cover over the steel of 50mm to avoid problems with corrosion. Steel pipe piles need to be coated with special paints prior to fixing. The ideal spans for a small jetty structure should not exceed 3.0 m. The cross beam should be in reinforced concrete as illustrated in Figure 6-5, and designed to brace the head of the pile section.

Figure 6-6 Typical piled jetties with low tide access (left)

The ideal level for the deck is approximately 1.0 m above the highest tide level and access stairs like the ones depicted in Figure 6-6 may be necessary in areas where the tidal variation is larger than 0.50 m.
Depending on the level of wave action at the head of the jetty, the longitudinal beam supporting the deck planks and the planks themselves require special attention. Table 6-2 illustrates the recommended types for the various levels of exposure; spray, green water or wave impact. The longitudinal beam should be anchored to the cross beam and the deck planks or grating bolted to the longitudinal beams. The GRP grating is the ideal overall decking medium and this should be bolted to the longitudinal beams with special stainless steel bolts to avoid corrosion, see Figure 6-8. The grating is required in the presence of strong wave action to reduce the wave loads on the structure by allowing the wave to pass vertically through the deck.

Steel longitudinal beams should be galvanised and once galvanised, no welding should be done on the beams in the field as this destroys the zinc coating. All fixtures should be bolted through pre-drilled holes.

A jetty extending out into the sea should be illuminated at night to avoid collisions. Solar-powered lights on galvanised poles bolted to the jetty should be installed every 5.0 m.

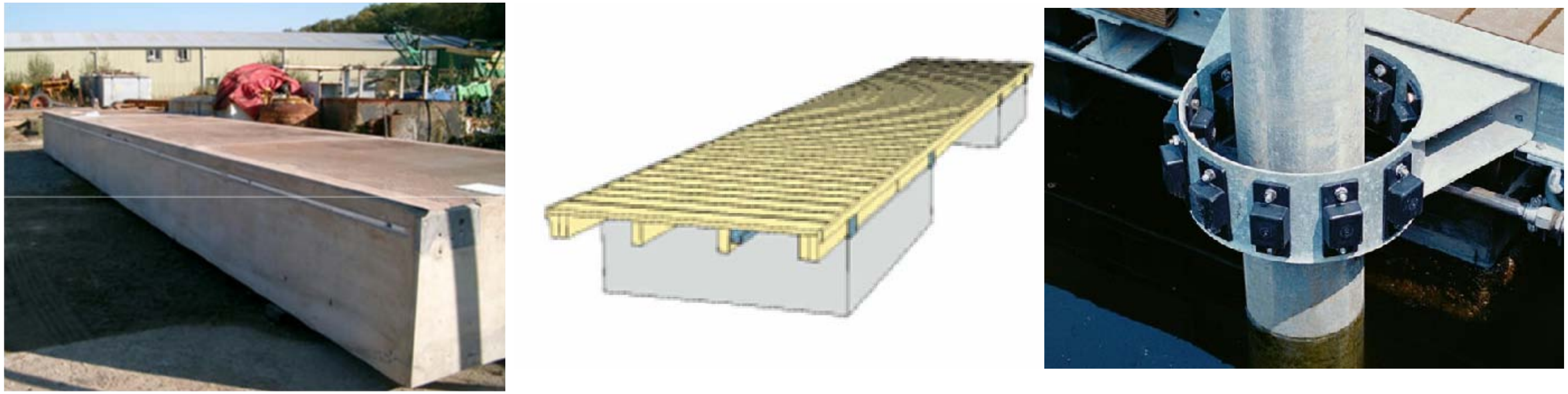


Figure 6-7 All concrete pontoon (left), Timber decked pontoon (centre) and typical pile guide for a pontoon (right)

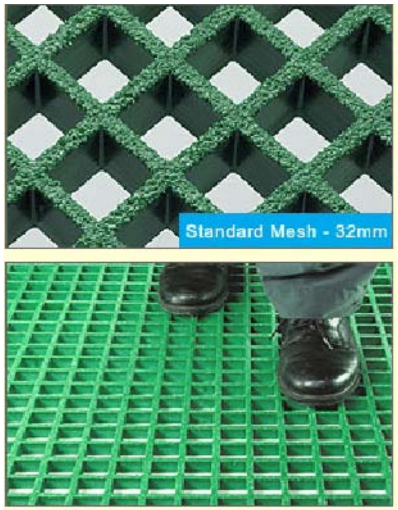


Figure 6-8 GRP non-skid grating suitable for piled jetties (left) and the stainless steel fixings for bolting the grating to the longitudinal beams (top)

FRAME 7 – ROAD ACCESS

INTRODUCTION

Rural roads are not an end to themselves but rather a component of a rural transport system and one of two methods, the other being sea transport, of making markets more accessible. If developing countries are to participate in the world market for high quality products, the landed fish has to reach the processing or export chain in the least possible time to avoid spoilage and private sector transport will not venture into areas that are not connected by a road that is passable with great difficulty in the dry season or not at all during the wet season.

OBJECTIVES

Frame 7 is not intended as a design aid but rather as a decision tool when a government has to weigh poverty reduction (through improved productivity and raised incomes) against economic benefit of the singular investments.

TYPES OF ROAD

Figure 7-1 Laterite or unpaved roads

The most common type of road to many artisanal fish landing sites is the simple laterite road, Figure 7-2, consisting of a compacted base excavated from a nearby quarry or mine 300 to 600 mm in thickness depending on the geotechnical characteristics existing sub-base.

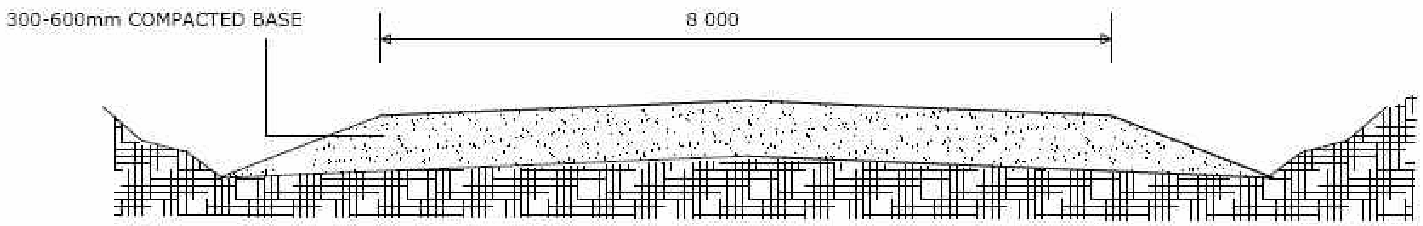


Figure 7-2 Laterite road

Simple laterite roads are mainly fair weather roads that cannot withstand high rainfalls and require yearly maintenance to prevent rutting if too many heavy vehicles use the road. Figure 7-1 (left) illustrates a simple laterite road after a couple of seasons of heavy rainfall without the periodic maintenance. Lacking drainage structures, a simple laterite road tends to wash away in large tracts during periods of heavy rainfall making it impassable to normal vehicles, minibuses and insulated trucks, even after the following dry season and not until the surface is re-instated. Villages and fish landing centres at the end of such roads are lucky if they manage to attract 1 truck per week and the average speed attainable is 5-10 km/hour.

An all-weather laterite road, Figure 7-1 (right) is to all intents and purposes a complete road with rainwater culverts, drainage channels and bridges but minus the bitumen paving. The useful life of this type of road is approximately 3 years but it still needs yearly maintenance to maintain the cross slopes. Average speed is 50-60 km/hour.

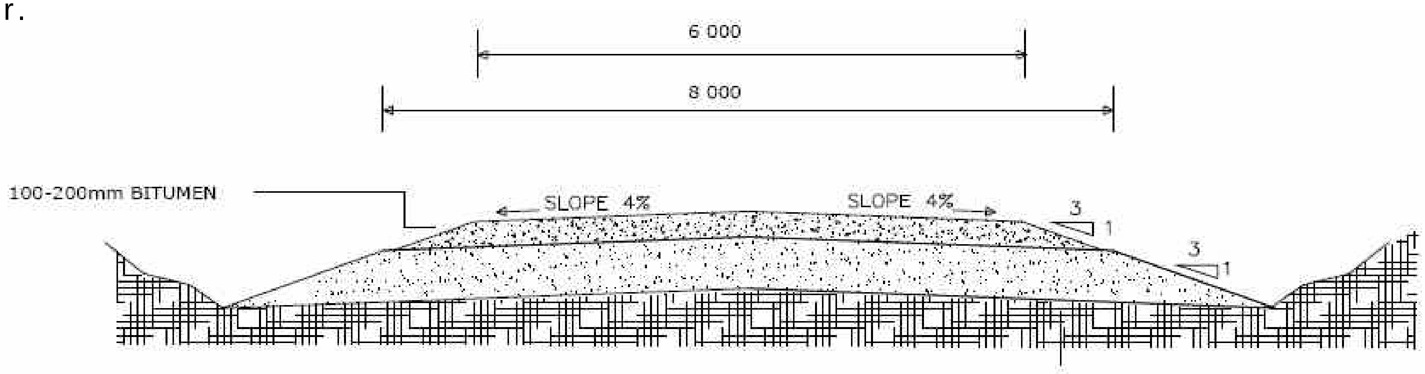


Figure 7-3 Paved road

Frame 7 Page 2 of 3

A fully paved road, Figure 7-3, is the best solution if a road upgrade is on the national programme, even if 1 to 3 km spurs from the paved toad to the landing area may still be in laterite. The West African states of Senegal, Mauritania and to a lesser extent Sierra Leone and Liberia have upgraded or are in the process of upgrading roads to paved cross section but much still needs to be done in the latter two to connect productive sites that are currently isolated from the market chain.

Two planning tools have been devised fairly recently to assist planners, Donors and Agencies:

- Integrated Rural Accessibility Planning
- Basic Access Provision

The objective of these two planning tools is to formally integrate the factors influencing accessibility within a comprehensive framework to allow tradeoffs amongst them and at the same time ensure that choices are made locally. Roads are normally planned by the Ministry of Transport and implementing an accessibility approach requires close departmental cooperation between the various ministries, to the point of subordinating budgetary sums and allocations to an arbitration centred on accessibility.

FRAME 8 – WATER SUPPLY

INTRODUCTION

Water is used for fish washing, ice making, sanitation and processing after capture. The adage stating that "No water = No port" is often taken too lightly by the competent authorities during the planning and construction stages of many landing sites. It is not uncommon to come across sites with no water supply, no hygiene facilities and where unsafe lake, river or harbour water is used for rinsing fish.

OBJECTIVES

This Frame reviews the basic infrastructure required to equip a fisheries landing site with a basic, but safe water supply for the rinsing of fish and general housekeeping. If fresh water is not available, treated sea water or brackish water may still be utilised for most operations except sewage treatment. Ice should be sourced separately.

BACKGROUND STUDIES REQUIRED

If a site does not have sanitary water available but is within a relatively short distance of a city mains supply (say 2 to 3 km), then every effort must be made to link it to this supply via a pipeline. A site's local water supply (fresh, brackish or saline) may also be sourced from a shallow well (up to 10 m deep) or a deep well (up to 100 m deep) on dry land or close to a beach, lake shore or river bank. If the site is already equipped with pit latrines or soakaways, then the ground may be contaminated with faecal matter and the well may have to be installed further away from the village. The ground may be of a sandy nature and porous or clayey or rocky and impervious. The following background studies are required to determine the best option:

- An approximate idea of the amount of water that is required on a daily basis (preferably the peak demand);
- Detailed topographic map of the site/village;
- Geotechnical boreholes with detailed description of the strata and permeability coefficients;
- Laboratory analysis of water samples taken from the water table at various levels inside the boreholes, over dry land or over the sea and/or river foreshore. Water may not be drawn from a free flowing river or the sea surface.

If the laboratory analysis indicate that the water is free from pathogens (bacteria harmful to man), nutrients (nitrates and nitrites), priority pollutants (carcinogenic compounds), heavy metals and pesticides, then the borehole from which the sample was retrieved may be used to supply water, whether the water is fresh, brackish or saline. The World Health Organization (WHO) publishes a full list of the allowable limits of the above chemicals in drinking water. National guidelines may differ from country to country.

TYPICAL SECTIONS FOR WELLS

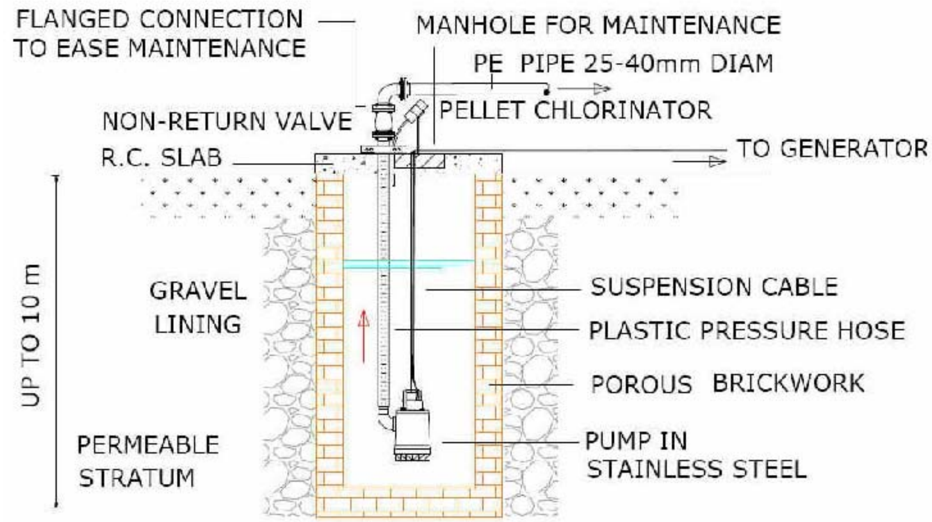


Figure 8-1 Typical shallow water well

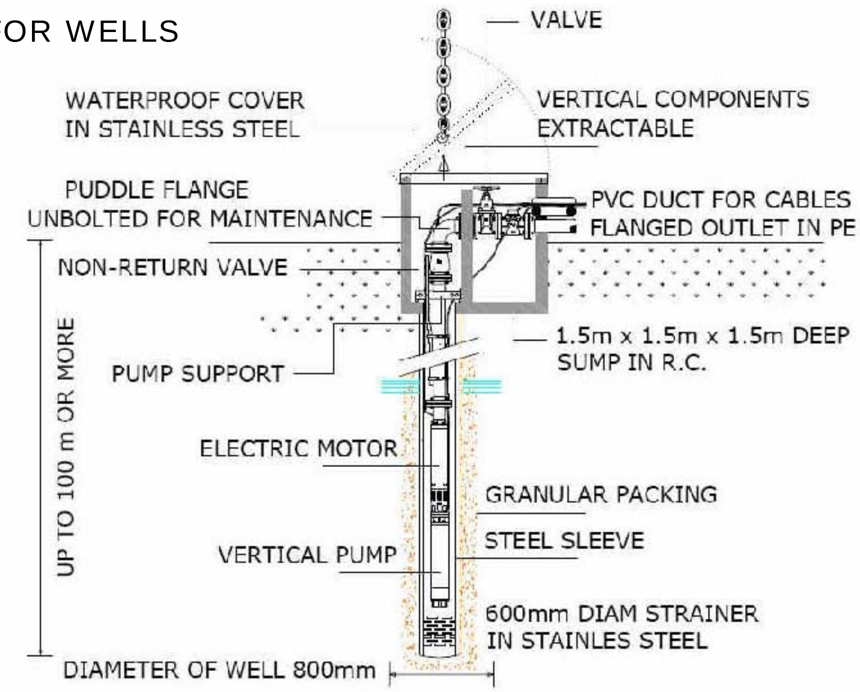


Figure 8-2 Typical deep well

The permeability coefficient will decide on the rate of extraction and hence the size of the pump required. Figures 8-1 and 8-2 above illustrate typical cross sections of the wells and Figures 8-5 and 8-6 illustrate typical pumps available on the market. Irrespective of whether the water is fresh or completely saline, it must be disinfected with chlorine before being used in the fish handling process. The minimum requirement is for 5 parts per million of residual chlorine in the water. This may be achieved by one of two methods:

- Dry hypochlorite pellets dropped inside the well (suitable for a shallow well);
- Liquid hypochlorite injected into the outlet pipe (suitable for deep well installations).

Figure 8-7 illustrates a typical automatic dry pellet chlorinator that drops dry pellets in the water body of the well for maximum contact time. The rate at which the pellets are fed into the water is controlled by the flow from the pump.

CONCLUSION - <u>If the pipeline is not financially feasible and a well is geotechnically impossible, then the site should not handle fish for export and due consideration given to moving the landing site elsewhere.</u>

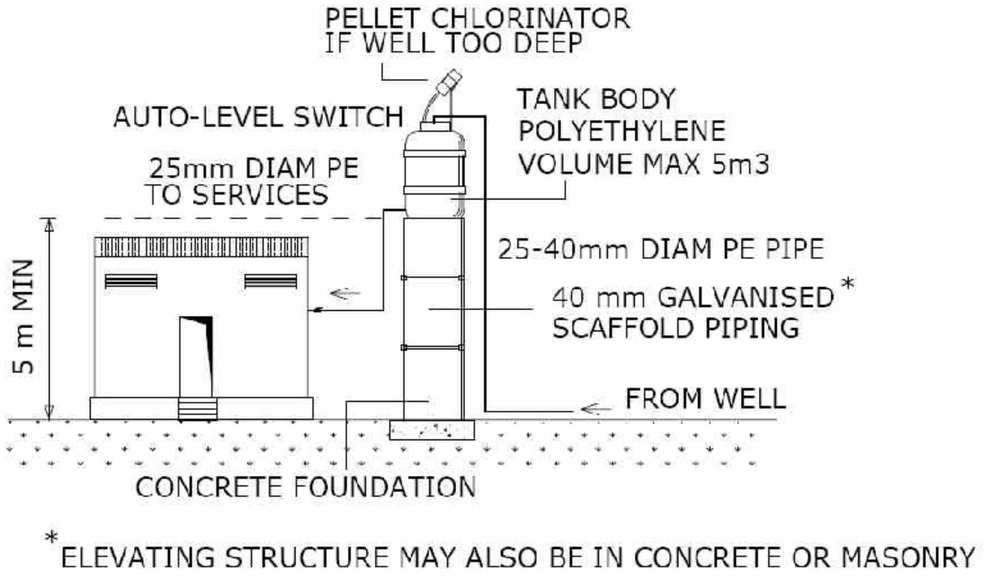


Figure 8-3 Small elevated water storage tank

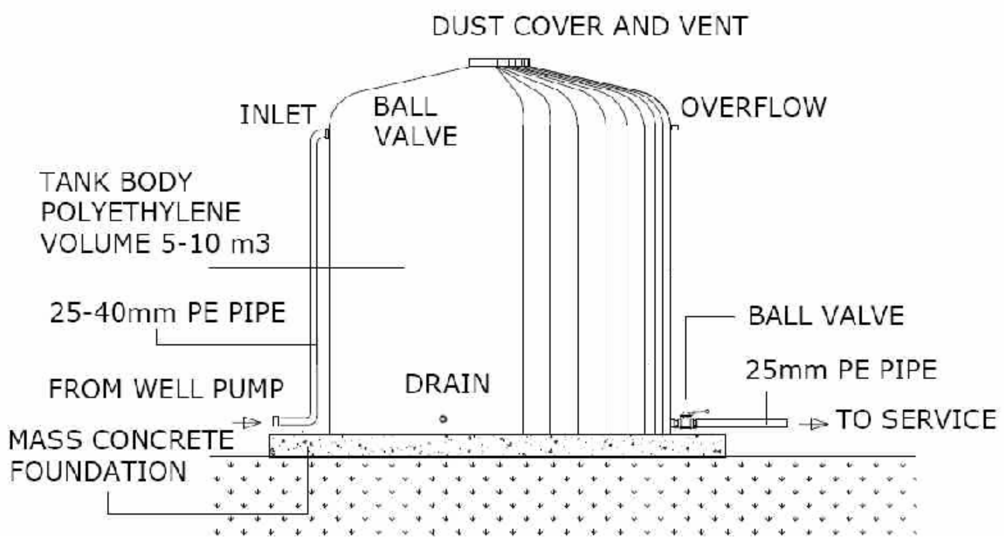


Figure 8-4 Ground level water storage

Figure 8-5 Shallow well pump

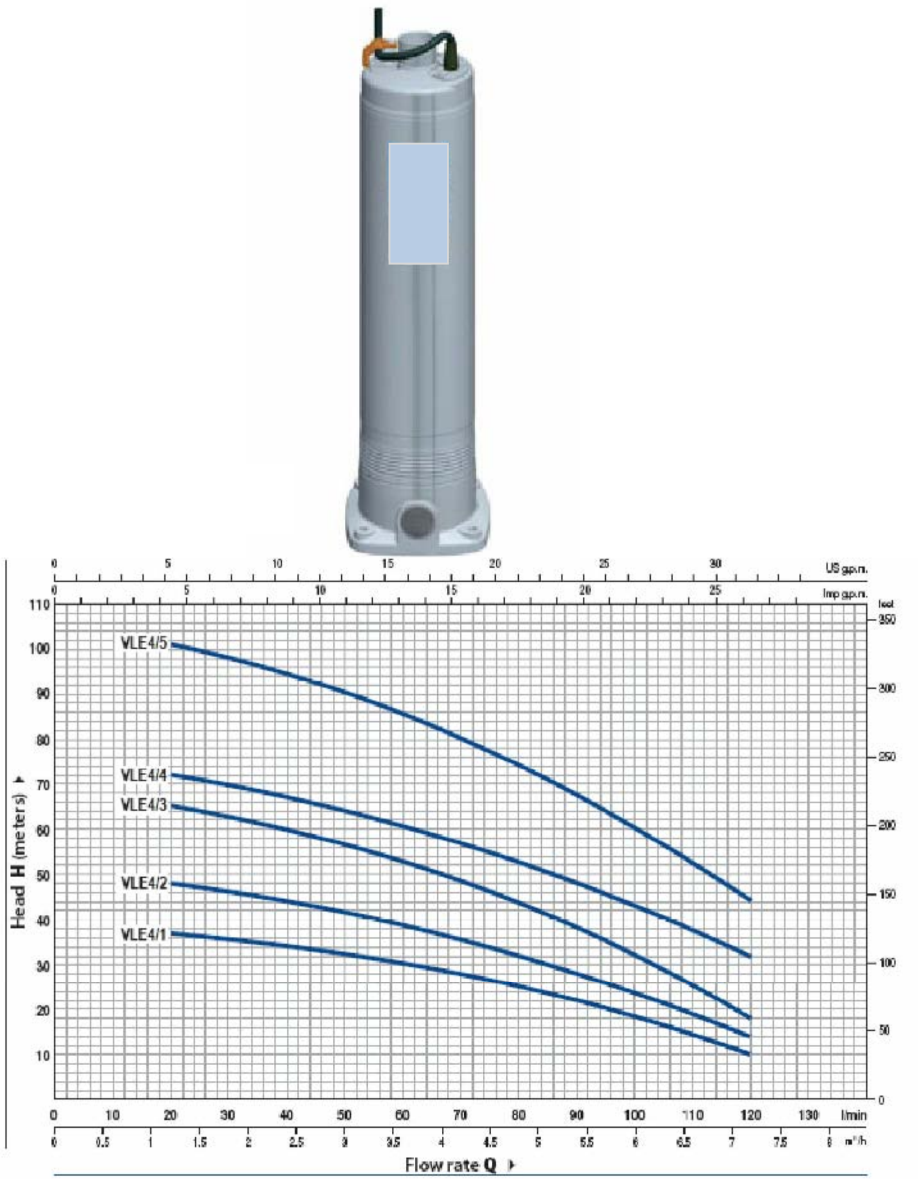
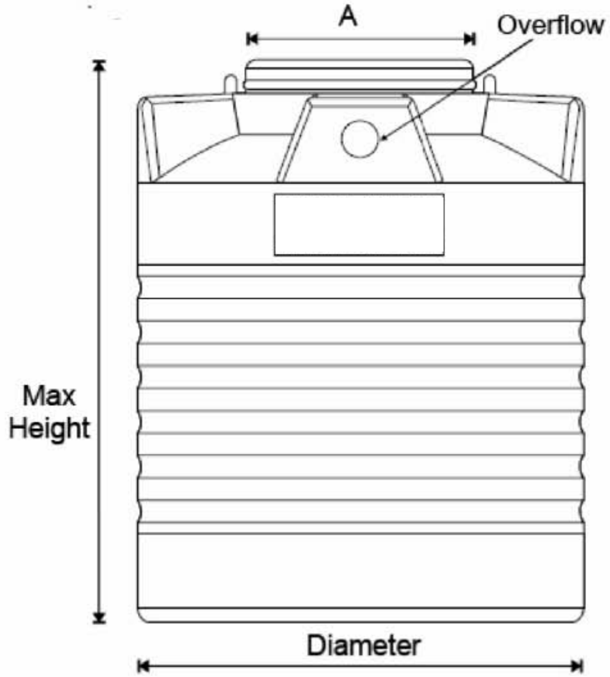


Figure 8-6 Multi-stage pump for deep well

Specifications

	Model LP-3015	LP-3115	Chlorine Pellets
Electrical Rating	115V 60/50 Hz	220V 60/50 Hz	EPA registered: 50610 1 Active ingredient: Calcium hypochlorite 70%
Power Requirement	26 watts	31 watts	
Fuse Protected	Yes	No	
Pellet Feed Rate (Max)	6 pellets/minute		Inert ingredients: Soluble material 30% Available chlorine: 70% Pellet weight: 0.035 oz. (1 gm) Pellet size: 3/8 inch diameter x 5/16 inch long (9.5 x 7.9 mm)
Pellet Storage (Max)	15 pounds (6.8 kg)		
Shipping Dimensions	12.5 x 15.3 x 30.5 inches (31.8 x 38.9 x 77.5 cm)		
Shipping Weight	31 pounds (14.1 kg)		

Figure 8-7 Dry pellet chlorinator



Approx. Tank Dimensions in Cms

	Tank Size	Litres	Gallons	Diameter	MAX Height	A
1	CCV 15	150	33	58	74	29.6
2	CCV 25	250	54	69	84	29.6
3	CCV 30	300	65	75	65	29.6
4	CCV 50	500	109	86	103	42.2
5	CCV 75	750	163	98	118	42.2
6	CCV 100	1000	217	107	127	42.2
7	CCV 101	1000	217	93	175	42.2
8	CCV 135	1350	293	121	138	42.2
9	CCV 150	1500	326	124	142	42.2
10	CCV 200	2000	435	135	158	42.2
11	CCV 230	2300	500	144	165	42.2
12	CCV 231	2300	500	170	125	42.2
13	CCV 250	2500	543	148	169	42.2
14	CCV 300	3000	652	156	185	42.2
15	CCV 320	3200	696	169	140	42.2
16	CCV 350	3500	761	165	187	42.2
17	CCV 400	4000	870	173	200	42.2
18	CCV 460	4600	1000	200	178	62.3
19	CCV 500	5000	1087	185	212	42.2
20	CCV 600	6000	1304	198	223	42.2
21	CCV 800	8000	1739	219	243	62.3
22	CCV 000	10000	2174	236	266	62.3
23	CCV 1600	16000	3478	290	280	62.3
24	CCV 2400	24000	5217	356	280	62.3

Figure 8-8 Polyethylene tanks of various sizes

FRAME 9 – ELECTRICITY SUPPLY

INTRODUCTION

In any fisheries landing, electric power is basically required to run three types of equipment; lights, light duty equipment (VHF communications, computers, small water pumps, etc) and heavy-duty chilling and ice equipment. Although a mains supply is the preferred solution, in areas that are not connected to the grid, various other options are available. However, artisanal landing sites that run continuously on generators for their entire power needs are not sustainable and almost always fail in their objective.

OBJECTIVES

This Frame reviews the past practises in power generation and provides a current state-of-the-art solution to basic requirements.

BACKGROUND DATA REQUIRED

If a site is close (say 1 to 2 km) to a sub-station or any part of the national grid, then every effort must be made to invest in a proper link to the grid. If the site is farther than say 2 km, then the site's power requirements need to be rationalised in such a way that they become sustainable. It is no longer considered sustainable to generate power continuously on a small scale to produce ice or run chillers. If power needs to be generated in-situ, then ice should be brought in from outside and chilling seconded to third party commercial interests, leaving lighting and light-duty equipment only. The power requirement for lights and small equipment rarely exceeds 3-5 kW or so for a typical small landing site and if solar-powered lighting is installed, the power requirement is even less.

INDEPENDENT POWER SUPPLIES

Lights should be run on solar power as totally independent units, Figure 9-3. They may also be connected to a solar-powered local grid on the site but cabling and ducting are expensive. All light fixtures should be of the energy-saving type.

Small equipment, such as VHF radios, laptop computers, small water pumps and the automatic pellet chlorinator are best connected to a solar-powered grid with a standby generator to re-charge the batteries during long periods of overcast skies. So-called hybrid grid packs, already incorporating a small generator, are also available ready-made. The power output is very stable and the maintenance costs are minimal.

The power requirement for a deep borewell is typically in the range of 8 to 10 kW and this should be custom-designed in tandem with the water storage capacity to avoid the need for continuous pumping. Solar-powered water pumps are also available on the market as a package.

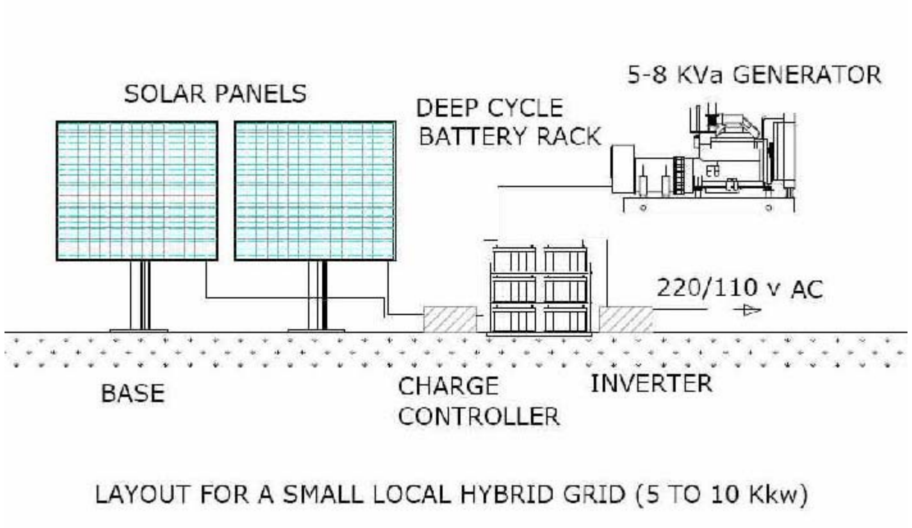


Figure 9-1 Schematic for a hybrid solution for a small local grid

PLAN

FRONT ELEVATION

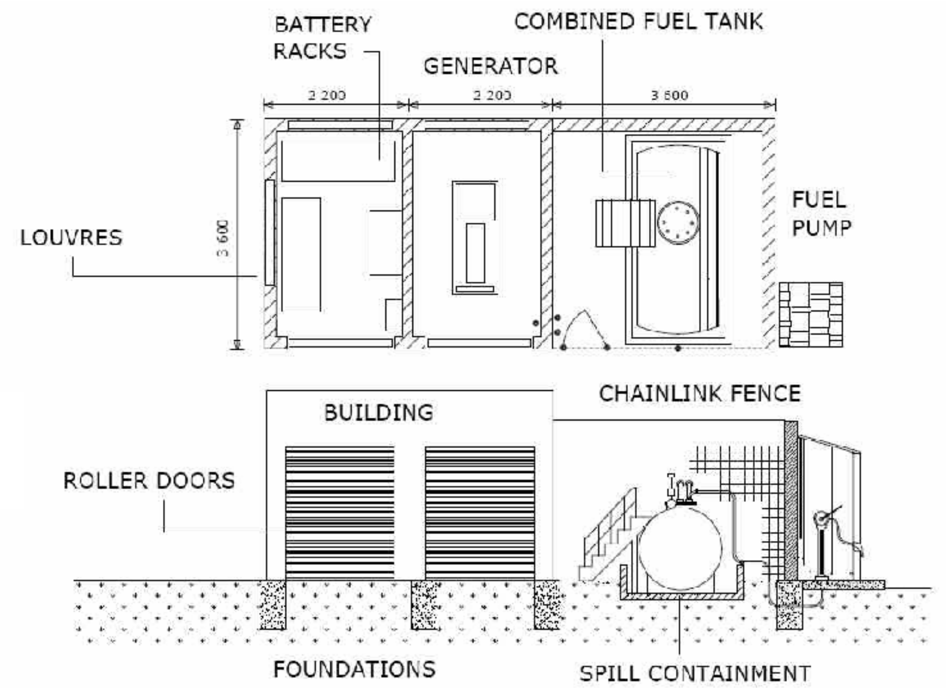


Figure 9-2
Potential layout for a small combined hybrid power source and re-fuelling facility.

If both diesel and petrol are required, the fuel tank may be divided internally to supply both

Figure 9-3 Public lighting

Figure 9-4 Solar powered water pumps

When considering the sustainability of a "generator-only" solution, as opposed to a more expensive hybrid, due consideration must be given to the cost and transport of the fuel, spares and maintenance involved in running a generator continuously. Experience demonstrates that even in the best of scenarios, such solutions almost always fail in the short term or until the first major overhaul, when the cost of major spares outweighs the original investment.

CONCLUSION – In small landing sites, generators should not be used for continuous power supplies.

FRAME 10 – ICE SUPPLY

INTRODUCTION

Spoilage of fish begins immediately after death. This is evident in the gradual development of undesirable odours, softening of the flesh and eventually substantial losses of fluid containing protein and fat. By lowering the temperature of the dead fish with ice as soon as possible, spoilage can be retarded long enough until the fish enters the processing chain. Ideally, ice should be produced in-situ, but this should only be attempted if the landing site is connected to an electricity grid. Previous attempts to run ice machines with generators have all failed miserably as the process has been shown to be unsustainable in terms of fuel and spares.

OBJECTIVES

Frame 10 lists the alternatives available to supply ice to a landing site in a sustainable manner.

ICE SUPPLY

If mains power is available, or potentially available (see Frame 9) then a small ice machine and insulated ice store may be installed as illustrated below.

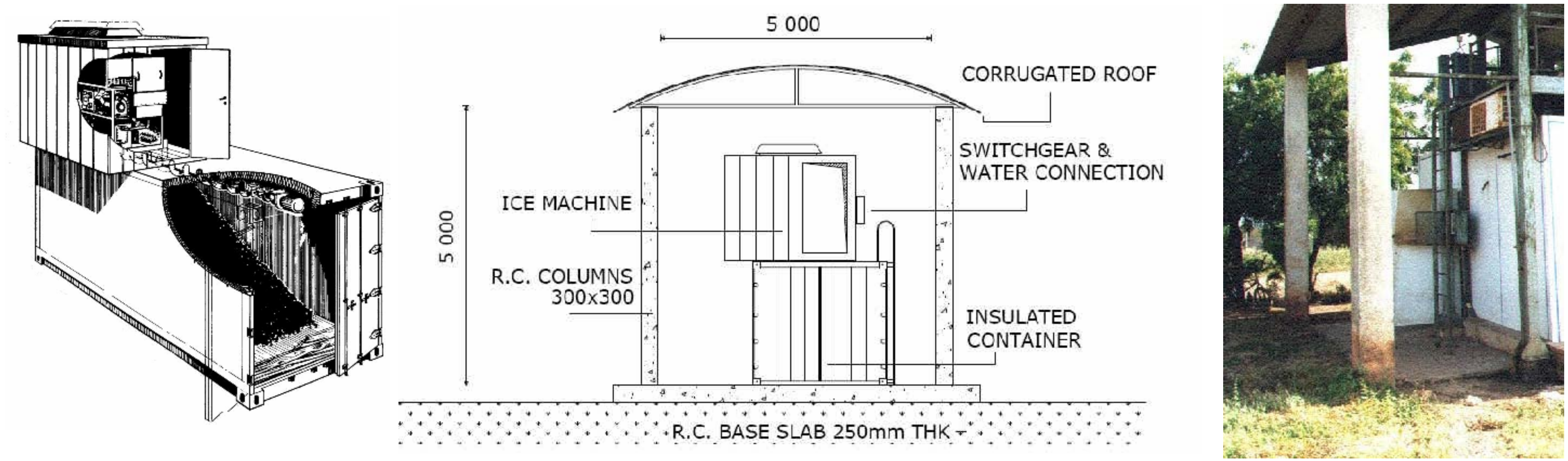


Figure 10-1 Installing a small ice machine when mains power is available

When installed in isolated places, ice machines still need experienced maintenance personnel to maintain them in good working order. Machines owned and run by the private sector are preferred to other forms of ownership and the best solution appears to be to make funds available through a PPP (public private partnership) initiative.

Figure 10-2 Private sector suppliers of ice in Senegal

Every effort should be devoted to improving the connection of the landing site, both via road or sea transport, to enable commercially produced ice to be delivered to the site on a regular basis and for the fish to move on to the processing chain as fast as possible. Frames 6 and 7 cover the operational infrastructure required for both. Nowadays, large supplies of crushed or flake ice may be brought to the site in commercial chest cooler boxes as illustrated in Figure 10-3 left and centre . If an insulated truck is not available, a normal pickup is sufficient. Figure 10-3, right, illustrates chest coolers as used in the Maldives for the yellow fin tuna industry. Ice boxes may also be manufactured locally to suit any form or shape and suitable for inserting into a canoe well, see Frame 14. The use of large chest coolers replaces the chill room at simple landing sites, as illustrated in Figure 11-2 in Frame 11.

CONCLUSION - When mains power is not available or feasible, then ice in any form should not be produced in-situ by the landing site with generator power unless the ice making operation is owned and run by the private sector on a commercial basis.

TYPICAL OFF-THE-SHELF PRODUCTS

Figure 10-3 Typical flake ice maker suitable for installation above an insulated containerised ice store, see Figures 10-1 and 10-2. Ice production for the semi-commercial models varies from 500 Kg to 10,00 Kg per 24 hours.

Figure 10-4 Ice may be delivered to site and stored in chest cooler boxes

Most chest coolers on the market are also compatible with dry ice, especially useful when high value species are destined for export as fresh. All such chests come with airtight lid seals to keep warm air out. Chest coolers also enable iced fish to be transported on a simple pick-up without the need for specialised insulated trucks.

FRAME 11 – BUILDING INFRASTRUCTURE

INTRODUCTION

A considerable number of sites handle fish on the floor and simultaneously use the surrounding bush or the beach itself as a toilet. It comes as no surprise, then, that the two major deficiencies in most landing sites refer to a lack of adequate building infrastructure to handle the landed fish in a hygienic manner and to house proper toilet facilities.

OBJECTIVES

This Frame recommends a basic building design incorporating both the handling area and the hygiene facilities. The design may be adapted to suit local conditions (volume of landings and number of people working at the site).

BUILDING INFRASTRUCTURE

Figure 11-2 illustrates a basic landing platform or hangar, in reinforced concrete, equipped with toilets, storage and a small office space for a site manager. A site manager is required to manage housekeeping and record landing statistics. The area around the landing platform should be uncluttered and kept free at all times in order that proper housekeeping may be maintained, i.e. no local fish or market stalls, no smoking ovens or fish drying, no boat repair or outboard repair workshops, gear stores and no fuel storage. All these services should be located away from the landing along the beach front. Controlled access to the area is also desirable but in villages where local hands turn up in great numbers to unload the catch from beached vessels, this may be problematic and proactive management techniques are required.

Figure 11-1 Toilets on the landing beach, uncontrolled access (middle) and fish sales at the landing area

TYPICAL BUILDING INFRASTRUCTURE – BASIC LANDING PLATFORM WITH COOLER BOXES

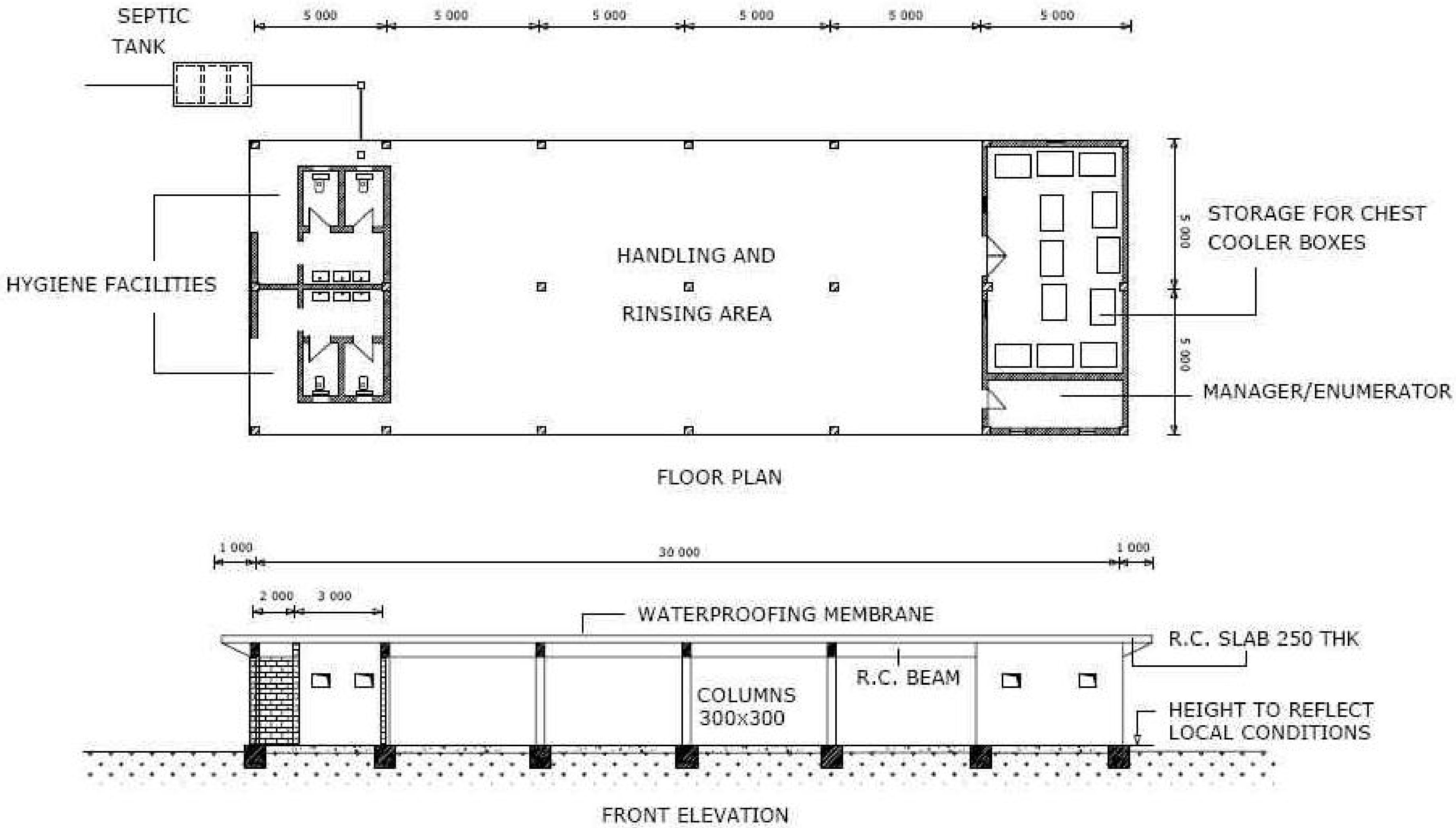


Figure 11-2 Basic Landing platform – Packed cooler boxes collected by pick-up when full

TYPICAL BUILDING INFRASTRUCTURE – ADVANCED LANDING PLATFORM WITH ICE MACHINE

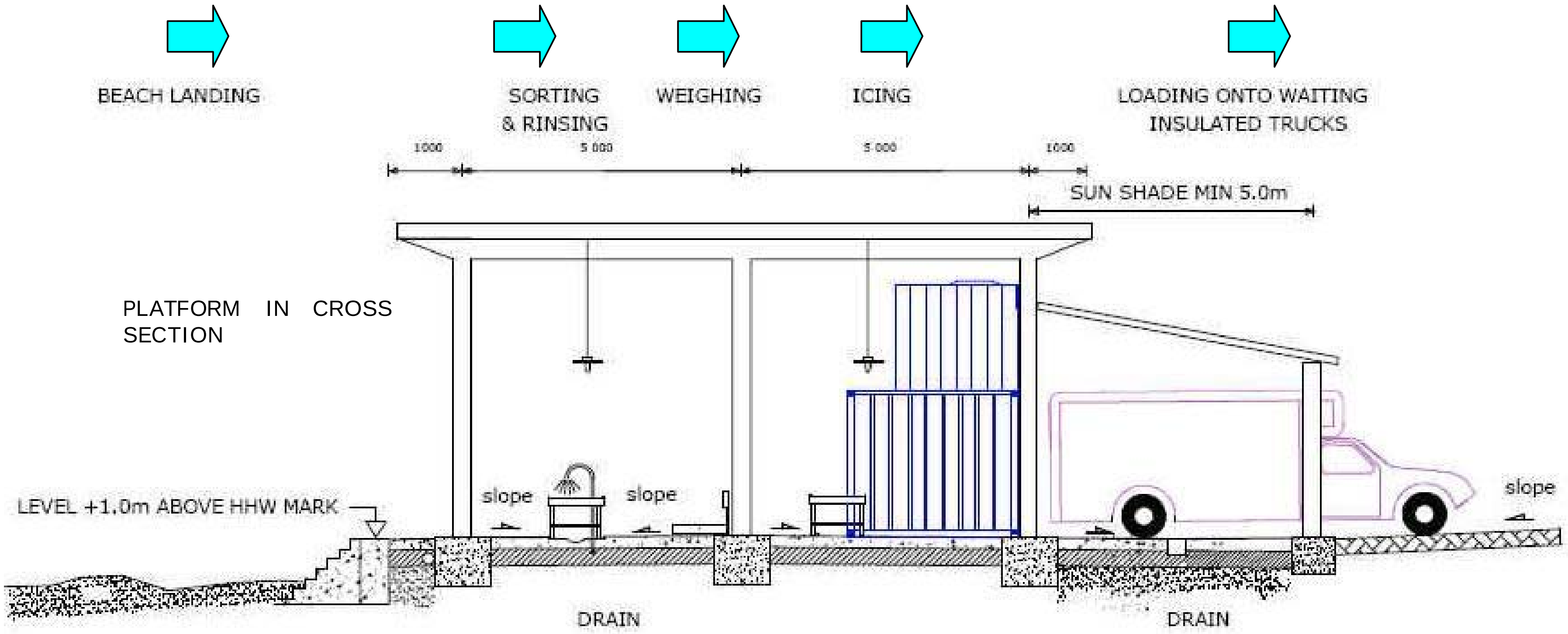


Figure 11-3 Advanced landing platform – Insulated trucks may need a whole day to fill up

Figure 11-2 illustrates a basic landing platform without an ice machine. A van or insulated truck delivers ice in cooler boxes and picks up cooler boxes packed with iced fish over a 2 to 3 day period. This type of facility is suitable for low volume, high value species, typically landed by 1-2 men canoes. No mains electricity is required. Figure 11-3 illustrates an advanced platform that incorporates an ice machine and handles enough fish on a daily basis to warrant more than one insulated truck. In this case, the insulated trucks may have to wait for a whole day to fill up and necessitates a sun shade to keep the waiting trucks out of direct sunlight.
At this type of landing site, the fish has to be rinsed, weighed, iced and then packed into fish boxes carried by the trucks themselves. None of this occurs in the example illustrated in Figure 11-1 (middle). If mains power is not available, the ice is best brought in the insulated trucks on a daily basis. Pre-positioned freezer trucks with ice may also be used.

Hygiene facilities may also be stand alone as illustrated in Figure 11-3, depending on the ratio of male to female fisherfolk at the landing site. At least one toilet per 10 workers should be planned if a large number of village hands are used to unload the vessels. Figure 11-4 illustrates a typical example. Note bright internal colour scheme, glazing, drain and tiled floor to ease maintenance.

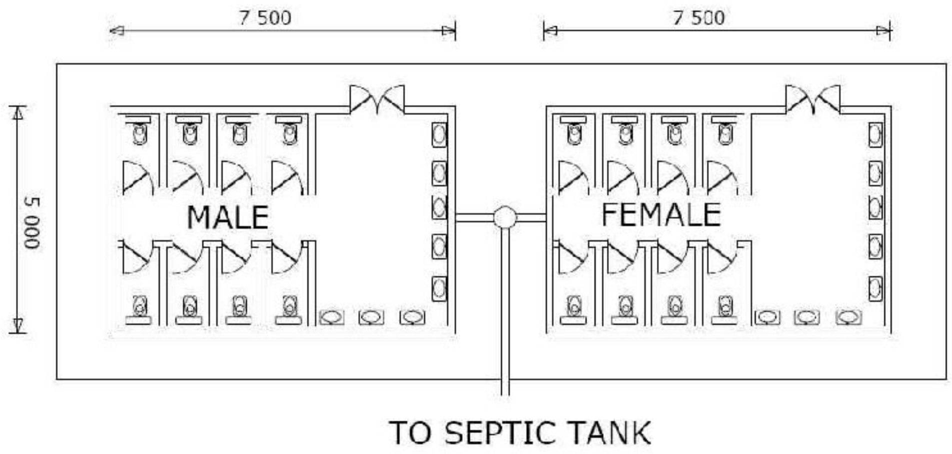


Figure 11-4 Potential layout for a large stand-alone facility

Figure 11-5 Actual example of a stand-alone facility

BUILDING SPECIFICATIONS AND QUALITY ASSURANCE

Both the landing platform and the hygiene facilities are located in a very aggressive and salty environment and are also subjected to heavy use. It is of the utmost importance that both buildings are designed for durability by:

- specifying a minimum Grade 35 concrete structure;
- using special admixtures in the external rendering to make it resistant to salt;
- replacing all timber fixtures with heavy duty PVC fittings (door frames, doors and windows);
- utilising only rigid PVC plumbing with stainless steel fittings;
- specifying heavy-duty faucets and flush units that are suitable for constant use.

Sub-standard work is the result of a lack or improper site supervision. Lack of experienced site supervision generally leads to:

- porous concrete which absorbs moisture, spalls easily and does not retain finishes;
- rapid corrosion of reinforcement due to lack of appropriate cover;
- improperly laid pipes and fittings leading to frequent leaks and flooding;
- poorly laid paving and glazed surfaces and drains prone to rutting and blockages;
- installation of inappropriate household fittings that do not withstand the rigours of constant use;
- fitting of corrodible metal fixtures;
- leaking roofs.

Adding poor design specifications to sub-standard construction work results in infrastructure with a useful operating life measured in months instead of years.

Following on from the above, it is evident that these buildings need to be designed by professional engineers or architects who are fully conversant with the aggressive environment in which these buildings are situated. Moreover, the standard of supervision must be such that the mistakes made in the past are not repeated. It is recommended that a quality assurance programme be set up prior to construction to ensure conformity with the drawing specifications.

In areas of high rainfall, buildings should incorporate rainwater harvesting to increase fresh water reserves.

CONCLUSION – <u>The landing platform and hygiene facilities are an integral part of the landing and must be constructed to the highest standards possible for durability.</u>

FRAME 12 – SEWAGE TREATMENT

INTRODUCTION

Many artisanal fish landing sites are situated outside municipal sewerage networks and thus require local treatment of the sewage effluent. The basic tool for primary treatment is the 3 stage septic tank and this may be constructed from locally available materials or purchased ready-made in light plastic. Various options are available for the disposal of the effluent from the septic tank.

OBJECTIVES

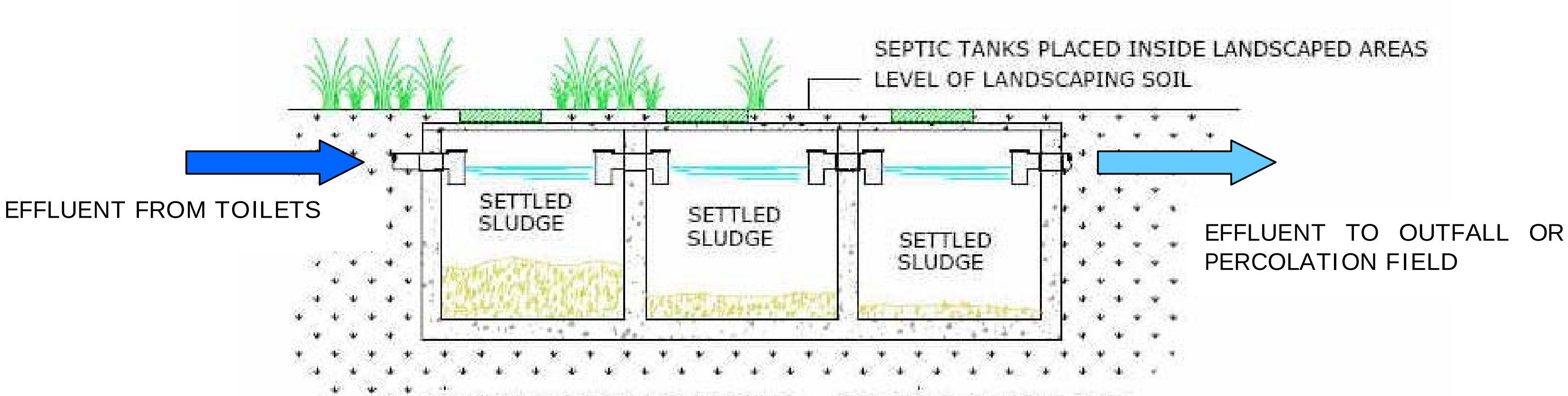
Frame 12 outlines a typical sewage treatment system for a small landing that may be extended to the associated village if space is available. Ideally, however, the landing should have its own system.

SEWAGE TREATMENT ON SITE

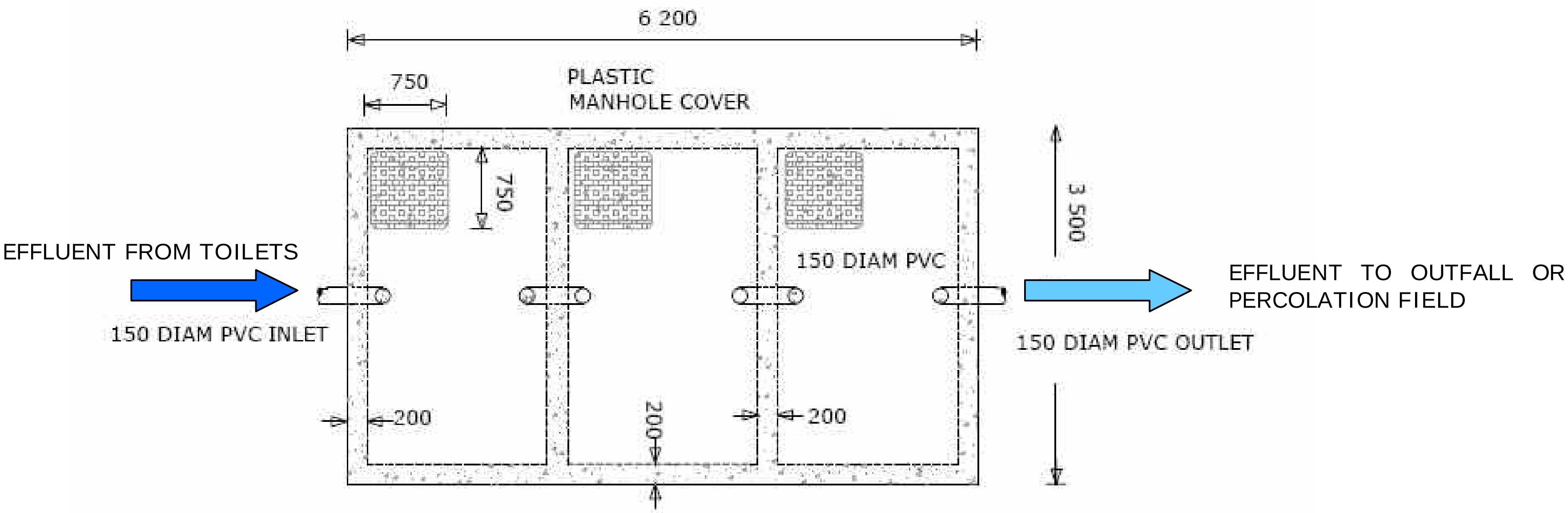
At a properly organised landing site, there are three types of effluent that require proper disposal:

- Type 1 effluent from the flush toilets consisting of faecal matter suspended in water;
- Type 2 effluent from the wash-hand basins and showers (if present) consisting of soapy water;
- Type 3 from the fish washing area consisting of water (may be seawater) with fish blood and scales.

TYPE 1 - The septic tank is the primary component of a sewage treatment system suitable for treating the first type of effluent. The term “septic” refers to anaerobic bacterial environment that develops inside the tank and which decomposes or mineralises the toilet wastes discharged into the tank Some pollutants, especially sulphates, under the anaerobic conditions of a septic tank, are reduced to hydrogen sulphide, a pungent and toxic gas. Likewise, nitrates and organic nitrogen compounds are reduced to ammonia. Because of the anaerobic conditions, fermentation processes take place, which ultimately generate carbon dioxide and methane. The fermentation processes cause the contents of a septic tank to be anoxic with a low redox potential, which keeps phosphate in a soluble and thus mobilized form. Because phosphate can be the limiting nutrient for plant growth in many ecosystems, the discharge from a septic tank into the environment can trigger prolific plant growth including algal blooms. The effluent from a septic tank may either be discharged into the sea via a plastic outfall discharging in deeper water, or, if groundwater is not being extracted from ground wells, it may be percolated over a gravel bed or used to water plants for landscaping. For a septic tank to work properly, the water used to flush toilets must be fresh water. The efficiency of the treatment is less with brackish water and practically zero with sea water. The dimensions of each chamber should be such that the peak total daily effluent flows are retained for a minimum period of 3 days inside each chamber.



3-STAGE SEPTIC TANK - CROSS SECTION



3-STAGE SEPTIC TANK - PLAN

Figure 12-1 The septic tank

Figure 12-2 illustrates a septic tank under construction. It is of the utmost importance that septic tanks do not leak sewage-laden water into the ground, especially if a well is located in the vicinity.

Ideally, the tank should be built in reinforced concrete base and sides as illustrated in the figure. Breeze block walls should be avoided (except for the internal dividing walls) as these are difficult to seal properly and rendering is not suitable as a sealer.

There is no rule-of-thumb for how often tanks should be emptied of sludge. The required cleaning frequency depends on usage. A properly designed and properly operated septic system is odour free and, besides the periodic cleaning should last about 50 years.

Figure 12-2 A septic tank under construction

The effluent from the septic tank may either be treated further by percolating it over a sub-surface flow trickle bed as illustrated in Figure 12-3 or piped to an outfall. The percolation field treatment should come first and only if this is not technically feasible should the effluent be discharged into a water course directly. Sub-surface flow trickle beds (as opposed to constructed wetlands treatment) are ideal in areas where mosquitoes are active. A kerb or bund should line the perimeter of the trickle bed to prevent rain water run-off from flooding the system. The effluent from the trickle bed is suitable for use in certain types of agriculture.

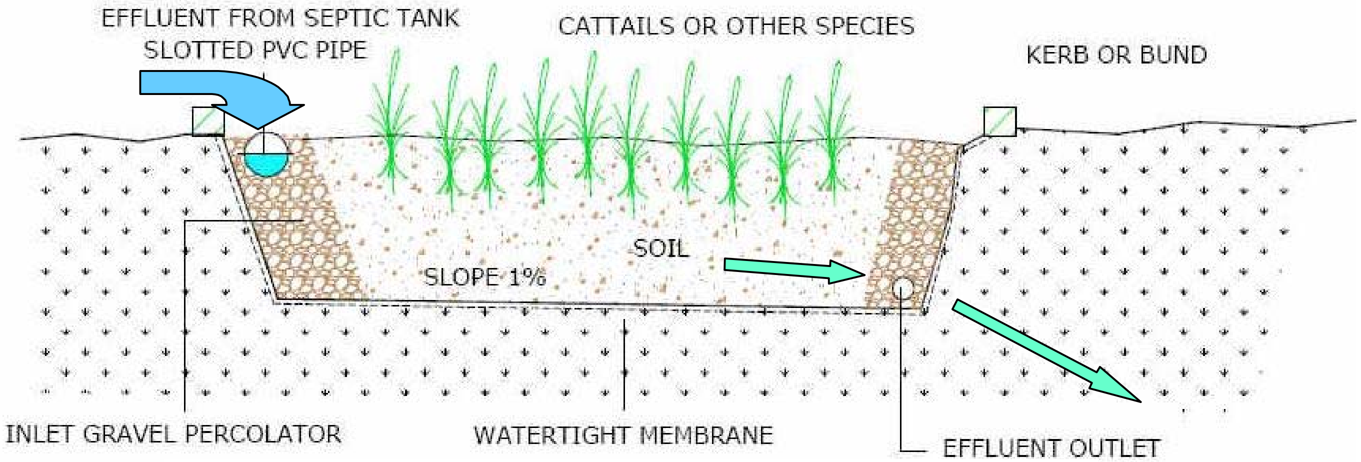


Figure 12-3 A sub-surface flow percolation field

TYPE 2 - The soakaway pit is the traditional structure used for soaking away the second type of effluent such as that from wash hand basins and showers, consisting of water and soapy residues only (no faecal matter).

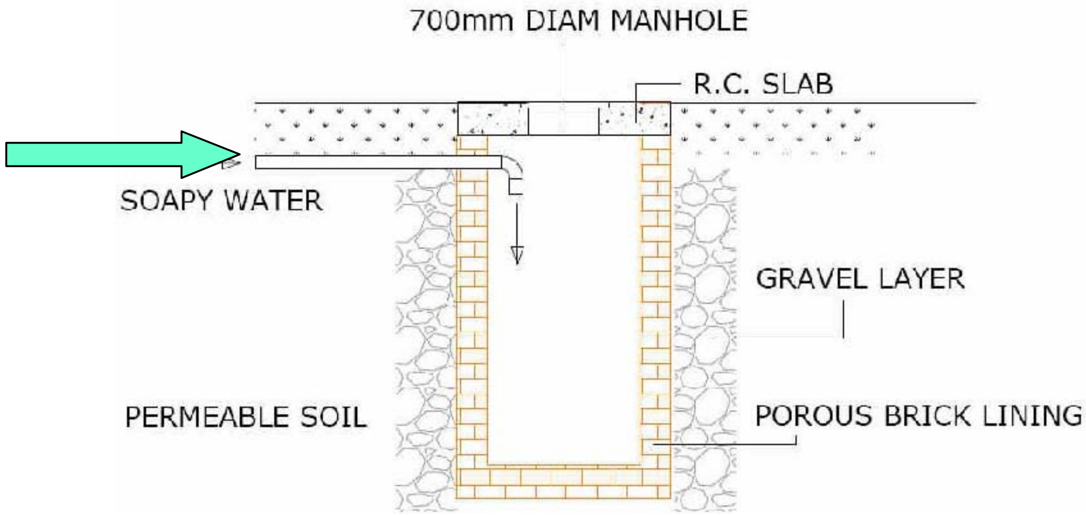


Figure 12-4 Standard soakaway

The diameter of the soakaway, Figure 12-4, should be at least 1.0m and the depth depends on the local geotechnical conditions. If the ground is used as a source of water, the soakaways must be placed as far away as possible from the groundwater well or the effluent sent directly to the percolation field.

TYPE 3 - The sea outfall is suitable to convey the third type of effluent to a water course for dilution. It normally consists of a flexible low density polyethylene pipe, weighed down by concrete collar weights, extending from the shoreline to deeper water. The terminal end of the pipe normally consists of a diffuser (closed end with a series of holes) to ensure proper dilution of the effluent.

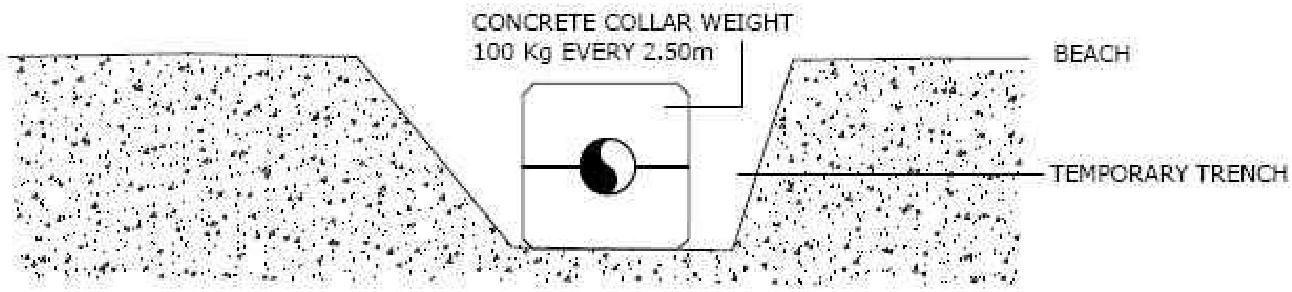


Figure 12-5 Section across outfall buried in sandy beach at the shoreline

A small 100-150 mm diameter outfall would need around 100 Kg of weight every 2.0 m and the whole may be placed inside a trench excavated across the shoreline as illustrated in Figure 12-5 if the landing is a beach. As soon as the pipe is placed inside the trench, sand may be placed back to cover up the pipe completely.

If a rock formation exists in the vicinity of the landing site, the outfall should be taken out over the rock and anchored down with in-situ concrete or concrete-filled jute bags placed across the pipe.

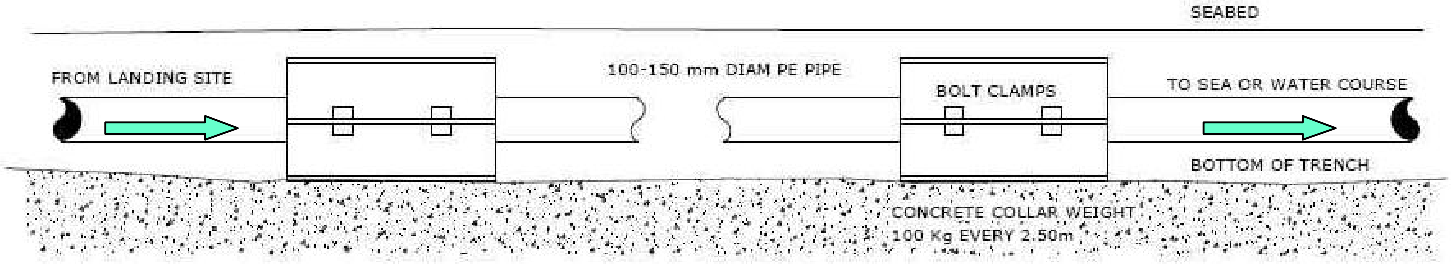


Figure 12-6 Side view of buried sea outfall

In all cases, the terminal end of the pipe must be taken out to sea as far as possible and secured to a larger weight to prevent it from flapping in the waves if the site is exposed to wave action. The outfall may also be used to channel away the effluent from the septic tank if geotechnical conditions do not permit the installation of a percolation field.

The entire system, from septic tank to percolation bed to outfall should be designed by a professional water engineer, preferably in association with the design for the water supply.
Construction supervision by a competent engineer is also required to ensure that the system does not leak sewage into the ground.

Figure 12-7 (right) shows a large diameter outfall with concrete collar weights as it is being lowered on the sea bed.

No solids of any kind should be allowed to enter an outfall. Hence, the effluent should pass through a filter basket before entering the outfall to trap all solids, including fish scales.

Figure 12-7 A large diameter outfall being placed – www.pipelife Norge

FRAME 13 – ANIMALS ON SITE

INTRODUCTION

In many landing sites, it is not uncommon to come across a mix of domestic animals, some purposely kept whilst others breeze in and out during the unloading activity. It is also very common for rodents to invade such places to mop up the scraps of food left lying around when fish is cleaned on the beach, Figure 13 (left). In other places, open-air drying of fish attracts large swarms of flies that settle on everything and everywhere, Figure 13 (middle). Bird droppings from nests underneath a shed roof Figure 13 (right) occasionally find their way on to the fish underneath. International standards of hygiene do not allow any of the above near fish meant for human consumption for fear of disease being transmitted to the fish.

OBJECTIVES

This Frame reviews the Best Practise Solutions to enable a landing site to conform to the requirements when pests invade the landing site.



Figure 13-1 Common situations -Large fish slaughtered on beach (left), chunks of fish placed anywhere convenient and left to dry in the sun (middle) and birds nesting inside the hangar roof (left)

TYPE OF NUISANCE	TYPE OF ISSUE	BEST PRACTISE OPTION
RODENTS	Infrastructure-Management	Provide receptacles for wet wastes and enforce housekeeping
FLIES	Infrastructure-Management	Provide net-covered hangars and enforce use
BIRDS NESTING INSIDE HANGAR	Infrastructure	Install netting or false ceilings
DOGS, GOATS	Infrastructure	Install fence and controlled access

Table 13-1 Best Practise options

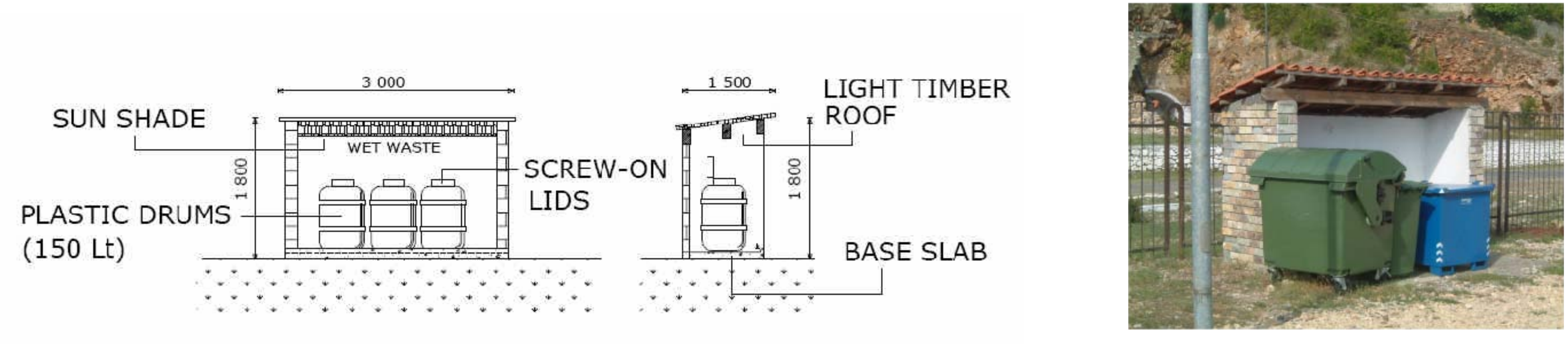


Figure 13-2 Wet wastes handling centre (left), and a typical sun shade (right)

Figure 13-2 illustrates a simple wet wastes handling centre for the collection and eventual disposal (as fertiliser or dumped offshore) of wet wastes from around the landing site. The drum lids must be air-tight to prevent the waste centre from attracting flies. The drums must be protected from direct sunlight under a sun shade to prevent the early fermentation of the wastes. The drums and sun shade must be kept scrupulously clean.

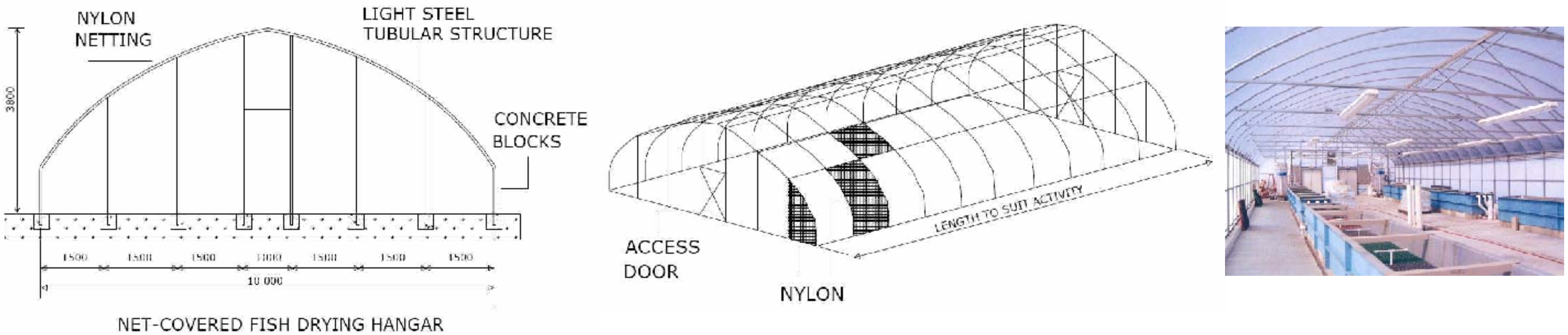
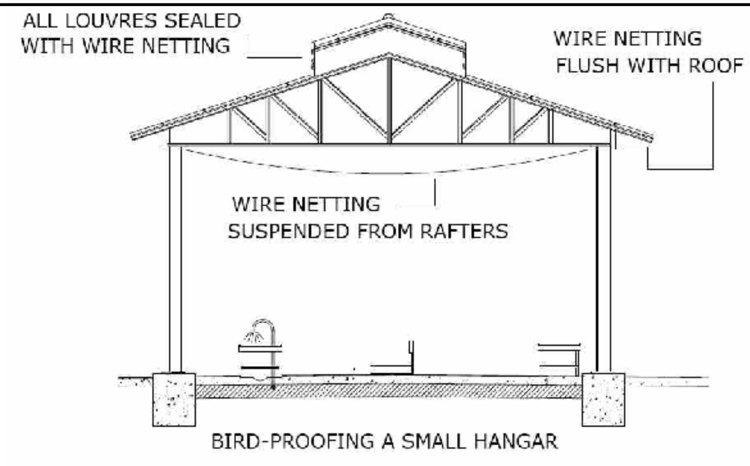


Figure 13-3 Net-covered fish drying hangar to prevent flies from laying eggs on rotting fish

Figure 13-3 illustrates a structure commonly used in fish farming which may also be used for drying and smoking fish. The net cover prevents access to the fish by flies attracted to the smell of rotting flesh.

Figure 13-4 (right) Bird-proofing a small shed or hangar constructed with a truss and sheeting roof.



Hangars built in reinforced concrete (flat roof slab) do not normally experience the same problems with birds. However, some areas are known to be breeding areas for swallows who normally build mud nests cemented to corners or under ledges. Nest building inside the hangar should be interrupted immediately it starts to force the birds to seek other suitable areas.

The area allocated to the landing site should be demarcated to prevent service industries (market stalls, fish smoking and drying, etc.) from encroaching on the site and making it harder to keep clean. Once demarcated, the area should be secured by a boundary fence or wall, depending on local customs and conditions. Whereas a fairly open area on a beach may require only a light fence, a heavily over-populated area may require a proper masonry wall. In areas where rodents are present or rainwater or open sewer run-off flow toward the landing site, the first 900mm off the ground of a chainlink fence should be solid masonry, Figure 13-5 right.

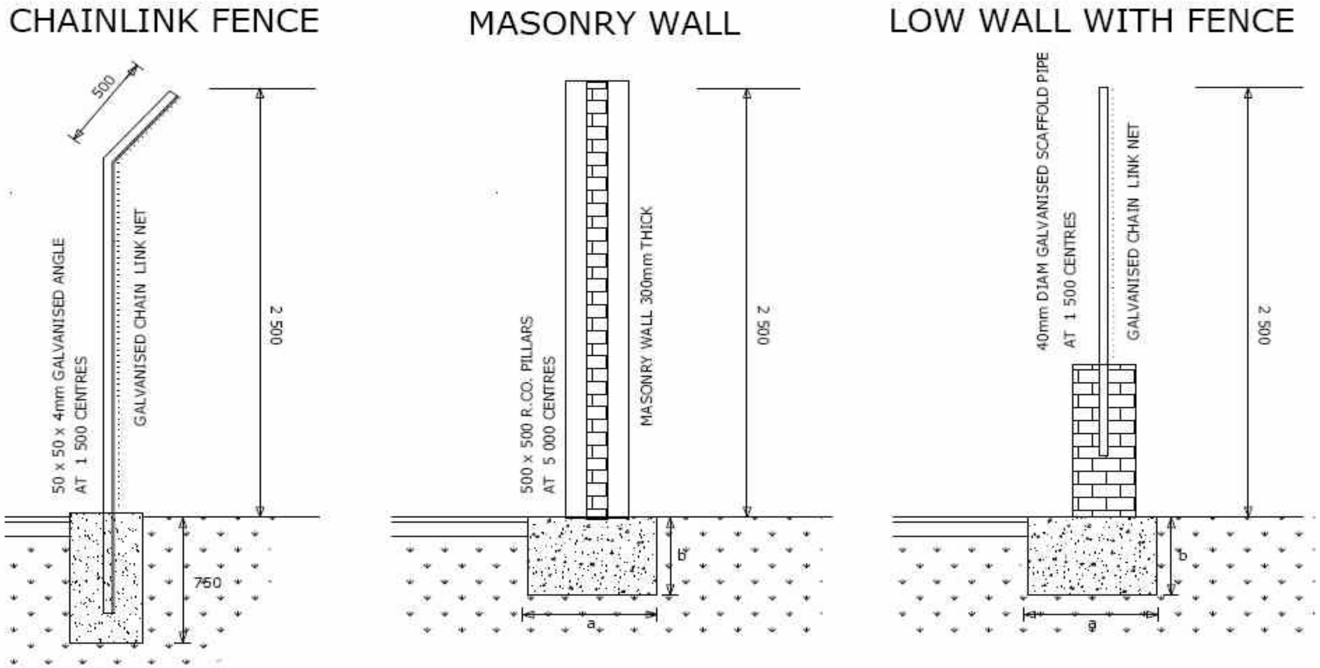


Figure 13-5 Typical cross sections of boundary walls and fences

Chainlink fence posts, Figure 13-5 (left), may be anchored in concrete blocks, 500 x 500 x 750 deep, excavated in loose material. The vertical posts, placed every 1.50 m, should be cross-braced with 3mm wire. The posts as well as the 3mm thick chainlink wire net should be of the galvanised type.

A solid masonry wall should be laid on a reinforced concrete strip foundation (dimensions a & b depending on the ground conditions). A reinforced concrete pillar should be erected every 5.0 m or so to strengthen the wall against wind forces, Figure 13-5 (middle).

A cross between the aforementioned types consists of a solid base, approximately 900mm high with a light galvanised structure on top. The vertical posts may be in scaffold pipes or angles, anchored inside the low wall. A galvanised chainlink net spans from one post to the other to complete the wall.

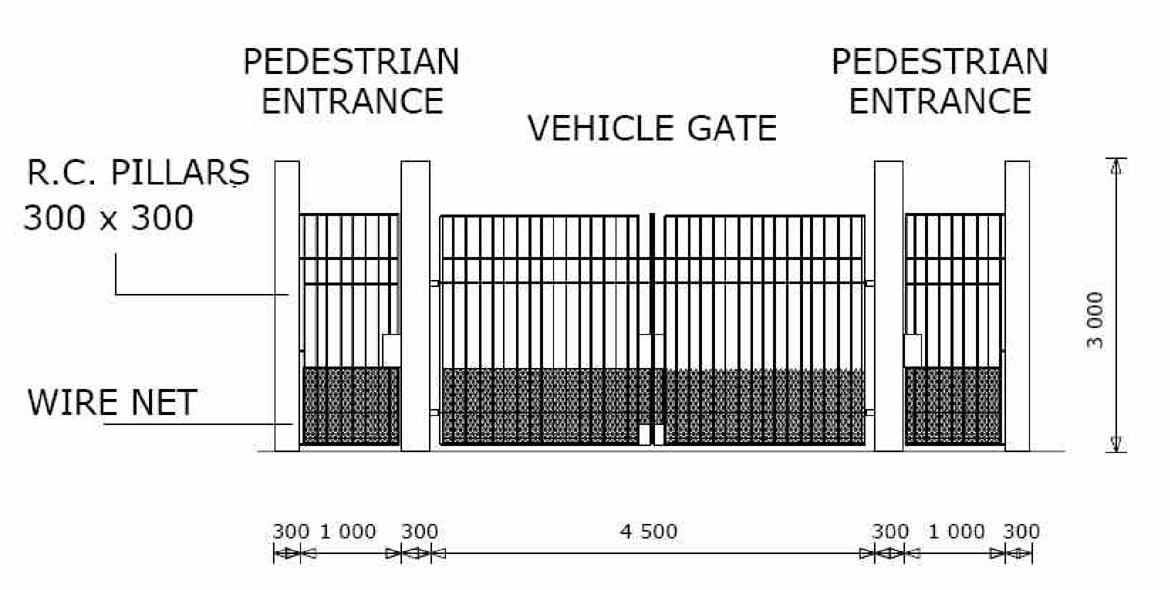


Figure 13-6 Typical dimensions for the main access gate

Once the perimeter fence is installed, a proper access gate should be installed to allow controlled access to both pedestrians and vehicles picking up fish or offloading ice. Wrought steel gates are the most commonly used and these should have the lower half plated over to prevent domestic animals from squeezing through the bars.

CONCLUSION – <u>Very simple infrastructural components together with a good housekeeping programme can prevent the contamination of fish by vermin, pests and domestic animals in general.</u>

FRAME 14 – FISHERIES EQUIPMENT

INTRODUCTION

Once the fish is offloaded from a vessel it needs to be weighed, rinsed, boxed on ice and stored for onward travel. Various items of equipment or soft furnishings are required to complete the landing infrastructure and these include the handling boxes, the scales, the sorting tables and ultimately the insulated containers for their journey to a processing plant.

OBJECTIVES

The traditional items of equipment normally used in artisanal sites are no longer deemed adequate to satisfy the hygiene regulations imposed by the importing countries. Frame 14 gives an overview of the modern items of equipment required and the type of materials employed in their manufacture.

FISH HANDLING BOXES

Figure 14-1 Current practises (from left to right - wicker, hand basin, bucket and laundry basket)

The illustrations in Figure 14-1 are common throughout the region. The illustrated containers are the wrong shape (requiring fish to be bent to fit), do not permit the use of ice (no insulation) and cannot be disinfected as required due to the soft nature of the material used (retain blood and bacteria and are easily scratched).

The proper type of a fish handling box is one made from High Density Polyethylene, or HDPE, and designed to be stackable without damaging the fish in the lower boxes. Figure 14-2 illustrates the common HDPE handling box.

Figure 14-2 A typical stackable fish box in HDPE

Fish boxes like the one illustrated above come in a variety of sizes (from 20 litres up) and are nestable when not in use. HDPE boxes are relatively expensive when compared to what is currently being used in most sites. However, the boxes have a very long useful life and may be loaded directly into waiting insulated trucks once the fish is iced properly. They provide the most hygienic way to store iced fish in chill rooms and transport iced fish inside insulated or chilled trucks.

SCALES

Scales are required in a fish landing site if proper statistics are to be kept. The traditional method of measuring buckets or individual groups of pieces is not statistically reliable except for the large volume species like sardines, where the size of the fish compared to the bucket is small. For the irregularly-shaped high value species, proper weighing at the landing site is a basic requirement.

Scales should be heavy duty and in stainless steel. They should be sturdy enough to withstand rough use and easy to clean for food handling and harsh environments. Three types of scales are available; the standard floor scale, the floor mounted plate scale and the roof-mounted suspended scale, Figure 14-3. The first two types can be used to measure the weight of the fish already boxed before icing. The third type is more compact and occupies less space but is more suited to buckets with handles.

Figure 14-3 Standard floor scale (left) plate scale (middle) and roof-mounted scales (right)

WORK SURFACES

Figure 14-4 Unacceptable work surfaces

Figure 14-4 above illustrates the type of working surface typically employed in small artisanal landings where high value species are sometimes sorted. This type of work should be carried out on a stainless steel surface and off the ground. Appropriate stainless steel tables are now very affordable.

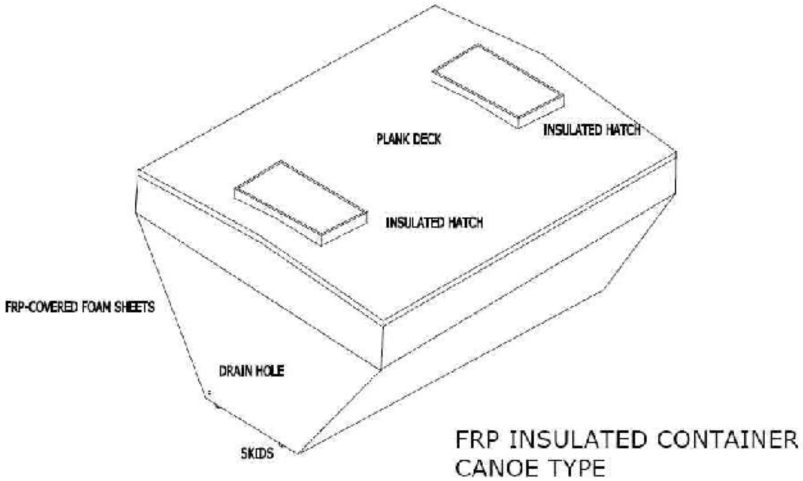
INSULATED CONTAINERS

If the quality of high value fish is to be maintained, insulated containers are required both onboard vessels and canoes and ashore to store crushed ice and iced fish. If insulated trucks are not available for transport, insulated containers must be used throughout the chain of events to move iced fish to the processing centres.
There is a wide range of insulated containers available, offering a variety of sizes, insulation efficiencies, modes of transportation, sturdiness, durability and construction materials. Insulated containers may be locally or commercially manufactured as illustrated in Frame 10. One of the most common types of commercially produced insulated container used in fisheries consists of double-walled HDPE with expanded polystyrene or polyurethane foam as insulation. These are usually manufactured in a single piece using a rotational moulding process. The HDPE walls vary in thickness from 3 mm to 6 mm and the total thickness varies according to the size and capacity of the insulated container. These types of containers are able to withstand relatively rough handling, and are considered to be superior to those manufactured locally with fibre reinforced polyester or FRP, which tends to be more brittle around the sharp corners and prone to impact damage and fractures.

The locally made insulated containers tend to be constructed in timber, galvanised metal sheets or FRP and insulated with palm leaves, wood shavings or saw dust. More recently, polyurethane foam and expanded polystyrene have been introduced. When compared to commercially produced containers, locally made units are very often structurally weak and have a relatively short useful life. However, locally produced containers may be designed to fit inside canoes, Figure 14-5, whereas commercial models only come in rectangular shapes. Timber is now considered unacceptable as it absorbs moisture, which may include fish slime, blood, fish wastes and bacteria, thereby contaminating stored fish. Containers in galvanised metal sheets are not common.

Figure 14-5 (right) Canoe-type FRP insulated container

Locally made insulated containers are the most suitable for installing inside canoes as these units remain in place without being man-handled around on rough surfaces. On shore, however, the much stronger commercially produced varieties are preferable.



APPENDIX 1 – LANDING SITE MANAGEMENT

Irrespective of the size of the landing site, a facility cannot be abandoned in the hope that it will run itself. Experience demonstrates that even small facilities need to be managed if the standards of hygiene mandated by exporters and importers alike are to be maintained.

The four basic functions that a management structure has to absolve are:

1. Overall responsibility and day-to-day operations like unloading, sorting, icing and onward despatch;
2. Bookkeeping;
3. Landing statistics;
4. Housekeeping (maintenance of hygiene standards throughout).

The four functions are best done by four different people unless the national fisheries department has posted one of its staff at the site to handle the landing statistics.

The day-to-day operations are best handled by a master-fishermen chosen from amongst the local population. Ideally, the master fisherman should have at least primary education and be able to read and write. He should also be familiar with the management of a large number people, such as when local hands join the unloading parties or when the fish mammies take over the catch for retail. The master fisherman must be empowered by the local community or the village elders to run the landing according to the hygiene standards imparted by the person in charge of housekeeping. He must be a respected person within the community able to command the respect of the village elders in order to enact management regulations which may go against local customs and traditions.

If the national fisheries department cannot spare staff to look after the landing statistics, both the bookkeeping and the landing statistics could be performed by teachers from the local community schools trained by the department of fisheries or a local NGO. Like mobile phones, laptop computers are now also making inroads in to village life and simple software may now be utilised to improve statistics and keep the books in order.

The person in charge of housekeeping may either be a locally trained person or an extension worker. This person must have at least secondary education with specialised training in health and hygiene and seafood handling and is probably the most important person on site regarding housekeeping standards. The person must also be trained in teaching other people.

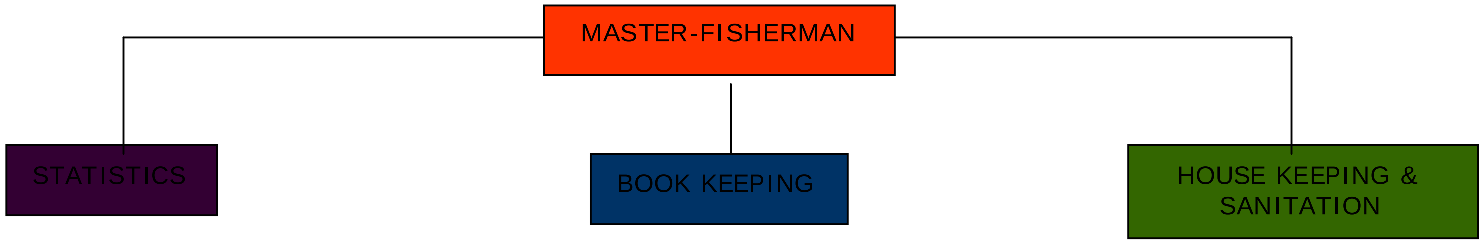


Figure App-1 Landing site management organisation

In order to perform its duties, the above landing site management organisation should be independent of any local community organisations or fishermen's cooperatives. It has to ensure:

- Compliance with the laws and other environmental directives governing the fishing sector;
- Compliance with the regulations governing the management of the landing site;
- Compliance with national conservation measures that may be in force from time to time;
- Integration with other users as in the case of seaborne transport;
- Transparency in the decision-making process.

APPENDIX 2 – AWARENESS PROGRAMMES

Awareness programmes are one of the most effective management tools and no landing site should be without a comprehensive and pro-active set of awareness programmes. There are three distinct areas where specific, tailor-made programmes, including manuals or posters, are required:

1. Prevention of pollution in fishing harbours and/or landing sites;
2. Sea food handling;
3. Personal hygiene.

PREVENTION OF POLLUTION IN FISHING HARBOURS AND LANDING SITES

In 1995, the Food and Agriculture Organization of the united Nations drew up an awareness programme in response to the regulations that came in to force in 1988 following the introduction of MARPOL 73/78, the International Convention for the prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978.

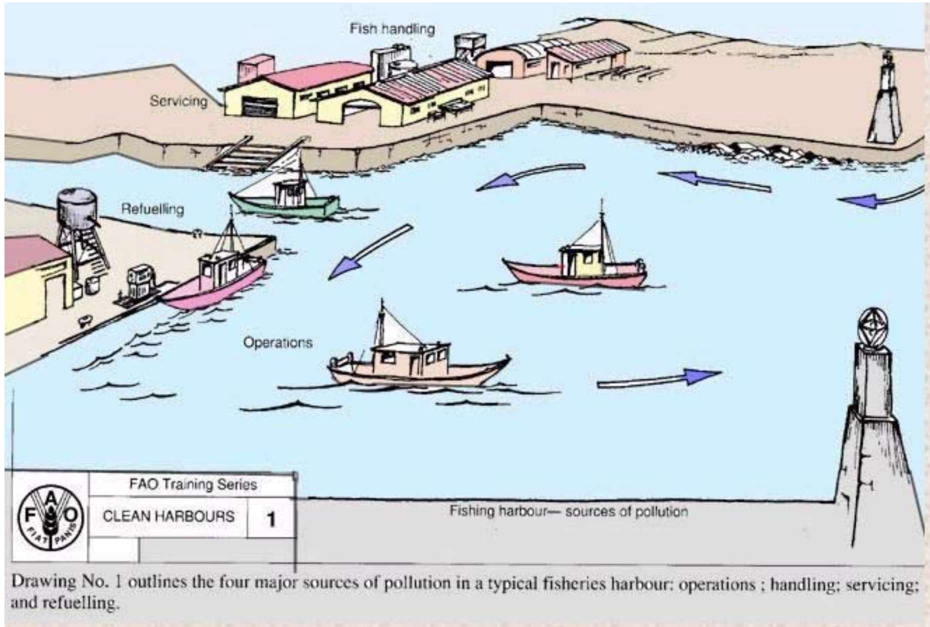


Figure 1 Slide No 1 from the FAO awareness programme on the prevention of pollution in fish landing sites

This awareness programme is a series of cartoon drawings and was initially drawn up for the Mediterranean Sea. However, with little modification, the cartoon drawings are adaptable to be compatible with other regions of the world. This awareness programme is suitable for use in countries where the artisanal fisheries sector is expanding rapidly and provides local NGOs with ready-made targeted material. Extension workers, fisheries training colleges and fisheries enforcement officers should also find them useful. Some of the drawings are also suitable as posters. Suppliers to the fishing industry (net manufacturers, outboard engine suppliers, etc.) may also be co-opted to act as sponsors to pay for advertising within the programme and thus reduce costs. Further details of the programme and how best to use it in the field may be obtained FAO Fisheries Division in Rome.

SEAFOOD HANDLING

In March 2007, India embarked on a programme to improve the hygiene and sanitation conditions in its harbours and fish landing centres as these also fall below internationally accepted standards and fish contamination levels are often high. Through a Technical Cooperation Programme, the Food and Agriculture Organization of the United Nations drew up a seafood handling manual for dissemination in selected sites which then passed on the training to the smaller sites through a capacity building initiative.

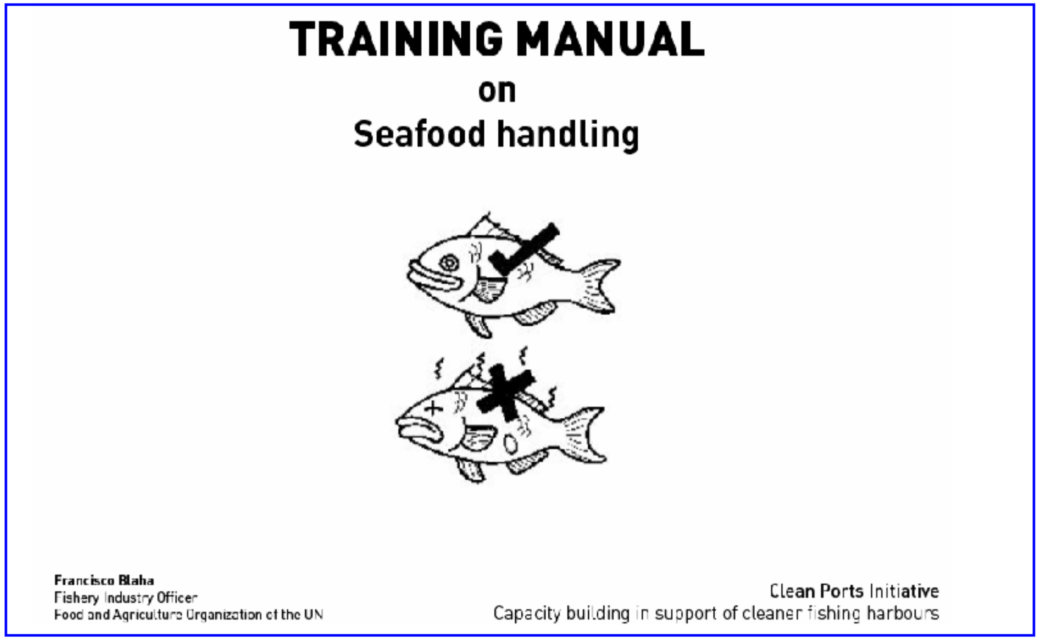


Figure 2 The Seafood Handling manual drawn up by FAO for use in India

This manual is suitable for use in the landing sites by the person responsible for hygiene. As with the previous awareness programme, suppliers to the seafood industry may act as sponsors to help cut down on training costs through advertising. Further details are available from FAO Fisheries Division in Rome.

PERSONAL HYGIENE

The misconception that visibly clean hands washed with water only are hygienically clean is still rampant in many parts of the world. Preventable diseases, resulting from poor personal hygiene and sanitation, pose a significant threat to contamination of fish through handling.

Various international organizations, such as the W.H.O. and U.N.I.C.E.F of the United Nations, the International Federation of Red Cross and Red Crescent Societies, and multinational companies in the personal care industry, such as Unilever and Dettol to name just a few, run or sponsor public awareness programmes in developing countries in conjunction with national governments and local NGOs aimed at instilling personal hygiene standards from an early age through the use of soap for hand washing. Further information may be obtained from:

www.who.int
www.unicef.org/wash

www.ifrc.org/what/health/water/hygiene.asp

www.unilever.com/sustainability/hygiene
www.dettol.co.in

PITFALLS IN AWARENESS PROGRAMMES

At some stage in their implementation, most awareness programmes require the use of clean water, disinfectants (chlorine tablets or bleach) and some form of soap (bar or liquid). Unless these programmes are also backed-up by financial commitments or sponsorships from national governments or the private sector sourcing hazard-free fish to pay for the water, disinfectants and soap, the behavioural change required in the personal habits of the fisherfolk will be short-lived and ineffective in the long run. It is not uncommon for people to refuse to pay even a pittance for the use of pit latrines (built at great expense by well-meaning NGOs) when the bush or the beach is available for free. As long as this vicious circle exists and proper housekeeping standards not enforced, many artisanal landing sites are destined to remain on the lower rungs of the ladder aimed at helping them increase the value of their landed catch.

APPENDIX 3 – BIBLIOGRAPHY AND FURTHER READING

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Directive 98/83/EC "Quality of water intended for human consumption"

Directive 91/493/EEC "Laying down the health conditions for the production and the placing on the market of fishery products"

Regulation (EC) No 853/2004 "Laying down specific hygiene rules for food of animal origin"

ADDITIONAL LINKS FOR OFF-THE-SHELF EQUIPMENT

Commercial ice cooler boxes

Yeti	www.yeticoolers.com
EvaKool	www.ausfish.com.au
Tropical	www.tropicaliceboxes.com

Chlorinators

Global Treat	www.globaltreat.com/solfeeders.html
Lincoln	www.lincolnaquatics.com
Triple S	www.septic-system-supplies.com

GRP GRATINGS

Sinograte	www.sinograte.com
Anglia Comp	www.fibreglass-grating.com
Grating Co	www.gratingco.co.uk

Ice machines

Ziegra	www.ziegra.com
Scotsman	www.scotsman-ice.com

Pontoons

Alfredo Martini	www.alfredomartini.it
Marinetek	www.marinetek.net
Intermarine	www.intermarine.co.uk

Pumps

Grundfos	www.grundfos.com
Falcon	www.falconsubmersible.com
Goulds	www.goulds.com

Solar power

SolarstreetLights	www.solarstreetlights.net
Sepco	www.sepco-solarlighting.com
Solarlight	www.solarsky.com

Water Storage Tanks in polyethylene

Novacqua	www.novacqua.com Sierra
	www.petanks.com
Polyethylene	www.polyethylenetanks.co.uk