This Code of Good Agricultural Practice for the Protection of Water is issued by the Department of Agriculture, Fisheries and Forestry, the Department of Local Government and Environment and the Isle of Man Water Authority.

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Preface

This Code of Good Agricultural Practice for the Protection of Water is issued by the Department of Agriculture, Fisheries and Forestry after consultation with the Department of Local Government and the Environment and the Isle of Man Water Authority pursuant to section 36(2) of the Water Act 1991. It is also intended that it be approved as a code of practice under section 11 of the Water Pollution Act 1993. It has been prepared by a Working Party consisting of professional and technical officers of the Department of Local Government and the Environment, the Department of Agriculture, Fisheries and Forestry and the Isle of Man Water Authority.

Contents

Introduction

1.1 This Code of Good Agricultural Practice for the Protection of Water is a practical guide for farmers, growers, contractors and others involved in agricultural activities, on whom there is a statutory obligation to avoid causing pollution of the environment. The Code covers the main agricultural activities which can give rise to pollution of the water environment and describes some of the management practices which can be adopted to avoid, or at least minimise, the risk of causing pollution, while enabling economic agricultural practice to continue.

1.2 The Code deals with preventing pollution of water and has a statutory base under section 36(2) of the Water Act 1991. This means that, in any proceedings for an offence under section 36, in particular an offence under section 36(1) (pollution of water used or likely to be used for human consumption etc.), the court is to have regard to this Code in determining any person's liability. A contravention of this Code under the Water Act 1991 does not itself give rise to any criminal or civil liability, but it may be taken into account in any legal proceedings involving a water pollution offence.

1.3 In addition, it is intended that this Code be approved as a code of practice under section 11(1) of the Water Pollution Act 1993, which relates to the pollution of coastal and inland waters generally ('controlled waters'). A contravention of this Code does not itself give rise to any criminal or civil liability, but it may be taken into account in any legal proceedings instituted by the Department of local Government and the Environment under Part 1 of that Act, involving pollution of controlled waters.

1.4 The Code is based on the best available information at the time of writing. The use of any new technology should follow the general principles of Good Agricultural Practice laid down in the Code.

POLLUTION CONTROL LEGISLATION

1.5 Section 27 of the Inland Fisheries Act 1976 makes it an offence, for any person, without lawful excuse, to cause or permit any deleterious matter to enter any waters. This includes any river, lake pond, pool, watercourse or estuary, but does not include any part of the sea. The maximum penalty on summary conviction is a fine not exceeding £5,000; on conviction on information a fine of any amount may be imposed.

The Department of Agriculture, Fisheries and Forestry (D.A.F.F.) is responsible for enforcing this legislation.

1.6 Where any poisonous, noxious or polluting matter has entered, or is likely to enter, any controlled waters, the Department of Local Government and the Environment (D.L.G.E.) have powers to carry out counter-pollution works and operations under the provisions of section 10 of the Water Pollution Act 1993. The Act provides that the reasonable costs of carrying out such work, including the expense of restocking rivers, may be recovered from the person responsible for endangering the waters or causing the pollution.

1.7 The general statutory provisions in the above Acts are to be supplemented by this Code of Practice setting minimum standards for installations used for the storage of such substances as silage, slurry and fuel oil. The Code applies to new, substantially enlarged or substantially reconstructed installations. Farmers are recommended to notify the D.L.G.E. , in writing, on the completion of such installations at least 14 days before they come into use. A relevant form is available from D.A.F.F. for this purpose. Detailed requirements for the different types of facility can be located under the appropriate sections of this Code.

1.8 Section 9 of the Water Pollution Act 1993 contains powers for the designation of "water protection zones", such as Nitrate Sensitive Areas, where it is considered appropriate to prevent or control the entry of polluting substances into controlled waters. The D.L.G.E. and D.A.F.F. are responsible for promoting areas for designation by Tynwald. To date, no such areas have been designated in the Isle of Man but the position is being kept under review.

1.9 This Code takes full account of the requirements of Article 4 and Annex 2 of the "Nitrates Directive" (Council Directive 91/676/EEC) concerning the protection of waters against pollution caused by nitrates from agricultural sources, even though the Directive is not binding on the Isle of Man.

PROTECTION OF DRINKING WATER

1.10 The Water Act 1991 places a duty on the Water Authority to supply "wholesome" water. Under Schedule 4 of the Water Act 1991 the Department of Local Government and the Environment may make regulations for the purpose of securing compliance with Section 13(1) (Sufficiency and Purity of Supply) no such regulations have been made and although the EU Water Quality Regulations are followed, there has not been any empowering legislation. The Public Analyst in carrying out his duties in accordance with Section 14 of the Water Act 1991, compares the Authority's performance with the EU Drinking Water Directive 1980. The Water Authority is not permitted to supply water in their pipes which is unfit for human consumption. The Water Act 1991 and bye-laws made by the Water Authority prevent pollution of the public (mains) drinking water supply and these generally contain provisions which relate to farming activities. (Refer to Appendix V for the address of the Water Authority).

The D.L.G.E. has a duty to keep themselves informed of the quality of public and private supplies and to take steps to see that quality is maintained.

AGRICULTURAL POLLUTANTS

1.11 Certain agricultural practices produce waste products or use hazardous substances which can and do have a serious impact on the surrounding water environment when improperly managed. The discharge of farm residues such as silage effluent and livestock manures and slurries into watercourses can result in serious damage to the aquatic environment giving rise to weed and algal growth in waters due to nutrient enrichment.

The disposal of such wastes to a watercourse has a serious effect on fish stocks and other aquatic life along the full length of watercourse, even extending into the marine environment. The careless use and disposal of agrochemicals also has serious ecological consequences for the environment. In some cases there are human health implications, particularly from the effects of substances such as pesticides, sheep dips, fuel oil and ammonia in drinking water where water is abstracted directly from surface or underground sources for public or private supply.

Cryptosporidium is a parasite which can cause illness in humans and is difficult to detect and remove during water treatment. The Badenoch Report on Cryptosporidium in water supplies suggests a probable link between contamination of water supply sources by this parasite and livestock wastes. Pathogens such as Salmonella may also be present in water contaminated by slurry or manure.

1.12 The majority of pollution incidents are due to the escape of silage effluent, with livestock slurries and manures the second most prevalent water pollutant. Others include incidents involving dairy premises and milking parlours, milk bottling plants, and land drainage works.

1.13 Those incidents which are due to structural failure tend to be related to silos and silage effluent tanks.

The principal objective of this Code is to reduce substantially the number of pollution incidents which result from the structural failure of silage, slurry and agricultural fuel oil installations.

There is a relationship between the number of pollution incidents and the concurrent weather conditions. In a wet winter there is generally an increase in pollution by slurry, while a wet summer tends to result in an increase in pollution by silage effluent. However, heavy rainfall is not a valid excuse for poor or ill-prepared management.

1.14 Most agricultural pollution incidents occur when wastes with a high Biochemical Oxygen Demand (BOD_5) enter watercourses. Substances with a high BOD_5 have a dramatic effect, creating very rapid and severe oxygen depletion of the water which can result in a large number of fish and invertebrate kills. Table 1 gives examples of typical BOD_5 Levels (mg/l) for the main pollutants originating on the farm.

Table 1: EXAMPLES OF TYPICAL BOD5 LEVELS

Pollutant Substance	BOD_5 (mg/1)
Silage effluent	30,000 – 80,000
Pig Slurry	20,000 – 30,000
Liquid sewage sludge	
Brewers Grain Effluent	10,000 – 20,000
Cattle slurry	
Liquid effluent draining from slurry stores	1,000 – 12,000
Dilute dairy parlour and yard washings	1,000 – 2,000
(dirty water)	
Vegetable washings	500 – 3,000
Raw Domestic Sewage	300 – 400
Treated domestic sewage	20 – 60

Milk, although not a common problem as a pollutant, has a very High BOD_5 value of approximately 140,000 mg/1

The BOD_5 is often used as an indicator of the pollution potential of organic wastes. BOD_5 is a measure of the amount of oxygen required by micro-organisms to break down the organic material present. It is expressed in mg/l or parts per million (ppm). As a good quality watercourse normally has a BOD_5 of less than 3mg/l, any loading in excess of this can be considered a pollutant, and this threshold places the potential threat from agricultural pollutants in context. The BOD_5 of silage liquor is some 200 times more polluting than raw domestic sew age. A clamp containing 500 tonnes of unwilted silage has the same polluting potential as the daily untreated sewage production from a of approximately 200,000 people.

OPERATOR AWARENESS

1.15 All farmers, farm staff and contractors involved in the handling, storage, use spreading or disposal of any substance which could pollute the environment, should be aware of their statutory responsibilities not to cause or knowingly permit pollution.

Responsibility lies with the person having custody or control of an installation, and it is this person that the D.L.G.E or local authority would contact and where necessary on whom they would serve the appropriate Notices.

All such persons should be aware and should make their employees aware of the likely causes and consequences of water pollution and should be familiar both with any specific operation or maintenance instructions for the equipment being used and with emergency procedures.

CONTINGENCY PLANNING

1.16 Farmers should have a contingency plan to deal with water pollution incidents. A sketch plan showing the location of the drainage system, where available, especially around buildings, should be prepared and kept with the farm waste management plan (Refer to Section 2) which should include relevant telephone numbers (eg D.L.G.E, D.A.F.F., IOM Water Authority, downstream landowners and water users) and record the availability of equipment to carry out remedial work. Facilities should be available for emergency situations to plug land drains, dam ditches, excavate catchpits and retain oil spillages by placing wooden scum boards across the watercourse.

EMERGENCY PROCEDURES

1.17 Farmers should familiarise themselves with their drainage systems, and in particular the location of all pipes, channels and outfalls draining their land, and from their buildings. The location of any adjacent boreholes and springs and any private water supply sources should be known. The Water Authority will be able to advise on the location of public water supply sources and the Environmental Health Department on private water supplies.

All storage installations should be regularly inspected for structural defects and associated leakage.

1.18 Regular inspections should be carried out to ensure that watercourses have not become polluted. Obvious signs of pollution in watercourses include excessive frothing, the presence of white, pinkish or brown fungal growths and in severe cases, dead fish and invertebrates may be present. The frequency of such inspections should be increased at times when the risk of pollution is high, such as following the filling of silos and during the application of slurry, silage effluent or dirty water to land.

If polluting discharges are identified, immediate action should be taken to stop the discharge at source. An emergency plan has been developed for the integrated response to pollution of the Island's 'controlled waters'. In such situations the Environmental Health Division of D.L.G.E should be informed without delay, outside normal office hours such initial reports may be made direct to the Police or Fire Service. Telephone and fax numbers are given in Appendix V.

Principles of Land Application and Storage of Livestock Wastes

INTRODUCTION

2.1 The disposal of livestock wastes to agricultural land is presently the most economical and environmentally sound solution.

To achieve this without causing environmental pollution, livestock farms should draw up a WASTE MANAGEMENT PLAN to establish the quantities of waste produced, and safe methods of collection, storage and land-spreading, and may be required under certain circumstances to produce one, for example in high risk situations.

Pollution of the Land and/or Watercourses may occur as a result of:

- direct contamination from surface run-off or from rapid movement through the soil or water contaminated with raw livestock wastes.
- long-term leaching or diffusion of nitrates or other chemicals through the soil.

Where slurry is disposed of by spreading on the farm, there is a standard requirement for four months storage capacity, unless it can be demonstrated by means of a Farm Waste Management Plan that less than four months storage will result in no greater risk of pollution. If this is considered likely, the Plan should be discussed with the D.A.F.F. with a view to reducing the storage requirement.

A comprehensive Waste Management Plan would include the following steps:
a) Identify the Waste Production Pattern
b) Prepare a Land Availability Schedule
c) Match Waste Production to Land Availability
d) Calculate Size of Store Required

IDENTIFY THE WASTE PRODUCTION PATTERN

2.2 The wastes should be classified to identify the type, quantities and nutrient content so that a pattern of waste production can be drawn up.

2.2.1 Type of Waste

Livestock Excreta and Bedding
Contaminated Yard and Floor Washings
Contaminated Rainwater
Silage Effluent and Feed Residues
Dairy Washings and Rejected Milk
Farm Chemicals
Sheep Dip and Veterinary Medicines
Other Effluents

2.2.2 Quantity of Waste

Quantities of each type of waste are calculated from current published data which is relevant to the systems of production used on the farm and adjusted if necessary. (Refer to Appendices 1, 11 and 111)

2.2.3 Content of Plant Nutrients

Available nutrients should be estimated from current published data supported by representative sampling of the wastes from time to time.

2.2.4 Waste Production Pattern

A pattern of waste production should be drawn up to show at which time of year each type of waste is produced, in what quantities and what plant nutrients are available to the time of land spreading.

PREPARE A LAND AVAILABILITY SCHEDULE

2.3 An annual schedule for application on available land should be prepared based on the annual cropping programme, land suitability, and meteorological data.

2.3.1. Annual Cropping Programme

The annual cropping programme determines when land is available for the application of livestock and other wastes. Consideration should be given to cropping pattern, cropping calendar, or seasonal uptake of nutrients by the crops.

Cropping Pattern

The cropping pattern refers to the annual pattern of different crops grown on the farm (ie the rotation), and provides an indication of the area available.

Cropping Calendar

The cropping calendar refers to the different stages of growth of each crop and the periods when there is no crop cover, ie time of land availability

Seasonal Uptake of Nutrients

There is a higher risk of water pollution from leached nitrates if livestock wastes with a high percentage of their nitrogen content in soluble form, such as slurry and poultry manure, are applied when nitrogen uptake by crops is low or non-existent. Nitrate leaching following applications of farmyard manure, which contains most of its nitrogen in an insoluble organic form rather than a soluble form, is much less sensitive to the time of application.

2.3.2. Land Suitability

The land suitability for application of livestock wastes is determined by farm topography and soil type and condition. This is outlined in more detail below.

Proximity of Watercourses and Sensitive Habitats

An untreated strip at least 10m wide should be left beside all watercourses to reduce the risk of direct contamination. Field irrigation systems should be operated so that there is no possibility of the spread pattern reaching within 10m of a watercourse. Care must also be taken to minimise the risk of wind drift to open water.

By leaving uncultivated strips of land adjoining watercourses and other sensitive habitats (eg ponds, wetlands, botanically rich pastures etc) to act as a buffer between these areas and land under cultivation, the nutrient content of agricultural run-off can be reduced and a valuable wildlife habitat provided. The effective width of the uncultivated margin will depend on topographical and/or soil characteristics.

Farm wastes, fertilisers or pesticides should not normally be applied to land within a National Nature Reserve or an Area of Special Scientific Interest, without prior notification to and agreement with the Department of Agriculture, Fisheries and Forestry and Manx National Heritage. Waste disposal should not be carried out on land which is subject to nutrient application restrictions under an Environmental agreement.

The statutory nature conservation sites (ASSI's, NNR's and other such designated areas) are likely to be highly sensitive to agricultural pollution, and particular regard should be paid to careful agricultural practice in the total catchment areas for such sites.

Proximity of Water Supply Sources

Disposal sites for livestock wastes in proximity to public water supply sources, either surface or underground, are likely to be restricted by water authority bylaws preventing pollution of the water source. An unpolluted zone around the source will usually be required. The cordon-santaire should generally be a minimum of 50m but the extent of it will vary. The land may also be unsuitable for application of livestock waste where it drains directly into a water supply channel or aqueduct, or even where it lies in close proximity to an enclosed storage tank.

Private water sources are not protected by bylaws, but account should be taken of these when considering land suitability for livestock waste disposal, in order to prevent contamination. Such sources are common in rural areas.

No application of waste should be made within a 50m radius of a spring, well or borehole which provides water for drinking, domestic, or commercial use.

Slurry should not be spread on any land forming part of a water supply catchment where Cryptosporidium has been identified.

Many farms will have areas of rough grazing which may be suitable for land application of livestock wastes. However, many of these rough areas provide valuable habitats for wildlife and some have a rich and diverse mix of botanical species. Such areas might include unimproved pasture (moorland, wet grasslands, hay meadows) uncultivated field headlands and mires. Given the possible nature conservation value of such areas, advice should be sought from the Department of Agriculture, Fisheries and Forestry before using them for the disposal of farm wastes.

Rough ground may also contain sites of archeological interest, some of which may be protected as Scheduled Ancient Monuments, and all of which are of conservation interest. Advice should be sought from Manx National Heritage.

Rough ground which is unsuitable for land-spreading equipment obviously cannot be considered in the Waste Management Plan.

Sloping Ground

The application of waste on sloping ground should be carried out with care due to the risk of run off entering a watercourse. The soil type and condition, gradients adjacent to water courses, weather conditions, in particular the likely conditions that may exist in the days following application, and the soil cover must be taken into account. Application rates can then be adjusted to match the conditions.

Risk of Flooding

Flooding of low lying fields in relation to water courses can occur at certain times of the year. Disposal to these areas should be avoided when there is a risk of flooding, especially in the weeks following application.

Groundwater

Applications to land can pollute water in underground strata. The risk applies to any field where permeable soils directly overlie water-bearing formations, especially where there is a high water table or where the underlying rock formation is fissured.

Field Drains

Fields with effective land drainage systems can present a risk of pollution as, under some conditions, liquid waste can gain direct entry to the drains and from there to watercourses. There is a higher risk where the drainage system has only recently been installed and in particular where permeable backfill has been used.

Other soil disturbance such as moling or subsoiling also increases the risk. Liquid waste should not be applied to such areas until the land surface has settled and the risk of direct entry of waste to the drains is reduced.

Soil Conditions

The quantity of liquid waste that can be applied to an area without causing surface run off with the subsequent risk of pollution is a function of soil type, soil moisture content, infiltration rate and surface gradient. As the permeability and infiltration rate of a soil decrease and the surface gradient increases, the greater the risk of surface run off. To minimise this risk, liquid waste should not be applied at rates greater than the infiltration capacity of the soil and at no time during periods when a soil is waterlogged.

The use of heavy, fully laden tankers in wet conditions increases the risk of soil compaction and smearing, which will reduce the infiltration capacity of the soil and increase run-off.

Soil Nutrient Status

Livestock wastes should be applied in amounts such that the nutrient content, particularly the nitrogen and phosphorus, can be utilised by growing crops. Detailed fertiliser recommendations including the contribution from livestock wastes can be obtained from the Department of Agriculture, Fisheries and Forestry. Excessive application rates will result in high concentrations in the soil and an increased risk of water pollution.

Note : Possible Nuisance Caused By Smell : Spreaders or irrigators that spread the slurry without throwing it up into the air and produce large drops, will help reduce the chance of causing a nuisance by smell when slurry is spread. Applying the slurry straight onto the surface or injecting it into the soil can reduce this problem even more.

2.3.3. Meteorological Data

Rainfall Pattern and Quantities

The design of any livestock waste system which includes contaminated rainwater is dependent upon not only the annual rainfall but also its distribution throughout the year. This is essential information for calculating requirements for both long and short term storage.

Frozen Ground Conditions

The application of liquid and semi-liquid livestock wastes to frozen ground presents a high risk of run-off and should be avoided.

Periods of Snow Cover

Similarly, liquid and semi-liquid wastes should not be applied to ground with snow cover as there is a high risk of run-off during the subsequent thaw.

Wind Direction and Force

Wind direction and force will dictate days when spreading should be avoided to prevent air pollution from drift and odour affecting residential and other sensitive areas.

2.3.4 The proposed application site must be inspected before work commences to ensure it is in a suitable condition. During and after application, frequent inspections should be made to ensure that ponding or run-off is not occurring.

MATCH WASTE PRODUCTION PATTERN TO LAND AVAILABILITY

2.4 Calculating the total amount of waste which can be safely disposed of to land is central to a Farm Waste Management Plan. From the above criteria, a Plan for the whole farm can be produced for any given farm waste system.

As part of the Plan the equipment for land application and handling should be considered and possibly re-specified to maximise land availability and flexibility in the system.

All application machinery should be suitable for the type of slurry or effluent involved and capable of producing a reasonably even spreading pattern over the appropriate range of application rates.

2.4.1 Tanker Systems

Care should be taken to avoid overfilling tanker systems. Spillage during filling, transit and unloading must be avoided at all times.

Water added to make the slurry easier to handle, increases the number of loads required.

The operator should be aware of the factors which influence application rate, be able to determine application rate and change the spreading rate according to the characteristics of the slurry, field conditions and weather.

The spreading system should be set so as to produce a low trajectory spreading pattern and reduce the atomisation of slurry. This will minimise the risk of odour nuisance.

The tanker should not cause excessive soil compaction. Compaction is minimised by reducing the load on each wheel so minimising payload and by spreading the load eg by fitting large tyres.

2.4.2. Irrigation

Irrigation systems require regular checking to relocate the rain gun or sprinkler or change the speed of a mobile irrigator to avoid over-application. Frequency of moving will depend on the weather, soil characteristics and condition, slope, location and nature of the liquor being applied.

Alternative systems of storage or distribution might be required in very extreme weather conditions which may not be included in the Waste Management Plan ie prolonged periods of frosty weather.

The responsibility for operation of the system should be given to a competent person who must check the disposal area for signs of over-application, eg ponding, run-off, etc.

Mobile irrigators should shut off automatically at the end of each run.

The system should be flushed out with water after use and such water treated in the same manner as the waste.

Operators should be aware of the potential odour nuisance for any particular site and take any action necessary to minimise this risk.

2.4.3. Soil Injection

Soil type, slope and crop condition will often limit the circumstances when injection can be successfully carried out.

Avoid injection into backfill or infill over drainage systems, particularly on very heavy soils, or into subsoil below root depth, or into very light gravelly soils.

The application rate for injected slurry should not exceed 140m^3/ha (12,500 gallons/acre) or a level equating to the nutrient requirement of the following crop, whichever is lower.

Work the injector across the slope, if practical, rather than up and down the slope.

Application rates

2.4.4 Table 2 shows the maximum surface application rates which should be applied in any one application under suitable soil and weather conditions to avoid run-off and minimise pollution risk. Lower rates should be used in the event of inappropriate or difficult conditions and no effluent or wastes should be disposed of where the constraints described in 2.3 are encountered. In the event of an area being identified as vulnerable to levels of nitrate in watercourses, specific restrictions on the application rates may be introduced to limit the input of nitrogenous compounds.

Table 2 : Maximum surface application rates of wastes

Waste Material	Rate of Application m^3/ha (gallons/acre)
Slurry	50 (4,500)
Manure	50
Dirty Water	50 (4,500)
Silage Effluent 1:1 minimum dilution	50 (4,500)
Sheep Dip 1:3 minimum dilution	20 (1,800)

Repeat applications should not be made for a period of at least 3 weeks.

CALCULATE STORE CAPACITY REQUIRED

2.5 The calculation of capacity required is a matter of providing adequate storage volume to cover the periods during which land cannot accept livestock wastes but while the waste is still being produced. The calculation of the minimum size for any slurry installation must include provision for the likely quantities of rain water failing directly onto the store and on areas which drain into the store during the likely maximum storage period. (NB: The definition of "slurry" includes any liquid containing excreta.)

For typical livestock excreta production figures, refer to Appendix 1.

All liquid stores shall maintain a minimum freeboard of :

Lagoons and earth-banked compounds:	750mm
Slurry Tanks and other stores:	300mm

"Freeboard" means the distance between the surface of the stored liquid and the top of the container walls.

Where slurry is disposed of to land on the farm, four months storage capacity is required, unless the Waste Management Plan demonstrates, to the satisfaction of the Department of Local Government and The Environment, the Department of Agriculture, Fisheries and Forestry, and the Isle of Man Water Authority that a lesser capacity will result in no greater risk of pollution.

The Management and Disposal of Livestock Wastes

WHAT ARE LIVESTOCK WASTES?

3.1 For the purpose of this Code livestock wastes are substances originating from buildings and yards housing livestock and which on reaching the water, soil or air environments, may cause pollution.

HOW ARE LIVESTOCK WASTES CLASSIFIED?

3.2 Livestock wastes are generally classified by type of stock and physical form of the waste. This may be a solid, semi-solid or liquid. Solid wastes form a stable mass but can produce effluent due to normal drainage and the leaching effect of precipitation. Liquids are materials with flow characteristics and are difficult to contain. Semi-solid wastes have a tendency to slump (move due to gravity) but do not flow and are difficult if not impossible to stack; given suitable conditions there is a tendency for them to dry out and there is always a discharge of effluent. The problem in managing a semi-solid waste is to decide whether to change it into a liquid or solid form, or to provide a storage and handling system which can cope with both types of material.

Slurry can be defined as:

a) excreta produced by livestock in a yard or building; or

b) a mixture consisting wholly or mainly of such excreta, bedding, feed residues, rainwater and washings from a building or yard used by livestock or any combination of these provided such excreta is always present; and of a consistency that allows it to be pumped or discharged by gravity at any stage in the handling process.

It is important to understand this definition as it specifies the waste management systems which will fall within Regulations made under Section 8 of the Water Pollution Act 1993.

MINIMISING THE RISK OF POLLUTION FROM LIVESTOCK WASTES

3.3 There are four stages during any of which pollution can occur; production, collection, storage and disposal. In each the emphasis must be on containment of the waste. At all times the quantity of materials to be handled must be minimised. Always separate uncontaminated drainage from contaminated and minimise uncovered area to which stock have access. Where clean water has to be added to waste as an aid to handling, always use as little as possible. Use previously contaminated liquids or recycled liquids where feasible.

The risk of pollution occurring is greatest in liquid systems, reducing as the proportion of solid material increases.

Within any of the phases there may be some element of biological or physical treatment of the waste which will change its physical form and aid in its management.

THE COLLECTION OF WASTES

Animal Housing

3.4 Where livestock are housed on a solid floor the waste will be collected with litter and allowed to accumulate (eg deep litter, bedded courts) or removed at frequent intervals from the floor. Where the stock are confined to perforated or slatted floors the waste will pass through the floor into a holding tank where it may be allowed to accumulate or be removed to a store at regular intervals. In some housing systems the floor area may be divided into designated areas where livestock either rest, feed or drink. These areas may be slatted or solid floored.

The solid floored area in all systems should be designed to drain to a collection point. In some situations it may be necessary to consider a tank to collect contaminated washwater (eg in poultry and pig housing).

The effluent from a cowhouse must be collected and stored as it is defined as slurry under this Code of Practice.

3.5 Livestock Yards

Collection yards, feed passages and areas used for movement of stock will become contaminated with slurry, bedding, feed residues and rainwater. Whether these areas are roofed or unroofed they must be designed so that all drainage can be contained and collected within the area to which the stock have access. Where appropriate solid barriers may be required between relatively clean and dirty areas. It is important that drainage from clean areas such as roof rainwater and unsoiled concrete areas does not mix with dirty water. Avoid large unroofed areas and keep rain water in sealed systems. By keeping clean and dirty water separate the volume of dirty water/slurry is reduced.

FEED PREPARATION AREAS, PARLOURS, DAIRIES ETC

3.6 Washings/run-off from these areas is likely to be highly polluted and must not be discharged to a watercourse.

Feed preparation areas which are unroofed or are used for short term storage of brewers grain and similar materials can be sources of relatively large amounts of effluent. Unroofed areas are a high risk during periods of rainfall. Where it is not feasible to collect the effluent in existing storage facilities a tank should be provided. The tank must not be allowed to overflow. The contents can be disposed of to land or transferred to the main waste storage system.

The design, construction and management of dairy buildings must comply with the Dairy Products (Hygiene) Regulations 1997.

The Parlour standings and parlour pit must be included in the design of the drainage and containment system. In both areas the washings may be contaminated with milk residues and chemicals. Land spreading is in nearly all cases the only available method of disposal. This may be separate from or included in the slurry disposal system. In the latter case the volumes produced must be included in any calculation of the slurry storage capacity. Insofar as it is practical, raw milk should be kept out of the parlour pit and dairy drainage unless disposed of to the slurry system.

Where the proportion of parlour and dairy drainage is high in relation to the slurry storage capacity, consider the possibility of direct land disposal where soil and weather conditions allow. In general some storage capacity will be required as a buffer.

Application to land should be made in accordance with the principles set out in Section 2.

SLURRY RECEPTION PITS AND TRANSFER CHANNELS

3.7 Where possible, keep the distance between the animal housing and the slurry store to a minimum. It is not always possible to site the main storage facility adjacent to where the wastes are produced and some form of transfer system is required. This may be a mechanical or gravity system, depending on the site.

In both instances some form of reception pit will be required to receive the slurry. Where a channel is used to take the slurry to the main storage facility by gravity any restrictions in cross sectional area and sharp changes in direction should be avoided. These can impede the flow of thicker slurry and restrict agitation. Pipes can be used but the size must suit the type of material carried. The higher the dry matter of the slurry the larger the pipe diameter required.

A reception pit must have sufficient capacity to hold 2 days maximum production from the area which it serves, including any washings or rainwater. From a practical standpoint this is only satisfactory where a permanent pump with integral drive is installed in the pit, otherwise a tractor may have to be available on a daily basis. In the latter situation at least one weeks storage is necessary and in many instances 3 or 4 weeks is desirable.

Where slurry is scraped directly to the store the design should minimise the areas of concrete which can become soiled.

Where slatted tanks are used, the slurry should never be allowed to rise to slat level before removal.

DESIGN

3.8 The bases of slurry stores and the walls and floors of any effluent tank, reception pits, channels and pipes must be impermeable and properly maintained so as to prevent pollution. British Standard 5502: Buildings and Structures for Agriculture - Part 50, Code of practice for the design, construction and use of storage tanks and reception pits for livestock slurry (1993), should be referred to for design guidance.

Where a channel or reception pit connects by pipe and can overflow to another container of lesser capacity, two valves must be fitted in the pipe to minimise the risk of overflow should failure in the operation of one of the valves occur. These valves must be kept locked when not in use.

All channels and reception pits must be covered or fenced and access openings for pumps and slurry should be guarded to prevent accidents. Covers must be designed to carry the loads to which they will be subjected. (For HSE guidance refer to Appendix VII).

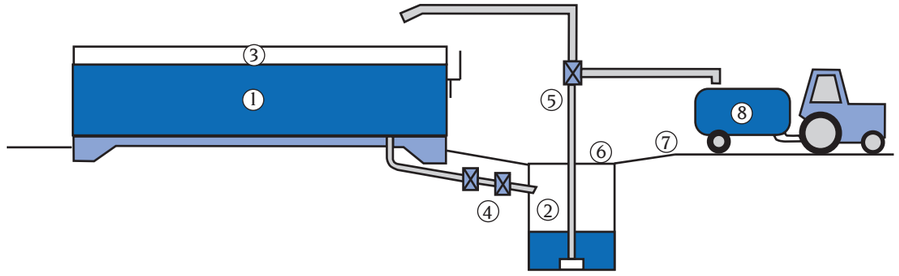


Figure 1. Circular above ground slurry store with reception pit

1 Above ground circular store.

2 Reception pit.

3 300mm, minimum freeboard maintained at all times.

4 Connecting drainage pipe fitted with two valves-locked when not in use.

5 Slurry transfer pump.

6 Load bearing covered.

7 Area around reception pit sloped to collect spillage.

8 Tanker spreader.

*store and reception pit designed to BS5502

STORAGE OF LIVESTOCK WASTES AND DIRTY WATER

3.9 The type of storage facility selected for any situation is directly dependent on the physical characteristics of the waste. The waste itself can be altered by treatment, for example by separation of the solids and liquids or by addition of liquid.

LIQUIDS are stored in above or below ground tanks. These are constructed of steel or concrete, or may be earth banked compounds. The container must be impermeable. A typical arrangement is shown in figure 1 (see page 23).

SEMI-SOLIDS are stored in below ground tanks, earth banked lagoons or in weeping walled middens. The semi-solids or mixtures of semi-solids, slurry and solid materials are simply stored en masse. Where the store contents are to be handled as a liquid adequate access for agitation must be provided. In situations where the contents are removed partially as a liquid and partially as a solid, suitable access must also be provided for equipment to enter the compound.

In tanks and lagoons some form of filter system may be used to separate liquids and solids. These filters may be a permeable dividing wall of timber or concrete battens or smaller mesh strainer boxes through which liquid drains by gravity. In the latter the liquid is removed frequently by pump and may have to be stored, while in the former the capacity for liquid can be much larger, so frequency of removal and disposal is reduced. Screens/ filters should be inspected regularly for damage and blockage problems. Drainage from the separated solids should be directed back into the system and all spillage must be properly contained.

In weeping wall middens one or more of the walls are permeable and over a long period the mass of waste material drains, the liquid passing through the permeable wall to a collecting channel. The effluent is collected in a tank.

Solids/liquid separations systems which operate by natural seepage are extremely slow and do not work successfully until evaporation exceeds precipitation. Such systems will therefore require storage for at least a season.

SOLIDS are stored in middens or dungsteads which must be properly drained and the effluent collected in a tank. The floor and any walls should be impermeable. In calculating the size of the tank, take account of rainfall likely to fall on the store and on the area draining to the store.

Temporary field storage can be used provided there is no risk of water pollution. Such stores should not be sited within 10m of any watercourse which run off could enter or within 50m of a spring, well or borehole that supplies water for human consumption or is to be used in farm dairies. The site should be fenced to exclude livestock.

PLANNING AND SITING

3.10 In planning any waste storage facility priority should be given to factors which lead to the prevention of pollutants escaping from the site.

In selecting the site consider:

- the risk of pollution if slurry or effluent accidentally escape, including the risk to the public and private water supply sources in the locality;
- the storage facility should not be sited within 10m of any inland or coastal water which any leakage or spillage could enter;
- a position close to the point of production of the waste;
- making best use of relative ground levels for loading and unloading the store;
- the provision of good access for handling equipment;
- the safety of personnel and stock;
- the necessity to avoid made up ground to carry load bearing elements of any structure unless the fill is specified as part of the overall design;
- the production of odours;
- visual exposure and screening.

DESIGN

3.11 Facilities must be designed to contain the materials which are stored in them or may drain from them. Some facilities, such as tanks for liquid storage must be totally impermeable to liquids while middens may have a perimeter drain connecting to an effluent storage tank. A slurry store should be designed and constructed so that with proper maintenance it may perform for the design standards for at least 20 years. Such a performance requires professionally prepared plans and specifications. Where prefabricated materials or units are used certification of design performance may have to be obtained from the supplier.

Gradients around pumps, pipes and tanker loading areas must be designed to contain any spillages and also to minimise the collection of clean stormwater.

CONSTRUCTION

3.12 The ground bearing capacity of a site must be capable of carrying the necessary loadings to avoid structural failure due to settlement. All topsoil must be removed to a firm base and hard-core laid in well compacted layers to form the necessary gradients. Where ground requires to be made-up, professional advice should be obtained as it may be necessary to use a lean concrete mix for specific areas.

To prevent pollution of controlled waters, a high standard of workmanship is required. The contractor should be experienced in the use of concrete. In particular;

a) The area of concrete to be laid in a single pour, between joints and water stops

b) The setting up of levels to provide adequate drainage

c) The placing of reinforcing steel, the setting up of shuttering and the formation of joints

d) The specifying, placing and curing of concrete

e) The sealing of joints including waterstops and the application of surface treatments

f) The installation of impermeable membranes in certain circumstances.

Where midden walls are formed with prefabricated panels the supporting columns should be set in concrete foundations and steps must be taken to ensure there is no effluent leakage at these points. Where the columns are removable for access particular care must be taken with the socket detail.

When substantially extending or reconstructing storage tanks the resulting structure must prevent the pollution of controlled waters. It will therefore be essential to seek professional guidance on the practicability of such an exercise prior to making a commitment to any work. In some instances upgrading may be impractical due to the lower design criteria used in the original structure.

MANAGEMENT

3.13 Management of any facility for the handling and storage of animal wastes and other polluting wastes must be considered with two aspects in mind:

- Maintenance to retain satisfactory performance requirements.

- Operational management.

These functions are the responsibility of the person having custody or control of the facility.

a) Maintenance

Insofar as it is practicable, all facilities must be inspected regularly for any signs of surface breakdown, cracking of concrete and fractured pipes.

SAFETY NOTE : Harmful gases are generated at slurry stores and these have been responsible for both human and animal deaths. It is essential that controls for pumps are situated so that they can be started and stopped without the need for the operator to enter buildings which have a potential to contain harmful gases. Such buildings should be well ventilated before entering. If it is absolutely essential to enter an area which may be contaminated by gas, operators should wear either an approved self-contained or airline breathing apparatus. Full training must be given in the use of this equipment before it is used. A notice should be erected at slurry stores warning of the danger of poisonous gas and that stores should not be entered without taking the recommended precautions.
(Refer to Health & Safety Publications Appendix VII)

The following is a suggested procedure which should be carried out at least at annual intervals.

- Clean any surfaces which cannot be clearly seen
- inspect walls and floors for cracking and surface erosion. Only the exposed external surfaces of slurry tanks should be inspected (see above)
- Inspect all drains and channels for damage or deterioration
- Check that all channels and pipework are free flowing
- Check all safety arrangements
- List all repairs required and prepare a timetable to execute the work. This may involve diverting materials to other storage or providing temporary arrangements.

b) Operational Management

- Carry out regular and spot checks at points where leakage may occur, such as joints in pipework connected to pumps.
- Check that external drains are running freely and not contaminated.
- Check automatic pumping systems and carry out routine maintenance. Pumping systems which can be removed from a tank for inspection are most convenient and essential in situations where poisonous gas may be present.
- Check tank storage levels at a frequency appropriate to its capacity.
- Check freeboard in tanks particularly after periods of heavy rain.
- Check parts of systems which may freeze during cold spells.
- Check tanks for the separation of contents which may lead to the build up of solids and loss of storage capacity. Above ground tanks require regular attention where surface drying can cause crust formation.
- Check all safety hatches etc after handling operations.

Persons having custody or control of slurry have the responsibility for making those who act on their behalf aware of the danger of allowing storage systems to overflow and the consequences should pollution occur. Adequate training in the proper use of facilities and associated equipment is essential. The dangers likely to be encountered from moving parts on equipment and the presence of poisonous gases particularly from tanks within buildings during mixing of slurry must be emphasised. In slatted courts it is preferable to remove stock housed over the slats and to ensure that the shed is well ventilated prior to and during slurry agitation. Avoid the storage of both silage effluent and slurry in the same tank at the same time as this can increase the risk of poisonous gases.

DISPOSAL OF LIVESTOCK MANURES AND SLURRIES AND DIRTY WATER

3.14 Livestock wastes should be disposed of to agricultural land in accordance with the principles set out in Section 2. The surface application rate should not exceed 50m^3/ha (4500 gallons/acre) and any repeat application should not be made within 3 weeks. The application rate for injected slurry should not exceed 140m^3/ha (12,500 gallons/acre) or a level equating to the nutrient requirement of the following crop, whichever is the lower.

Although the risk of causing pollution by spreading solid manures is lower than for slurries, surface run-off can occur if rain fails shortly after an application. Surface application rates for solid manures should not exceed 50 tonnes/ha (20 tons/acre) and should be lower where soil and weather conditions are likely to increase the risks of pollution. Poultry manures should not be spread at rates exceeding 5-15 tonnes/ha (2-6 tons/acre) depending on nitrogen content. The input of available nitrogen should not exceed the requirements of the following crop, taking account of time of application and the residual value in the soil from the previous application.

The maximum rate of application should be reduced if the soil has been compacted.

Where there is insufficient suitable land for disposal on the farm, alternative disposal options, such as waste treatment or the use of suitable neighbouring land, will require to be considered.

Fertilisers

INTRODUCTION

4.1 The risks of direct contamination of water by fertiliser either by leakage from store, field run off or direct application to surface water must all be considered on the farm. Avoiding unnecessary nitrate leaching is important when planning fertiliser use. (Refer to Section 5)

The calculation of inorganic fertiliser requirements should form part of an integral Fertiliser and Waste Management Plan for the whole farm.

FERTILISER PLANNING

4.2 Crops require adequate amounts of plant nutrients to ensure optimum yields. Nutrients may be supplied by commercial fertilisers alone or with waste organic manures which are potentially valuable sources of plant food.

4.3 Application rates of inorganic fertiliser should match crop requirements taking account of soil nutrient status and any organic manures applied. Advice on application rates can be provided by D.A.F.F.

4.4 Nitrogenous fertilisers should be applied at times when the crop can utilise the nitrogen. Application of nitrogenous fertilisers should normally be avoided between 1 October and mid February except when there is a specific crop requirement.

In the absence of active crop growth in winter, nitrates in soil leach readily in drainage water. In some years a late winter application (normally mid February onwards) of nitrogenous fertiliser to winter cereals is justified. This is of particular benefit to well advanced crops or after a winter of heavy rainfall. Some loss of nitrogen is unavoidable when heavy rainfall follows application.

The risk of run off and denitrification is increased in compacted soil. Compaction also reduces the rate of nitrogen uptake by the crop.

STORAGE AND HANDLING OF FERTILISERS

4.5 Fertiliser stores should be sited as far away as practicable from any watercourse, well, borehole or drain. Bye-laws for the protection of public water supply sources may impose specific restrictions on using or storing fertilisers within a stated distance from the source. Storage containers for liquid fertilisers should be lock secure, (ie capable of being securely locked) of suitable construction for the intended purpose, watertight and treated with a protective coating resistant to corrosion from the contents.

4.6 Handling procedures for filling stores from road tankers and for transferring liquids to the field applicator should be such that the risks of accidental spillage are minimised. Tanks should not be overfilled, to allow for expansion of the contents. Operators should be aware of these procedures, the potential pollution problems arising from spillage, and of emergency procedures to be followed.

LAND APPLICATION METHODS

4.7 Fertiliser must not be allowed to enter watercourses. Special care is needed when applying any inorganic fertiliser on fields with a risk of run-off to surface water. Fertilisers should not be applied when the soil is at field capacity, frozen hard or snow covered. In general, run-off risk is greatest in winter.

4.8 Precautions must also be taken to prevent the direct entry of fertiliser to watercourses during application. Public water supply bye-laws may impose a limiting distance from a source, either surface or underground, within which fertiliser may not be applied. In any case a protection zone for all water sources, public or private, should be allowed when applying fertiliser. The radius of the zone will depend on the likelihood of contamination but 50m might be appropriate in typical situations. Full width distributors will generally present no difficulty in regulating the application of fertilisers as long as operated carefully. Spinning disc and oscillating spout machines present greater difficulty in ensuring that the optimum application rate is applied up to the field edge and this can result in some fertiliser being applied to an adjacent watercourse.

Some machines can be adjusted by fitting headland discs or tilting on the tractor linkage to avoid this effect. Where this is a risk, the machine must be driven further from the water course, leaving a zone of zero or decreasing application rate adjacent to the water. Liquid fertiliser applicators should be operated to avoid wind drift of droplets into watercourses.

Similar precautions should be taken to prevent contamination of areas of conservation interest on farms and on adjoining land, such as National Nature Reserves (NNR) or Areas of Special Scientific Interest (ASSI)

4.9 By leaving uncultivated strips of land adjoining watercourses and other sensitive habitats (eg. wetlands, botanically rich pastures, etc) to act as a buffer between these areas and land under cultivation the nutrient content of the agricultural run-off can be reduced and a valuable wildlife habitat provided.

Nitrate

INTRODUCTION

5.1 Nitrate leaching is a natural process resulting in the loss of nitrogen from soils. This can be attributed to:

a) mineralisation of the soil's organic reserves, exacerbated by soil cultivations
b) direct run-off to watercourses
c) leaching to groundwater and watercourses.

The amount of nitrogen lost in the form of nitrate depends on the weather, soil type, soil temperature, season, cropping and farming practice.

The concerns about increasing amounts of nitrate in watercourses relate to:

a) the environmental implications of nutrient enrichment (eutrophication). This can lead to the formation of algal blooms in watercourses and the sea which result in oxygen starvation with severe implications for aquatic life.

b) the public health implications of higher levels of nitrate in drinking water supplies. The EC limit of 50mg/1 is the maximum acceptable concentration of nitrate in drinking water, and has been adopted by the Isle of Man Water Authority since 1993.

Section 9 of the Water Pollution Act 1993 contains powers for the designation of Nitrate Sensitive Areas where it is considered appropriate to control the entry of nitrate into water. The D.L.G.E and D.A.F.F. are responsible for promoting areas for designation by Tynwald. There are as yet no such areas in the Isle of Man but nitrate concentrations are being carefully monitored and the position kept under review.

The measures described in this Code are considered Good Agricultural Practice to minimise the risk of nitrate release to watercourses. However, should particularly sensitive bodies of water be identified, then the protective measures necessary in the catchment may go beyond those described in this Code.

This Code meets the requirements as to good agricultural practice as described in the EC Directive (91/676/EEC) concerning the protection of waters against pollution caused by nitrates from agricultural sources (1991).

MEASURES TO REDUCE NITRATE RELEASE

5.2 The following measures should make a significant contribution to reducing nutrient losses from agricultural land.

a) Avoid ploughing up permanent pasture - this cultivation triggers a flush of nutrient release due to the breakdown of decaying and dead plant material which can continue for several years.

If permanent pasture requires to be reseeded, this should be done with the minimum of cultivation as early as possible in the season so as to ensure that full crop cover is established before the end of the growing season.

b) Grass leys grown as part of an arable crop rotation should be sown to the first crop as early as possible in the final year of grass.

c) Reduce autumn cultivations by direct drilling of crops, where possible. Nitrate leaching from direct drilled crops may be only half that from conventional ploughing.

d) Where possible, sow winter cereals early to provide a growing crop to use some of the residual soil nitrate in the autumn and so reduce leaching losses. Early sowing encourages more of the residual nitrate overwinter to the crops where it will not be vulnerable to leaching loss.

If possible, cover or catch crops should be sown in fields that would otherwise be bare over autumn and winter.

e) Incorporate crop residues such as cereal straw and stubble, which do not contain a lot of nitrogen, rather than burning. The microbial growth induced by incorporation can modify levels of inorganic nitrogen and/or cause denitrification.

Crop residues which do contain a lot of nitrogen, such as those from non cereal and vegetable crops (eg peas or oilseed rape), should not be mixed into the soil until immediately before the next crop is sown.

f) The timing and rate of nitrogen applications should match crop requirements, taking account of existing soil nutrient status. Due to the different forms of nitrogen and the rate of availability to the crop, the risks of nitrate loss by leaching from organic manures and slurries and from inorganic fertilisers can vary. Organic manures which contain a large amount of their nitrogen content in the available form should be applied at a time when this can be used by the growing crop. Slurries from cows and pigs, poultry manures and some liquid sewage sludges have large amounts of available nitrogen.

To reduce the risk of nitrate leaching, applications to arable land in the autumn or early winter should be avoided whenever practicable.

Organic manures containing only small amounts of their nitrogen in forms that are easily converted to nitrate, such as farmyard manure and sewage sludge cake, may be applied at any time.

Similarly, inorganic fertilisers should be applied timeously and at appropriate rates to match crop requirements taking account of other sources of nitrogen input. Applications above the economic optimum increase the amount of nitrate leaching likely to occur. Advice on appropriate fertiliser applications and the nutrient value of livestock slurries can be obtained from D.A.F.F.

Applications should be in accordance with the principles set out in Section 2.

Records of the amount and date of applications of fertilisers, livestock wastes and other organic wastes will help accurate calculations of future nitrogen fertiliser requirements. Such records should form part of an integral Fertiliser and Waste Management Plan for the farm.

Whenever nitrogen fertiliser is being spread, care should be taken to apply it accurately, at the correct rate, avoiding overlaps and uncropped areas, hedges and watercourses. Fertiliser spreaders should be carefully adjusted to apply the amount intended and the spread pattern should be tested regularly.

g) Where intensive grazing is practised, up to 90% of the nitrogen is returned to the land resulting in high concentrations of available nitrogen. The loss of nitrate from the grassland through leaching can therefore be high. To decrease the risks, the stocking rate should be reduced in the autumn months.

h) Avoid over compaction of the soil. Compaction increases denitrification and decreases the rate of nitrogen uptake by the crop.

Other Organic Wastes

INTRODUCTION

6.1 This Section covers other organic wastes generally disposed of by application to farm land. The risk of pollution is similar to livestock wastes. The vast majority of organic compounds are broken down in the soil often, but not always, into harmless substances. The application of wastes to land must avoid risks to water supplies, the food chain or of creating nuisance such as unpleasant odours. Where appropriate, application rates should be controlled to minimise these risks, in particular the build-up of elements which may have a deleterious effect on soil structure and fertility or on flora and fauna.

SEWAGE SLUDGE

6.2 Consideration should be given to the Code of Practice for the Agricultural Use of Sewage Sludge (DOE, HMSO 1989) which applies to the disposal of sewage sludge to agricultural land. The purpose of the Code is to identify practices, etc. which control the build-up of potentially toxic elements in soil and to restrict the planting, grazing and harvesting of certain crops following the application of sewage sludge. Analytical testing of the sludge and the soil should be carried out by the sludge producer prior to application to land.

6.3 Sewage sludges contain nitrogen and phosphorus, but little potassium. Accumulations of nitrate and phosphate are a potential cause of water pollution. When applying sludge to land, the quantity applied should take full account of the fertiliser requirements and nutrient up-take of crops to be grown on that land, and of any additional inorganic fertiliser inputs.

6.4 The application of zinc, copper, nickel, cadmium, lead, mercury and chromium should be subject to restrictions. These include both the rate of application and ultimate concentration in the soil (Appendix IV) in samples taken to a depth of 25cm or the depth of soil if less. In addition, the UK Code of Practice recommends limits for molybdenum, selenium, arsenic and fluoride (Appendix IV). These limits have been set to take into account phytotoxity, zootoxicity, and effects on the food chain and on soil processes. As such they are subject to review in the light of new information which may become available.

6.5 The UK Code also provides recommendations for the maximum concentration of contaminants in soils under grass which should be sampled to a depth of 7.5cm. These are intended to limit the risk to grazing stock by soil ingestion and to lessen the phytotoxic risk to plants whose roots may proliferate in this surface layer. if these concentrations are exceeded at 7.5cm, the soil should be cultivated to dilute the metals before further applications are made.

6.6 The on-farm storage of liquid sludge is not recommended but if practised, an equivalent standard to that for livestock slurries is required. Dried sludges stored on-farm should be covered and care should be taken to avoid sites over drains, within 10m of a watercourse, or within 50m of a water supply source used either for human consumption or in farm dairies. In the case of public water supply sources, further restrictions on the storage of sludge may be included in general provisions enforced by the isle of Man Water Authority and will require to be observed.

6.7 Liquid sludge is available in raw and digested forms. Raw sludge can contain potentially harmful m icro-organ isms. It should not be allowed to contaminate water or crops that may be eaten uncooked. Liquid untreated sludge should not be applied to pasture except by soil injection.

The criteria for application are as for livestock slurries. Under no circumstances should sewage sludge be applied, by whatever method, to areas where there is a very high risk of water pollution. Surface application rates should not exceed 50m31ha (4500 gallons/acre) of liquid sludge, or 50 tonnes/ha (20 tons/acre) of dewatered sludge at any one time in areas where there is a risk of pollution. Where soil injection is practised the application rate should not exceed 140M3/ha. Repeat application should not be made within 3 weeks. The spreading of sewage sludge on soils with a pH less that 5.0 should not be undertaken as the acid condition of the soil will cause any heavy metals contained within the sewage sludge to be released more readily into groundwaters and into the environment.

Solid Sludge cake contains very little nitrogen in the ammoniacal form. Timing of application is not therefore critical and the criteria for disposal of solid manures apply.

To minimise the risk to human and animal health and damage to plants, sludge applications should be co-ordinated with planting, grazing and harvesting operations. Sludge must not be applied to growing fruit and vegetable crops, used where crops are grown under permanent glass or plastic structures. Untreated sludge must not be used in orchards or on land used for growing nursery stock (including bulbs). Further constraints which must be taken into account are set out in Tables 3 and 4.

As there may be a risk to human health, operators who carry out sludge spreading work should adopt the highest standard of hygiene. Adequate first aid kits must be provided, eg at least a litre of fresh clean water should be provided to irrigate eyes in the event of contamination.

Table 3 Acceptable uses of treated sludge in agriculture.

When applied to growing crops	When applied before planting crop
Cereals, oilseed rape	Cereals, grass, fodder, sugar beet
Grass (1)	oilseed rape etc
Turf (2)	Fruit trees
Fruit Trees (3)	Soft Fruit (3)
	Vegetables (4)
	Potatoes (4), (5)
	Nursery Stock (6)

(1) No grazing or harvesting within 3 weeks of application

(2) Not to be applied within 3 months before harvest

(3) Not to be applied within 10 months before harvest

(4) Not to be applied within 10 months before harvest if crops are normally in direct contact with soil and may be eaten raw

(5) Not to be applied to land used or to be used for a cropping rotation that includes the following:

(a) basic seed potatoes

(b) seed potatoes for export (ie to avoid risks of potato cyst eelworm)

(6) Not to be applied to land used or to be used for a cropping rotation that includes the following:

(a) basic nursery stock

(b) nursery stock (including bulbs) for export

Table 4 Acceptable uses of untreated sludge in agriculture

When applied to growing crops by injection*	When cultivated or injected into the soil before planting crops
Grass (1)	Cereals, grass, fodder, sugar beet
Turf (2)	oilseed rape ete
	Fruit trees
	Soft Fruit
	Vegetables (3)
	Potatoes (3), (4)

(1) No grazing or harvesting within 3 weeks of application

(2) Not to be applied within 6 months before harvest

(3) Not to be applied within 10 months before planting if crops are normally in direct contact with soil and may be eaten raw

(4) Not to be applied to land used or to be used for a cropping rotation that includes seed potatoes (ie to avoid risk of potato cyst eelworm)

Footnote to Table 4 : Injection carried out in accordance with WIRC publication FR 008 1989, "Soil Injection of Sewage Sludge - A Manual of Good Practice (2nd Edition)".

MILK AND DAIRY PRODUCTS

6.8 To ensure the economical use of water and to minimise the quantity of dirty water to be disposed of on dairy farms it is essential to have a Water Management Plan.

6.9 Milk has a very high BOD and therefore an extremely high potential to pollute if it reaches water. There are occasions when it is necessary to dispose of milk on the farm. This may occur when severe weather prevents collection, when cows are receiving medication (eg when being treated for mastitis) or colostrum from newly calved cows. If possible avoid discharging into the parlour and dairy drainage system when disposal is through a septic tank. Waste milk can be applied directly to agricultural land or added to the slurry storage system for later disposal as slurry.

SAFETY NOTE : As the act of physically mixing milk and slurry may give rise to lethal or explosive gases, only small quantities of waste milk should be disposed of to the slurry system.

Ideally, waste milk may be fed to livestock but it is advisable first to consult a veterinary surgeon, especially where the milk is contaminated or where large quantities are involved. Similar precautions should be taken before spreading contaminated milk on grazing land.

6.10 Milk should not be applied on sites with a high run-off risk. On suitable sites, the milk should be diluted 1:1 with water before application.

The application rate should not exceed 50m^3/ha (4500 gallons/acre) of diluted milk.

Similar considerations apply to the disposal to land of surplus whey or other waste liquid dairy products and applications should be carried out in accordance with the principles set out in Section 2.

VEGETABLE WASHINGS

6.11 These are a trade effluent and should not be discharged to a watercourse. Effluent from vegetable washings can have a high BOD and suspended solids content. Following settlement, biological treatment may be required prior to disposal. Where possible a closed circuit system should be used.

6.12 Where untreated washings are applied to land the same criteria apply as for livestock wastes. To reduce the likelihood of pollution in high risk situations, applications of dilute untreated liquids, applied directly to land by pumped irrigation systems, should not exceed:

either
a precipitation rate of 5mm/hour for manually moved sprinklers,

or
an application rate of 50m^3/ha for travelling irrigators.

Care is always required to ensure that spreading does not result in ponding or run-off or seepage to field drainage systems.

Watercourses which run-off could reach should be inspected at least daily during spreading and if pollution is found immediate action taken to terminate the discharge and notify the D.L.G.E.

In order to ensure the control of certain plant diseases it is not recommended to dispose of any solid or liquid waste obtained from processing any raw potatoes, beets, carrots, celery or celeriac, leeks, swedes or turnips imported from outside the British Isles, except on land which is not likely to be used for food production.

ANIMAL PROCESSING WASTES

6.13 It is not permitted to spread any unprocessed abattoir waste on agricultural land, with the exception of blood for use as a fertiliser.

6.14 The Animal (Waste Food) Order 1983 prohibits the feeding of livestock any unprocessed waste unless under the authority and in accordance with the conditions of a licence. Applications of such substances to agricultural land should be restricted to land which is to be ploughed immediately following application and should be carried out in accordance with the principles set out in Section 2.

6.15 To minimise risks of water pollution, blood should not be spread on high risk areas. In all other situations, blood should be diluted at least 1:1 before application. Application rates should not exceed 50m^3/ha (4500 gallons/acre) of diluted blood and should be soil injected, in the interests of good hygiene.

6.16 Application sites should be chosen with care to avoid public nuisance. Careful attention is needed to ensure that application does not result in ponding or run-off. Watercourses should be inspected during and after application. Applications should be carried out in accordance with the principles set out in Section 2.

6.17 Under the Specified Risk Material Regulations 1998 all specified material, such as head (including brain), spinal cord, spleen, intestines, etc of bovine, sheep and goat must be either sterilised and disposed of to a suitably licensed landfill site or sent to an incinerator for incineration.

EFFLUENT FROM BY-PRODUCTS

6.18 Feeds such as wet brewers' grain and sugar beet pulp will produce effluent when stored or ensiled, they should be stored and spread safely and in accordance with this Code.

Silos and Silage Effluent

INTRODUCTION

7.1 Silage effluent is the most prevalent cause of water pollution from farms. A large number of very serious pollution incidents occur each year, through failure to contain or dispose of the effluent satisfactorily. Silage effluent has a BOD, value of up to 200 times that of raw sewage.

7.2 Poorly designed, maintained or operated silos or associated effluent collection and storage facilities are the main cause of pollution incidents. Silage effluent is highly acidic and attacks concrete surfaces, causing deterioration of cracks and joints in silo floors, walls, collection channels and tanks, making it impossible to contain and collect all the effluent.

As the peak flow of effluent normally occurs within the first 2 to 3 days following ensiling of the crop and with up to 50% of the total volume of effluent produced in the first 10 days, it is essential to monitor collection tank levels regularly to avoid overflow during this period.

QUANTITIES OF EFFLUENT

7.3 The volume of effluent produced is directly dependent on the moisture content of the crop being ensiled. This in turn is dependent upon factors such as the maturity of the crop, the degree of wilting, the weather conditions, the use of additives and absorbents and whether the silo is roofed or unroofed. As Table 5 demonstrates, the typical volume of effluent likely to be produced can vary significantly with the dry matter of the crop ensiled.

Table 5: Dry matter content of grass ensiled and quantity of effluent produced

Dry Matter Content of Grass Ensiled (%)	Effluent Production (m^3/100t of Grass Ensiled)
15	33
20	22
25	11

Wilting is very desirable but is highly dependent on weather conditions at the time of silage making. The ensilage of crops with relatively high dry matter content, such as whole crop cereals, results in less effluent production, but the farmer should always be well prepared to contain, collect, store and dispose of any effluent, especially in the period immediately following ensilage. Farmers should be aware that the use of some silage additives tends to increase the amount of effluent produced. In a wet year, very high volumes of effluent have to be dealt with and greater care is required.

The objective should be to reduce the volume of effluent to a minimum and to this end rainwater failing directly on the silo cover should, if possible, be diverted and drained separately from the silage effluent. When the silo is being used, rainwater failing on the floor will become polluted and should be collected. Ideally a roof over the silo with an independent rainwater drainage system will minimise the quantities of effluent which require to be handled.

7.4 The regular monitoring of collection tank levels should be undertaken at all times but with greater frequency during the first 10 days following ensiling, to contend with peak flow rates of effluent, and during periods of wet weather. Many factors influence effluent flow such as depth of silage, efficiency of drainage within the silo and the use of certain additives.

SILAGE MAKING

7.5 As a measure to prevent environmental pollution by silage effluent, all parts of the silo should be sited at least 10 metres from a watercourse, including permeable drains (eg field drains) and open ditches, which any escaping effluent could enter.

In terms of silage making:

Making silage in free-standing field heaps without an impermeable base and effluent containment system is not recommended.

Silage should be made:

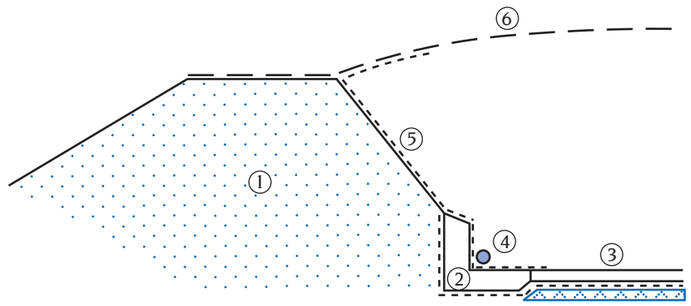
a) in tower silos which comply with BS 5061: Specification for cylindrical forage tower silos and recommendations for their use.

b) by an unbaled, bulk bagged system which uses an impermeable membrane with sealed ends that effectively prevent any effluent leaking from the bag. The minimum specification for this method is 3 ply 1000 gauge polyethylene or a material of at least equivalent impermeability and durability. The bags must be kept sealed and stored so as not to infringe the 10m rule.

c) by baled and bagged or wrapped techniques, provided they are wrapped and sealed in an impermeable membrane and are not stored or opened so as to infringe the 10m rule.

d) in earthbanked silos, providing that the base is impermeable and the walls are lined with an impermeable membrane such as 1000 gauge polyethylene or butyl rubber sheeting. An effluent collection and storage system as per (e) below, but excluding the external channel, should be provided. A kerb is necessary at the edge of the floor adjacent to the earth banks and the lining should be carried down over this to prevent any leakage of effluent into the earth banks. Temporary internal drainage pipes should be provided to aid the removal of effluent to a storage tank. (figure 2 illustrates a typical earth bank and floor relationship).

Figure 2. Typical detail for earth banked silo



1. Consolidated earth bank.
2. Concrete kerb at foot of bank.
3. Impermeable concrete floor.
4. Temporary drain.
5. Impermeable lining sheet carried under temporary drain.
6. Plastic silo cover place to shed rainwater and melting snow.

e) in a conventially constructed silo, subject to the structure meeting the following requirements:

The Silo:

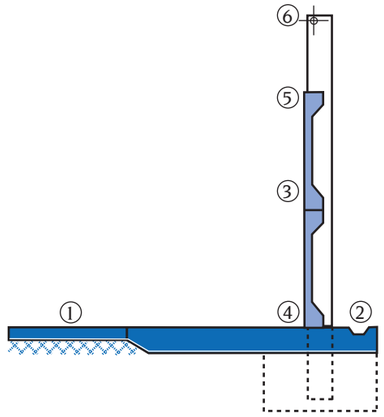
- The base and all assorted effluent tanks, pipes and channels should be impermeable. In addition they, and any silo walls provided, should, so far as is reasonably practicable, be resistant to attack by silage effluent. (see Figure 3)
- Where walls are provided, other than earth bank walls, the base shall extend beyond the walls and be provided with channels to collect any effluent which may escape. (See Figure 4)
- The collection channel must lead to an effluent tank.
- Where there are retaining walls these should be capable of withstanding minimum wall loadings as calculated in accordance with British Standard

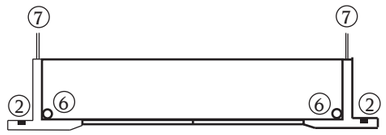
5502: Buildings and Structures for Agriculture - Part 22, Code of Practice for design, construction and loading (1987).

Figure 3. Detail of typical silo wall and floor

1. Impermeable floor slab.
2. Floor slab extended to form perimeter channel outside wall.
3. Wall of panels or reinforced concrete treated to resist attack by effluent.
4. Temporary drain.
5. Notice showing design criteria.* e.g. maximum weight of loading and maximum. weight of compacting vehicle.
6. Slight rail.

*design loadings to B55502





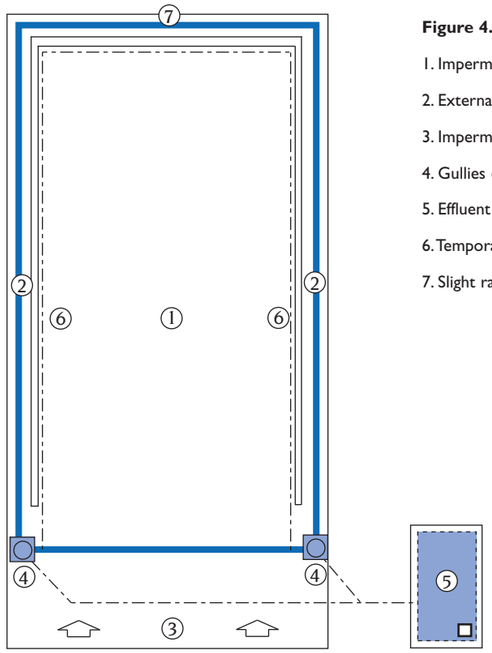


Figure 4. Typical silo layout

1. Impermeable floor.
2. External Perimeter channel.
3. Impermeable apron with fall to silo.
4. Gullies connecting channels to impermeable drain.
5. Effluent tank.
6. Temporary drain.
7. Slight rails.

The Effluent Tank – (See Figure 5)

- The walls and base of the effluent tank should be impermeable and, as far as is reasonably practicable, resistant to attack by silage effluent.
- The tank should have a minimum capacity of not less than $3m^3$ for each $150m^3$ (or part thereof) of silo capacity for a silo of less than $1500m^3$ capacity. For larger silos, the effluent tank should have a capacity of at least $30m^3$ plus $1m^3$ for each $150m^3$ (or part thereof) of silo capacity in excess of $1500m^3$.

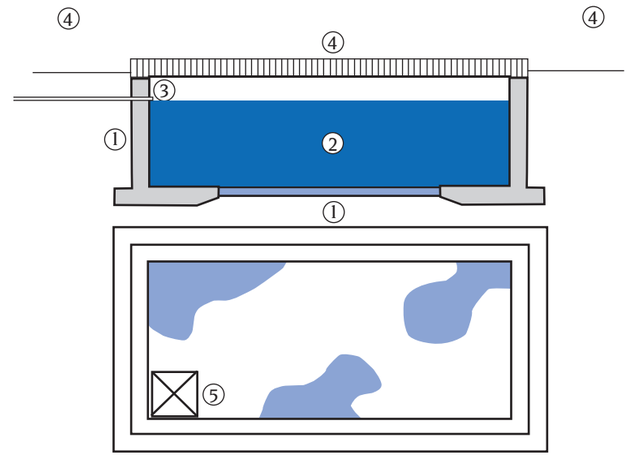


Figure 5. Silage Effluent Tank

1. Floor and Walls – impermeable and resistant to attack by effluent.
2. Effluent storage capacity related to cubic capacity of silo. Effective storage capacity equals volume of tank below level of inlet pipe invert.
3. Impermeable inlet pipe from silo drainage system.
4. Safety cover or child proof perimeter fence.
5. Manhole with locking cover for access.

*Design to BS5502

The tank capacity should provide at least 2 days storage at peak flow. However, if the effluent tank provides inadequate storage and pollution occurs this would still be an offence. The effluent tank capacities which are stated are a MINIMUM and are unlikely to be sufficient for 2 days storage for unwilted silage made in an unroofed silo. Farmers should check and empty their tanks as often as is necessary in the light of their own circumstances and experience.

Table 6. Examples of effluent tank capacity requirements

Silo		Effluent tank capacity		
(m^3)	(tonnes)	(m^3)	(litres)	(gallons)
750	500	15	15,000	3,300
1,500	1,000	30	30,000	6,600
1,800	1,200	32	32,000	7,040
2,250	1,500	35	35,000	7,700
3,000	2,000	40	40,000	8,800

If any part of the tank is below ground, it should be either prefabricated in one piece (the preferred approach) or of an alternative construction capable of meeting the requirement of being impermeable and resisting silage effluent for at least 20 years with maintenance. if the farmer intends to opt for this latter alternative, it would be sensible to discuss his proposals with the D.A.F.F. at the planning stage. In order to protect concrete tanks from attack by silage effluent, it is essential that they be lined with bituminous paint, butyl rubber, glass fibre, proprietary resin or other equivalent material. These linings should be checked at regular intervals and repaired/renewed as necessary.

7.6 The following general principles of good practice should be adopted when considering and initiating proposals for silage production on the farm.

PLANNING AND SITING

7.6.1 Silos and effluent storage facilities should be sited at least 10m from watercourses and not in a position where any escape of effluent may reach a watercourse. The risk of flooding from adjacent watercourses must also be avoided. Account should also be taken of public and private water supply sources in the vicinity.

Reasonable care must be taken to avoid sites where drains exist. If any drains are present they should be isolated and diverted or removed. Any trenches created by such works should be securely backfilled with an impermeable material. Open and permeable drains should not be situated within 10m of an part of the soil, its effluent tank or any associated pipes or channels. Drains should be provided to intercept surface water which may otherwise reach the silo or its drainage system.

In the case of open silos the amount of storm water from the cover reaching the silage or floor should be minimised. Where possible it should be removed at the opposite end to the effluent collection system.

Storm water from roofed silos should, where practicable, be led in the opposite direction to the effluent collection system and removed in downpipes connected to sealed surface water drains. These drains should be backfilled with impermeable material.

In some circumstances it may be preferable to site silos away from the farm steading where there is likely to be an existing complex of stormwater drains.

7.6.2 Design

The essential design requirements are to provide facilities which will contain the effluent produced during the making and storage of silage, to collect the effluent by means of a drainage system and lead it to a store of an adequate capacity. With proper maintenance the whole system should continue to comply with the performance standards for at least 20 years.

Professionally prepared plans and specifications for all the work are recommended so that the necessary standards are attained on any site.

7.6.3 Construction

The ground on which a silo is to be built should be capable of carrying the necessary loads to avoid structural failure due to settlement. This will involve removing all top soil to a firm base and laying hardcore in well compacted layers to form the necessary gradients. Avoid made-up ground and use a lean concrete mix for the making up of small areas.

Adequate steps should be taken to ensure that all work is carried out to a high standard. The contractor must be well versed in handling concrete on site. In particular:

a) the areas of concrete to be laid in a single pour;

b) the setting up of the levels to provide adequate drainage;

c) the placing of the reinforcing steel and the formation of joints;

d) the placing and curing of concrete;

e) the sealing of joints, including water stops and the application of surface treatments;

f) the installation of impermeable membranes in certain circumstances.

Hot rolled asphalt may be used in place of concrete to form the floor slab. It is important to seek specialist guidance on the particular specification for the floor design and the asphalt mix to be used. Good compaction is essential to the success of the material.

Concrete walls and steel columns which are permanently built-in should be given a surface treatment as protection against corrosion. Such treatments used in accordance with the manufacturer's instructions will be an aid in minimising maintenance and enabling the structures to comply with the performance standards for at least 20 years.

Where silo walls are constructed using prefabricated panels the column supports will be secured in concrete bases and care should be taken to ensure no leakage of effluent will take place at these points. This is of particular importance where the columns are set into sockets formed in the bases.

When substantially extending or reconstructing a silo it will be essential to seek professional guidance on the practicability of such an exercise prior to carrying out any work. In many instances upgrading is likely to be impractical due to the lower design criteria used in the past.

MANAGEMENT

7.7 Two aspects of the management of a silage making operation should be considered:

a) MAINTENANCE to retain acceptable performance standards.

b) OPERATIONAL MANAGEMENT of a silo at all times but particularly during periods of maximum effluent discharge to confirm that there are no leakages, that the drainage system is working effectively and that the tank is not allowed to overfill.

MAINTENANCE

7.8 The silo drainage system and effluent tank should be thoroughly inspected for any signs of surface corrosion, cracking of concrete and fractured pipes.

The following is a suggested procedure which should be carried out when the silo is empty.

Empty and when safe to do so, visually check the effluent tank. DO NOT ENTER THE TANK AS POISONOUS GAS MAY BE PRESENT. If it is necessary to enter for repair purposes seek advice on safety requirements.

- Clean any areas which cannot be clearly seen;
- Inspect walls and floors for cracking or surface corrosion;
- Go over all sealed joints for sections where the jointing material has been damaged;
- Inspect all drains and channels for damage;
- Check that all channels and pipework are free flowing;
- Check all safety arrangements;
- List all repairs required and prepare a timetable to execute the work.

Many silos only have few weeks between becoming empty and being refilled and many materials require time to cure before being exposed to effluent.

Management Practice

7.9 Although roofed silos require less management during and after filling, frequent checks to ascertain that the drainage system is free running and that the effluent tank does not overflow are essential.

The design criteria of BS5502 require that there are drains along the bottom of the walls to reduce pressure. These are normally provided in a temporary form as 75mm plastic drain tiles or equivalent and should be placed in position prior to filling the silo.

Where the silage is made as a wedge or grass ramps are used, care must be taken that the ramp does not extend beyond the silo's drainage system to ensure that the effluent is contained. To deal with this difficulty many silos have a concrete apron which slopes inwards to the silo floor.

The filling of unroofed silos requires planning if the maximum quantity of rain water is to be diverted from the effluent tank. The aim is to dome or shape the top of the silo so that water falling on the cover is directed away from the working end of the pit. To achieve this in solid walled silos the covering sheet should extend over and out from the end or one side of the silo. This may require a lower wall at the end or side, and the highest area of the top surface should be as close to the working end as feasible. In earthbanked silos one bank may be lower than the other.

It is important that silo covers are properly secured in place by the use of weights such as rubber tyres, and are regularly inspected to ensure they remain intact. Old cover sheeting should be disposed of carefully to avoid a potential health hazard to grazing stock, a pollution threat or an unsightly deposit spoiling amenity.

If practical on the site, and where a ramp for filling cannot be provided, ideally open silos should have a wholly or partly closed end. When the end remains open on the completion of filling, the coversheet may be run out over the effluent channel to shed stormwater away from it.

While any silage remains in the pit all effluent and contaminated rainwater (floor, cover and silage) must be collected and disposed of. When empty the silo may be washed down and the water from the floor diverted to a suitable disposal point. On no account should wash waters be discharged to a watercourse.

Frequent and regular inspections of the nearest watercourse just downstream of the point of discharge of the surface water drainage system should be undertaken to check for signs of silage effluent pollution. (Refer to Paragraph 1.18) This is particularly important during and following the period when silage effluent is being produced.

Disposal of Silage Effluent

7.10 Although aeration treatment can significantly reduce the BOD_5 strength of silage effluent (Refer to Section 7) it cannot be treated to a safe level for discharge to a watercourse.

Silage effluent should be diluted by a minimum of 1:1 with water and disposed of by land application. The application rate should not exceed $50m^3$/ha (4500 gallons/acre) of diluted effluent. Any repeat application should not be made within 3 weeks. Applications should be made in accordance with the principles set out in Section 2. This maximum rate of application should be reduced if the soil has been compacted.

Soakaways are not an acceptable method of effluent disposal and should not be used.

Although silage effluent has a relatively low nutritional value it can be disposed of by feeding to livestock. Absorbents can be used to reduce the amount of effluent produced from the silo, eg, the addition of modified sugar beet residues which are added at the time of ensiling.

Most silage additives are extremely polluting. They should be stored and handled at least 10m from a watercourse or field drain. Care should be taken to ensure that no additive or used container gets into a watercourse.

Waste Treatment Technology

INTRODUCTION

8.1 The practices outlined in this Code should be adopted by all farmers to avoid or minimise the risk of water pollution. However, where a specific or particularly severe problem arises it may be necessary to invoke the use of a waste treatment system or ameliorative measure to overcome it satisfactorily.

Over the past decade, considerable resources have been devoted to research and development on systems which operate effectively to reduce the polluting potential of farm wastes. The aim is to achieve this within reasonable installation (capital) and maintenance costs.

Many of the systems are well advanced in terms of treatment technology but some are quite expensive for on-farm use.

While this Code is based on the best available information at the time of writing, it is recognised that as a result of developing technology certain practices may change in the future. The use of any new technology should follow the general principles of Good Agricultural Practice laid down in the Code.

The following treatment systems may be appropriate in certain circumstances:

SILAGE EFFLUENT

8.2 Silage effluent can be treated by an aeration process which achieves a reduction in the soluble BOD value of 95% to approximately 1000(mg/l). This is still 3 times the BOD value of raw sewage and the effluent MUST NOT be discharged to a watercourse. Treated effluent can however be applied to land without dilution, observing the general rules relating to land application. This treatment also increases the pH value of the effluent from 4 to over 8.

LIVESTOCK WASTES

8.3 Livestock slurries can be processed by mechanical separation, anaerobic digestion and aerobic treatment to improve their handling characteristics and to reduce their potential for air, soil and water pollution. Before deciding if these are cost effective and practical solutions for your farm, professional and specialist technical advice should be sought.

8.4 Slurry handling and storage problems may be eased by separation of the solid and liquid fractions of slurries by using mechanical separators such as screen or belt presses, vibrating screens or centrifuges.

The advantages of separation include the production of storable solids which can be composted and have little smell when applied to land. The liquids, which contain up to 80% of the plant nutrient value of the original slurry, can be stored with minimal settling and crusting difficulties and applied to the fields through a pumped irrigation system at a lower energy input. The liquid when applied also presents a lower risk of smothering the crop. Mechanical separation can be considered as a pretreatment to aeration.

BIOLOGICAL TREATMENTS

8.5 Biological treatment occurs either in the presence of freely available oxygen (aerobic systems) or in the absence of oxygen (anaerobic systems). Most livestock slurries are present in highly concentrated forms so their biological treatment has been directed towards the reduction of odour and soluble BOD and the production of energy in the form of biogas or heat.

a) ANAEROBIC DIGESTION

The controlled anaerobic digestion takes place in an insulated air tight tank with slurry fed in almost continuously. The contents of the tank are mixed (agitated) regularly and heated to 35 or SO'C. The treatment period is usually 12-15 days for pig slurry and 20 days for cattle and poultry slurries.

The benefits are:
Slurry solids are reduced by approximately 35% and their ability to dry out is increased, so hastening the infiltration of the slurry into the soil and reducing the risk of creating anaerobic soil conditions.

BOD is reduced by approximately 80%. However such material MUST NOT be discharged to a watercourse.

Organic acids, the main contributors of the offensive odour of many slurries, are reduced by over 90%, so minimising odour problems during storage and field application.

b) AEROBIC TREATMENT

Aeration of whole or separated slurry usually takes place in tanks or lagoons at ambient temperature. In insulated systems, elevated temperature can accelerate the treatment. The length of treatment determines the size of the treatment vessel and the objectives of the process. The benefits are as for anaerobic digestion, but can be achieved much faster, within 2 to 7 days of treatment. It can also remove up to 70% of the nitrogen content of the slurry, and, at thermophilic temperatures (50 to WC), a rapid reduction of pathogens is achieved.

8.6 Use of Acidifiers and Nitrification Inhibitors

Acidifiers (eg sulphuridnitric acid) and nitrification inhibitors can be added to the slurry before spreading in an effort to reduce leaching of nitrogen. Inhibitors maintain the nitrogen in the slurry in the form of ammonia rather than easily leached nitrate, and so can reduce nitrate loss by up to 60% in sandy soils. The use of acidifiers may require the subsequent liming of the field to restore soil pH.

Sheep Dip

INTRODUCTION

9.1 A number of pollution incidents occur each year due to the careless handling and disposal of sheep dip. The main purpose of sheep dip is to kill parasites on sheep. By its very nature, sheep dip is formulated to kill insects and if allowed to enter watercourses, even in small quantities, it can kill fish and invertebrates. Organophosphorus dips are very harmful if they contaminate drinking water supplies as they can attack the human nervous system. Dips containing synthetic pyrethroids, although thought to be less harmful to human health, are 100 times more toxic to aquatic life. Consequently, the level of care which must be applied when using and disposing of these dips is just as great as that for organophosphorus dips.

SITING AND DESIGN OF FACILITIES

9.2 Dipping facilities whether permanently sited or mobile should be located well away from watercourses, springs, boreholes or drainage systems which could become contaminated. Isle of Man Water Authority bye-laws may impose restrictions on siting of sheep dips in catchments of surface water sources, or within protection zones of underground sources.

Dippers of one piece prefabricated construction are preferred and permanent installations should not be drained by an outlet in the base. Dippers can be a safety hazard, when filled with surface water, especially to young children. Adequate safety measures should therefore be employed to minimise this risk, for example, by the fitting of covering boards when the dipper is not in use. Where necessary splash boards should be provided to prevent overspill.

After dipping, sheep should be allowed to drain off in a pen for 5-10 minutes. The floor of this pen should be of concrete, laid on a slope so as to direct any drainage back to the dipping tank, normally via a silt trap.

If sheep are to be held prior to returning to the grazings then the area should be such that the risk of any drainage reaching a watercourse, spring, borehole or other underground water is minimised.

A mobile or piped water supply will normally be available at all facilities and care must be taken to control it and, in the case of the latter, avoid any possibility of dip being siphoned or sucked back into the water system.

DIPPING OPERATIONS

9.3 Only approved dip concentrates should be used and only obtained in sufficient quantity to meet the immediate need. Wherever possible environmentally safe products should be used. Concentrate should be stored in a secure place where any accidental spillage is safely contained. Advice on safe operating procedures is provided in HSE leaflet AS29 (rev2) "Sheep Dipping". Those using sheep dips may be required to hold recognised certificates of competence. Further advice on training can be obtained from the Agricultural Advisory Service, D.A.F.F.

Do not overfill the dipper. The dip concentrate should be placed in the dipper after filling with water to avoid the risk of overflow.

Freshly dipped sheep should stand in the drip pens for at least 5-10 minutes to allow complete draining of surplus dip back into the dipper.

Do not allow freshly dipped sheep to enter watercourses.

DISPOSAL OF SPENT DIP

9.4 Spent dip should be removed from the dipper as soon as possible after the completion of dipping. Where possible, dippers should be emptied by a slurry tanker or pump and not by a drain hole in the base of the dipper. It must never be discharged to a watercourse. Where a mobile dipper is used, responsibility for the safe disposal of waste dip should be clearly established with the contractor in advance.

Where a slurry tanker is used to empty the dipper, then slurry can be added to the tanker, in a dilution of 1 part dip to 3 parts of slurry, and the load then disposed of by spreading on agricultural land. The presence of slurry can speed up the bacteriological breakdown of the dip.

Where the spent dip is disposed of to a slurry store, great care should be exercised, as agitation or recirculation of the slurry (for mixing) can produce toxic gases. These gases may be lethal to operators and livestock. Alternatively, the spent dip should be diluted with 3 parts of water, prior to spreading on agricultural land.

Where disposal is to land, then the maximum spreading rate should not exceed 5m³/ha (450 gallons per acre) of spent dip, which is equivalent to 20m³/ha (1800 gallons per acre) of diluted spent dip. Land application should be carried out in accordance with the principles set out in Section 2. In case of difficulty with disposal, advice can be obtained from the D.L.G.E.

Spent dip should not be disposed of within 10m of watercourses, springs, boreholes or drainage systems or, in any public water supply catchment area or protection zone, without the prior agreement of the Water Authority. Great care should also be taken to avoid contamination of private water supply sources. Dip is harmful to wildlife. Farm livestock should be excluded from the disposal area for a period of at least 28 days following application. Repeat applications should not be made for a period of at least 3 weeks.

The presence of vegetation on the disposal area assists the breakdown of the dip.

If no suitable area of land can be identified on the farm, spent dip should be stored in a suitable holding tank and provision be made for the collection and safe disposal of the spent dip.

Soakaways are unsuitable for the disposal of spent sheep dip as they pose considerable risks of polluting surface and groundwaters. Soakaways should therefore not be used.

CONTAINERS AND UNUSED CONCENTRATE

9.5 Empty containers should never be re-used for any purpose. Containers should be cleaned when the dip is being prepared so that the rinsing liquid can be added to form part of the diluted dip wash. After cleaning, containers should be punctured or crushed to make them unusable. Cleaned perforated or crushed containers will be accepted at licensed disposal sites where they will be regarded as non-hazardous industrial waste.

Surplus concentrate must be returned to the supplier or disposed of using the services of a specialist waste disposal contractor.

Pesticides

INTRODUCTION

10.1 In this Section, pesticides should be taken to include insecticides, fungicides, herbicides and other crop protection chemicals. Poor preparation, application or disposal of pesticides and tank washings could lead to water pollution incidents. Such substances can have an acutely toxic effect on aquatic life and the use of pesticides should be carried out with extreme care.

In addition there is increasing concern over levels of pesticide residues found in drinking water sources and these may have serious implications for human health.

The careless application of pesticides can create spray drift which may result in damage to crops and wildlife habitats.

Safe storage of undiluted pesticides, careful mixing and application near watercourses, and safe disposal of dilute washings and containers are all important in avoiding environmental pollution.

By their very nature pesticides are designed to kill - even when diluted to concentrations as low as a few parts per billion some will kill fish and invertebrate life in watercourses.

10.2 The use of pesticides is controlled under the Health and Safety at Work etc Act 1974 (HSW Act).

All pesticide users should be familiar with the requirements and practical aspects covered in the MAFF/HSE 'Code of Practice for the Safe Use of Pesticides on Farms and Holdings (The Green Code)' (1998) obtainable from HMSO bookshops and in DETR's Waste Management Paper No 21 'Pesticide Wastes - a Technical Memorandum on Arisings and Disposal including a Code of Practice' available from HMSO bookshops.

10.3 Everyone involved in the use of pesticides on a farm or holding should have adequate training in the safe and efficient use of pesticides - including emergency action in event of spillages. Those using pesticides for agricultural use may be required to hold recognised certificates of competence. Further advice on training can be obtained from the Agricultural Advisory Service, D.A.F.F.

STORAGE

10.4 Any new pesticides store that is built should reflect the highest standard of design and construction. Existing structures used or intended for use as a pesticide store may need to be improved and modified, to provide acceptable storage. Pesticide stores should not be erected in areas where there is a risk of pollution to watercourses or groundwater. Isle of Man Water Authority bye-laws may impose restrictions on storing pesticides in source catchments and protection zones. Before erecting a new pesticide store or substantially altering existing storage arrangements the advice of the D.L.G.E, D.A.F.F., the Planning, Water and Fire authorities, the Crime Prevention Officer, and the Health and Safety at Work Inspectorate should be sought.

10.5 Guidance on the storage of approved pesticides is given in HSE Guidance Note CS19, Storage of Approved Pesticides, Guidance for Farmers and Other Professional Users. British Standard BS5502 Part 81, 1989 - Code of Practice for Design and Construction of Chemical Stores, also applies.

10.6 If spillage does occur and there is a possibility of a risk to other people, animals or the environment, immediate action should be taken to limit the effects and to warn others who may be affected, including the D.L.G.E, D.A.F.F. and the Isle of Man Water Authority.

MIXING PESTICIDES AND FILLING SPRAYERS

10.7 Mixing pesticides and filling spray containers should, wherever possible, take place well away from any surface water, watercourse or drain and always be carried out in such a way that there is no risk of polluting water by spillage. Make full use of devices specially designed for closed-handling and pre-mixing of pesticides. At the steading these operations should be carried out on a hard-standing constructed for this purpose and designed in such a way that spillage cannot escape from the area. In the field these operations must be carried out well away from surface waters and watercourses and every precaution taken to prevent spillage which could leach into field drains. Water for filling the sprayer should be drawn from an intermediate tank which has been previously filled, preferably from a piped supply. Spray equipment should not be filled directly from a watercourse.

APPLICATION

10.8 Pesticides must only be used in accordance with the specific approval conditions which are carried on the container label. Pesticides should never be applied in situations where they could drift onto surface water unless they are specifically approved for use in or near water. Isle of Man Water Authority bye-laws may impose restrictions on the use of pesticides in the proximity of water supply sources, including a restriction on aerial spraying. It is also extremely important that underground water supply sources are not contaminated. Bye-laws may also apply to protection zones around public boreholes, wells and springs. The Isle of Man Water Authority should be consulted where it is proposed to apply pesticides on l land adjacent to a public water supply reservoir. A large number of private underground supply sources exist in the Isle of Man, and these also need to be protected from contamination by pesticides. Drinking water is considered as unwholesome for consumption when there is 0.03 microgram/litre of an individual pesticide substance present within it. The D.L.G.E and D.A.F.F. should be consulted if the intention is to use a pesticide in or near water, and their consent obtained if the intention is to use a herbicide to control aquatic weeds.

10.9 In order to minimise the danger of drift of pesticides onto water, it is important to take account not only of the correct spraying techniques (for example spray droplet size, unnecessary spraying of field margins and boundary areas close to water courses) but also of weather conditions, in particular wind speed and direction. A 5 metre 'no spray' strip should be left adjacent to watercourses. Detailed guidance on these points is given in the Pesticides Code referred to previously.

Field margins and boundaries, particularly hedges and ditches are important wildlife habitats. Under normal circumstances these areas are relatively insignificant as sources of insect pests or crop diseases. The contamination of field margins by insecticides or fungicides, either by direct application or from drift, should be avoided so as to protect beneficial or harmless insects and other wildlife. Similarly contamination by herbicides may kill a wide range of naturally occurring wild plants and may create conditions for the establishment of aggressive weed species which could later invade crops. Advice should be sought on the appropriate management of field and crop margins where populations of weed species are such as to present a threat of invasion of a crop. Similar precautions should be taken to prevent contamination of other non-crop areas of conservation interest on farms and on adjoining land, such as National Nature Reserves or Areas of Special Scientific Interest.

LEGISLATION ON DISPOSAL OF PESTICIDES

10.10 In addition to the HSW Act, the Inland Fisheries Act 1976, the Water Pollution Act 1993 (WPA), and the Public Health Act 1990 and respective regulations also apply to the disposal of waste pesticides and containers. Users of pesticides should be aware of their legal responsibilities in respect of waste disposal and of their duty to ensure that any waste they produce will be disposed of safely and legally.

10.11 Department of Local Government & the Environment are responsible for issuing disposal licences under the Act for waste disposal activities on land. Accordingly, they are able to give general advice on disposal matters.

10.12 Under section 27 of the Inland Fisheries Act, it is an offence to cause or permit, without lawful excuse, any deleterious matter to enter any waters.

Certain provisions of the Water Pollution Act 1993 are still yet to be brought into force, under these provisions the consent of the D.L.G.E. will be required for the discharge of all wastes (including the substances most dangerous to the aquatic environment as detailed below and comprising certain EC - Red List substances which met the priority selection criteria) into controlled waters, which include streams, rivers, ponds, estuaries, coastal waters and underground waters.

SPECIAL CATEGORY EFFLUENT (The Red List)

The initial priority 'Red List' comprises the following substances selected on the basis of their toxicity, persistence and ability to bioaccumulate:

Mercury and its compounds
Cadmium and its compounds
Gamma-hexachlorocyclohexane
DDT (all isomers of)
Pentachlorophenol and its compounds
Hexachlorobenzene
Hexachforobutadiene
Aldrin
Dieldrin
Endrin
Polychlorinated biphenyls
Dichlorvos
1,2-Dicholoroethane
Trichlorobenzene (all isomers of)
Atrazine
Simazine
Tributyltin compounds
Triphenyltin compounds
Trifluralin
Fenitrothion
Azinphos-methyl
Malathion
Endosulfan

Further substances may be added to the list from time to time, where there are sound scientific reasons for doing so.

For discharges of waste to the public sewerage system advice should be sought from the drainage authority for your area. Further advice can be sought from the Department of Transport, Drainage Division.

MANAGEMENT OF PESTICIDES IN USE

10.13 The purchase and use of pesticides make it inevitable that some wastes will be produced. Initially, therefore consideration needs to be given to whether the use of a pesticide is essential in the particular circumstances.

10.14 Once it has been decided that use of a pesticide is necessary, an estimate should be made of the quantity required and the package sizes which need to be purchased. At the same time, consideration should be given to the means available for the disposal of all the wastes which will be produced and any disposal problems which may be presented by the pesticide in relation to its hazards, the shelf life of the product and its storage in a safe manner.

10.15 Effective management and control of pesticides should aim to produce no wastes, and practices should strive to achieve this. Where possible, follow on pesticides should be compatible thus avoiding the need to wash out spraying equipment. Even though a no waste situation will not be obtained in practice, it should be pursued. For example, the volume of washings produced when cleaning out equipment can be reduced significantly by using an efficient low - volume flushing system, as opposed to filling the spray tank with water and pumping it through the equipment. Such devices should be used.

Records of the amounts and dates of applications of pesticides, together with the type used and location should be kept, further advice is given in the MAFF/HSE Pesticides Code.

DISPOSAL OF WASTE CONCENTRATES

10.16 From time to time it can be expected that, for a variety of reasons, pesticides kept in a store will need to be disposed of. Typically, these will include pesticides which are surplus to requirements, out of date with respect to shelf life, unapproved or have had approval withdrawn, split or broken packaging, or degraded containers.

10.17 It is false economy to continue storing unusable pesticides as an alternative to disposal, especially if the approval for storage and use has been withdrawn. In some instances, it may be possible to return to the supplier unwanted, unused pesticides. Otherwise, it is most likely that holders of such items will require to employ the services of a reputable specialist waste disposal contractor having regard to the holder's individual legal responsibility. On no account may waste concentrates be diluted for disposal by the methods at paragraph 10.20(b) to (f).

DISPOSAL OF DILUTE WASTES AND WASHINGS

10.18 It is extremely likely that all spraying operations will produce some liquid waste. It is necessary, therefore, for the user of pesticides to provide arrangements for disposal in an environmentally acceptable manner.

10.19 On completion of spraying, all equipment involved in the operation should be cleaned, washed and rinsed. Whenever possible sprayers should be washed out in the field where the pesticide has been used (see paragraph 10.20). If the sprayer is washed out at the steading this should be carried out on a hard-standing constructed for the purpose and designed in such a way that spillage cannot escape from the area. The washing facilities provided must be designed to ensure that backsyphoning of pesticides into the water supply cannot occur. Non-return valves should be fitted to any taps connected to spray equipment. Such activities will produce a relatively large volume of water contaminated at low concentration with pesticide. If suitable, the contaminated water may be usable later for making a further batch of the dilute pesticide.

Other environmentally acceptable disposal routes include:

10.20 a) if within the terms of the product approval, applying the contaminated water to the treated crop, recognising that the efficacy of the previous application of pesticide may be impaired. As this operation will count as a separate application it is important to check the maximum number of applications permitted to any one crop or within any season and the maximum amount of product or active ingredient that may be applied to any one crop in a whole season;

b) subject to the product approval and, in the absence of streams and watercourses nearby, application to previously untreated crop areas. The part of the crop least in need of treatment should be selected for this purpose. This may be a headland or sometimes a strip in the middle of the field, depending on the purpose for which the pesticide is being applied;

c) subject to advice from D.L.G.E and D.A.F.F., spray onto an area of uncropped land, not stubble or fallow, of minimal wildlife value, that is an area which supports only poor vegetation and without hedges, trees or bushes on it or nearby. If such an area of land is identified, its approval for use will require that it must be capable of absorbing the volume of liquid to be discharged on to it without run off, the leaving of puddles, or risk to wildlife, watercourses, groundwater, septic tanks, field drains, water mains, service pipes or sewage systems. Where necessary the area must be signposted and fenced to exclude people and livestock;

d) storage of the waste in a suitable container pending collection by a specialist waste disposal contractor;

e) use of suitable equipment designed to treat liquid waste containing pesticides, provided the treated effluent can be stored satisfactorily and reused or used for another purpose or disposed of by a means acceptable to the D.L.G.E.

f) subject to advice from the relevant drainage authority, discharging the pesticide-contaminated water to a sewer.

DISPOSAL OF CONTAINERS

10.21 Farmers should investigate the willingness of manufacturers and suppliers of pesticides to offer a recovery service for used containers. Empty pesticide containers should never be re-used for any purpose except possibly, if in good condition, to contain an identical pesticide transferred from a deteriorated or leaking container. Containers, except those referred to in paragraph 10.23 below, should always be cleaned thoroughly before disposal. They may be cleaned either in accordance with the label instructions or, in the absence of any instructions, by successive rinsing. Ideally the cleaning should take place when a working strength spray dilution is being prepared so that the rinsing liquid can be added to and form part of the spray dilution.

10.22 After being cleaned, containers should be punctured in several places or crushed to make them unusable. So far as is practicable, their labels should not be disfigured. The perforated or crushed containers should be stored in a secure watertight compound - preferably not a pesticide store - pending their disposal. Where a spray dilution is not being prepared the rinsings should be collected in a suitable container labelled and stored in a safe place for subsequent disposal elsewhere.

10.23 Because of the hazardous gases which they produce on contact with moisture, empty containers in which hydrogen cyanide gassing powders or aluminium, magnesium or zinc phosphides have been supplied or kept, should not be rinsed or cleaned. Instead they should be filled with dry soil, sand or other inert material. Immediately before disposal the containers should be punctured in several places. On no account should containers which are empty or which have been filled with inert material be taken into or kept in a building. The treated containers may be buried as described in paragraph 10.25.

10.24 Clean containers, perforated or crushed, will generally be accepted at licensed disposal sites, subject to conditions allowing acceptance of such waste (see paragraphs 10.10-10.12 of this Code).

10.25 Containers cleaned or treated in accordance with the requirements given in paragraphs 10.21-10.23 may be buried on land used for agriculture which is owned or occupied by the person wishing to dispose of those containers. However, the burial site must be carefully chosen, particularly in respect of the items described in paragraphs 10.23 and 10.29, such that there can be no risk of pollution of surface or groundwater. The advice of the D.L.G.E. and D.A.F.F. should be sought on a suitable location. The containers should be buried to a depth of at least 0.8 metres below the surface and below the level of any land drains. The burial area should be marked so that its location may be identified easily in the future, and a record should be kept of the type and quantity of the materials buried and the date of burial.

10.26 In certain instances, it may be permissible to burn lightly contaminated combustible containers as a means of disposal. However, the burning of such materials may cause fumes and smoke which may present a serious health risk and/or nuisance and advice from the supplier of the pesticide and the Environmental Health Division of the Department of Local Government & the Environment should be sought for any activity other than a very minor operation. Hormone herbicide containers (MCPA, 2AD, CIVIPP etc) cannot be burnt safely.

10.27 When waste containers are to be burnt, the operator should ensure that:

a) burning takes place in a open space at least 15 metres from public highway and not in a location where any smoke produced is likely to drift over people or livestock or move towards any highway, housing or business premises. A shallow pit should be dug with additional cross trenches to provide an adequate air supply to the base of the fire. The design should be so as to encourage burning to take place up and through the material rather than from the top down. This burning process gives a much higher temperature and also reduces the risk of creating black smoke;

b) any containers are open and are placed on a very hot fire a few at a time;

c) the fire is supervised constantly;

d) the fire is extinguished before being left.

Any residues from the operation should be buried as described in paragraph 10.25.

10.28 Products classed as 'Highly flammable': pyrotechnic devices, such as smokes; and atomisable fluids should not be burned.

DISPOSAL OF OTHER CONTAMINATED MATERIALS

10.29 Packaging and other wastes, as well as discarded protective clothing resulting from dealing with spillages, will also require disposal. However, it is likely that disposal of such wastes on the premises will not be acceptable. Holders of such waste, therefore, should seek advice on a suitable authorised disposal route (see paragraph 10.11 of this Code).

10.30 The disposal of spent rodenticide or other pesticide baits and carcasses should be in accordance with the requirements specified on the product label. If burial is permitted and the requirements are not specified on the product label, disposal should be in accordance with the conditions set out in paragraph 10.25.

10.31 The disposal of containers which cannot be cleaned thoroughly, solid waste arising from the clean-up of spillages, including loose pesticides, heavily contaminated equipment and protective clothing or absorbents used on liquid spillages should be arranged through a specialist disposal contractor (see paragraph 10.11 of this Code).

10.32 Where any particular pesticide approval is withdrawn, special precautions may be necessary to ensure that disposal is carried out satisfactorily and in accordance with any official guidance which may from time to time be given. This may include the adoption of special safety measures.

Disposal of Animal Carcasses

INTRODUCTION

11.1 Under the provisions of the Disposal of Carcasses Order 1979 the responsibility to dispose of carcasses rests with the owner or occupier of the land or premises, who shall at his own expense dispose of the carcass(es) as soon as possible by burial where possible at a place on the land or premises on which the animal died or was killed, or the alternative is to send it to a licensed knackeryard. Where the option to dispose of the carcass(es) to a knackery is not available then carcasses should be disposed of on-farm in accord with the guidance provided in this Section of the Code.

DISPOSAL TO AN OFF-FARM LANDFILL SITE OR INCINERATOR

11.2 The municipal waste landfill site on the Island is unable to accept animal carcasses due to the conditions attached to its use. The local authority is under no obligation to collect or dispose of animal carcasses. It is intended within the All Island Incinerator Plant to provide provision for veterinary waste and fallen animals. In the mean time a service is provided by the Department of Transport for the collection and disposall rendering of fallen animals.

NOTIFIABLE DISEASES

11.3 Irrespective of any other considerations, if ill health or death is thought to be caused by a notifiable disease, this must be reported to the Animal Health Division of D.A.F.F. (refer to Appendix V), or the police station. In such circumstances carcasses should be available for post mortem examination. In cases of sudden death, veterinary advice must be sought in order to eliminate Anthrax as the cause of death.

ON-FARM DISPOSAL

11.4 On-farm disposal methods such as burial, incineration or burning in the open air should be carried out with care in accordance with the following paragraphs. Otherwise they can cause serious air or water pollution.

ON-FARM BURIAL

11.5 It is also an offence under the Dogs Act 1990 to leave a carcase unburied in a field or other place to which dogs have access.

Under no circumstances should a carcass remain unburied or be disposed of in or near watercourses or on areas of wildlife value. Apart from risking prosecution for causing water pollution, there is a serious risk of spreading disease to stock on neighbouring farms.

11.6 If a notifiable disease is not suspected, or has been eliminated as a possible cause, and other means of disposal are not available, burial on farm must comply with the following criteria. The burial site must:

- be at least 250 metres from any well, borehole or spring used as a source of drinking water or where Isle of Man Water Authority bye-laws specify a greater distance, this must be complied with. Such bye-laws may also impose restrictions relating to the distance of a burial site from a surface source.

- be at least 30 metres from any other spring or watercourse, and at least 10m from any field drain

- have at least one metre of subsoil below the bottom of the burial pit and allow for sufficient depth to provide at least one metre of covering soil

- where possible, sites on soils which are moderately permeable should be used. Avoid waterlogged sites.

Records of all burial sites, including a field plan, should be kept, together with number and type of stock buried and dates of burial.

Dogs must not gain access to carcasses. Carcasses placed in the pit must be covered immediately with sufficient depth of soil to deter scavenging animals and birds.
Burial in a manure store is not acceptable.

Lined Disposal Pit

Such pits are normally constructed from precast concrete rings or glass fibre and are typically 1.2m diameter x 2.7m deep. The top can also be of precast concrete, fitted with a metal manhole cover.

For small carcasses and foetal material, a pit with an impervious wall and with its base open to the soil may be used. It should be covered with a substantial top, fitted with a manhole cover. The siting, subsoil depth and permeability criteria given above apply. In practical terms this disposal route is likely only to be appropriate for small animals and small numbers of livestock.

These pits work best if started in spring or summer, using a bacterial starter such as sewage sludge. A slit in the abdominal wall to release intestinal contents also helps, as does the addition of a few gallons of water each week to keep the contents moist. LIME MUST NOT BE ADDED.

D.L.G.E and D.A.F.F. should be consulted if a lined disposal pit is to be used or there is any doubt over suitable burial sites. Where farms have large numbers of carcasses for disposal on a regular basis it is essential that prior discussion takes place with the D.L.G.E.

11.7 Do not bury carcasses in bags made from impermeable materials (eg polythene type bags) as this will inhibit decomposition.

ON-FARM INCINERATION

11.8 On-farm incineration should only be considered if :

a) there is no other reasonably safe preferable method of disposal and

b) the burning is carried out under the direct and continuous supervision of the occupier of the premises concerned or the person authorised to act on his/her behalf.

11.9 Dead stock should be burnt, either in the open or by incineration, as soon as possible and preferably within 12 hours of death. The use of on-site incineration equipment should be practised in preference to open burning.

Agricultural Fuel Oil and Waste Oil

INTRODUCTION

12.1 Oil is a highly polluting substance and its escape has serious implications for the soil and water environments. Accidental spillages of oil give rise to a number of pollution incidents each year.

STORAGE

12.2 Fuel Oil should be stored

a) in a fuel storage tank
b) in drums or barrels
c) temporarily in a tanker
d) in an underground tank

In the case of a. and b. the tank(s) or containers should be within a storage area which conforms with the standards set out in the details below. Nevertheless all fuel oil must be managed and stored with the same care.

When underground tanks are to be used it is recommended that guidance is obtained from the D.L.G.E.

SPECIFIC REQUIREMENTS

12.3 The fuel storage area should be surrounded by a bund particularly if above 1500 litres. The bund and the base of the storage area must be impermeable and constructed so that with proper maintenance they remain so for at least 20 years. (See Figure 6).

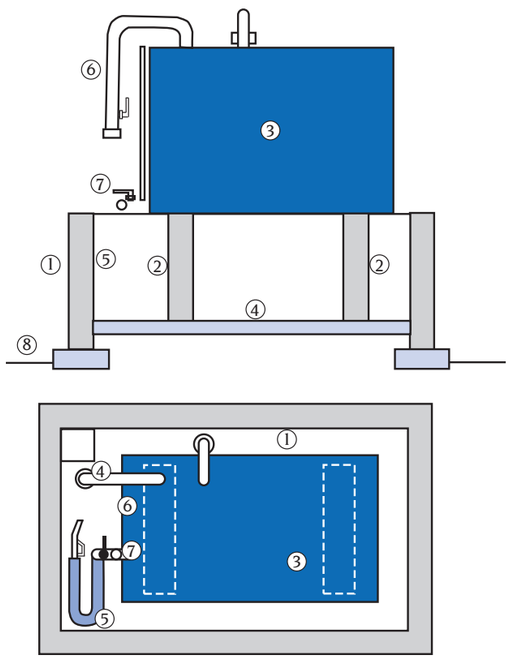


Figure 6. Bunded fuel oil tank

1. Impermeable walls forming bund (capacity of bund 110% of oil storage capacity).
2. Pillars supporting fuel oil tank within bund.
3. Fuel oil tank constructed to BS799.
4. Impermeable floor with sunken area to aid removal of storm water.
5. Filler pipe fitted with automatic cut off and locked within area of bund when not in use.
6. Inlet filler pipe with valve all within area of bund and directed downwards.
7. All valves within bund and locked when not in use.
8. When relative levels do not allow gravity discharge of the tank contents a pumped discharge system may be necessary.

No part of the storage facility shall be within 10 metres of a watercourse which fuel oil could enter if it were to escape. The minimum bund capacities required are:

For a single tank	110% of the tank capacity
For two or more tanks, for drums or barrels or for any combination of these with tanks	110% of the capacity of the largest container or 25% of the total volume of oil which could be stored in the area, whichever is greater

Every part of any container shall be within the bund including all taps, valves, pipes, etc. and these must discharge downwards into the bund. Taps and valves must be locked shut when not in use.

A system for the removal of rainwater and spillages must be provided, for example a small sump for removal by a hand pump. Ideally a simple roof should also be provided.

Flexible pipes used for filling vehicles and other container by gravity from the tank, and which are permanently attached to the tank, should be fitted with an automatic cut off and locked within the bund when not in use.

DESIGN AND CONSTRUCTION

12.4 The floor of the storage area will normally be constructed in reinforced concrete and should drain to an internal sump. This sump will facilitate the removal of the final part of any spillage or rainwater collecting within the bund.

The walls of the bund will generally be constructed in reinforced concrete either as blockwork or in-situ concrete. In the former situation the internal surface must be plastered and if necessary finished with a suitable protective coating.

The oil tank(s) supports (eg block walls) should be contained within the bund and can be independent or part of the bund. In the latter situation they must not be as high as the bund, to avoid the risk of any spillage or leakage escaping over the top of the bund. For similar reasons, other types of tank support systems must not be carried on the wallhead of the bund.

Steel tanks should be separated from the supports on which they rest by a bitumen felt or equivalent material.

All storage tanks should comply with the requirements of BS799 and BS5410.

A safe means of access to and from the bund should be provided. Facilities should be installed to enable the delivery operator to fill the fuel tank from ground level.

Storage tanks should be labelled and 'No Smoking' signs provided.

SITING OF STORAGE FACILITIES

12.5 Location

This must be considered in relation to other buildings as well as to the proximity of watercourses. Fire and the possibility of spillage should be considered. There should always be a suitable fire break between the storage area and adjacent buildings. It is preferable not to store fuel oils inside buildings unless the building is for that specific purpose.

Avoid locations where spillage could contaminate other stored materials such as animal feeds. Storage of oil within catchments of public surface water sources, or in protected zones around underground sources for public supplies, may be prevented or restricted by bye-laws made by the Isle of Man Water Authority.

12.6 Access

This must satisfy the needs of delivery and farm vehicles. Good artificial lighting should be considered for the area to provide safe working conditions and for security reasons in some situations.

Areas around the store on which vehicles park to load or unload should ideally be of concrete. If possible the drainage gradients should be inwards to the storage area. Drains must be fitted with a suitable oil trap and some means of sealing the drain in an emergency.

OPERATIONAL MANAGEMENT

12.7 Where feasible, delivery of oil should be supervised and only when unavoidable should ladders or steps be used. In such cases it is essential to conform with the Health and Safety at Work etc Act 1974. Top openings when used should be provided with a suitable system to hold the filler pipe in position. Where the connection to a filler pipe is below the maximum oil level in the tank, a tap or non-return valve must be fitted to prevent spillage when the filler pipe is disconnected.

Some method to indicate the level of oil in the tank should be provided. Gravity is frequently the method adopted for transferring oil from a farm storage tank and as this will necessitate the tank being raised above the level of a vehicle's fuel tank, good working access must be provided to prevent the operator overfilling the vehicle tank.

In the case of a direct oil feed from a storage tank to fixed equipment, an automatic emergency oil shut off system should be provided.

MAINTENANCE

12.8 The storage area and bund should be regularly checked for the presence of water and oil and to ascertain that there have been no failures of the structure. The bund should be frequently emptied of accumulated rainwater.

The storage tank(s) and associated pipes and valves should be regularly checked for oil leakage. The tank itself, if of steel, will require regular maintenance of the exterior surface.

TEMPORARY STORAGE IN MOBILE TANKS

12.9 The same care and attention should be given to mobile tanks as to permanent storage. These should be constructed to the same basic specification and fitted with equivalent safety devices as appropriate to minimise spillage of oil.

Fuel oil for engines driving pumps in or close to a watercourse should have their fuel systems regularly checked. Avoid the temporary storage of fuel oil for such equipment in places from which a leak or spill could enter a watercourse. Great care must be taken in transferring fuel oil from cans or drums to the fuel tank of the engine.

DISPOSAL OF WASTE OIL

12.10 Waste lubrication and hydraulic oils are produced in significant quantities from the servicing of agricultural machinery. Where waste oil cannot be used on the farm, for example to fuel a heater, it should be taken to a suitable disposal point eg. Civic amenity site, or waste oil reclamation service. Waste oil should not be disposed of to a soakaway or other farm waste system. Waste oil from farms can be burnt in waste oil heating appliances as long as a statutory nuisance ie. smoke nuisance, is not caused from its operation.

The use of waste oil for the purposes of starting bonfires should be avoided.

The drainage system from vehicle wash areas should be provided with a suitable oil interceptor which will require cleaning at regular intervals. The drainage should discharge into a collection tank. The aggressive nature of certain vehicle cleaning agents render them harmful to streamlife and care should be taken to avoid the discharge of washings to watercourses.

SAFETY PRECAUTIONS

12.11 A supply of dry sand, or suitable oil absorbent, should be provided close to the fuel oil store. This can be used to soak up accidental spillages or to contain a more serious spillage.

Suitable fire extinguishers should be provided close to the storage area.

All farm personnel working with fuel oil should be made aware of the pollution risk which can occur should it reach water and be aware of the action to take in an emergency.

Disposal of Waste Products and Litter

INTRODUCTION

13.1 Considerable quantities of waste materials are generated by modern farming practices and their use and disposal should be carefully planned so as to avoid or minimise the risk of causing water pollution.

Such waste materials include:

- packaging and containers of products purchased and brought on to the farm
- plastic covers, rubber tyres, batteries and sheeting used in crop storage
- worn out and used materials which are used in the servicing of agricultural machinery eg oils, solvents and detergents (refer to Section 6 - Agricultural Fuel Oils and Waste Oil).

13.2 When selecting materials or products, preference should be given to those which are biodegradable or which can be reused on the farm or can be disposed of either by a safe on-farm method or recycled.

13.3 The volume of waste materials should be reduced to the minimum by careful use to extend life expectancy and by on-farm recycling wherever possible.

POULTRY AND OTHER LIVESTOCK LITTER

13.4 Poultry and animal litter are difficult to burn except under closely controlled conditions due to their variable moisture content and composition. If burning is uncontrolled, the production of dark smoke and odour is inevitable, so burning poultry and animal litter in the open should be avoided.

APPENDIX

APPENDIX I – AMOUNT OF EXCRETA PRODUCED BY LIVESTOCK

Type of Livestock	Body Weight (K9)	Typical Volume (litres/day)	Moisture Content (%)
1 dairy cow	450-650	35.0-57.0	90
1 beef cow	550	30.0	90
1 calf	-	7.0	90
store cattle	-	14.0	90
finishing cattle	-	21.0	90
1 dry sow (dry meal fed)	90-120	4.0	90
1 lactating sow + litter	90-120	14.9	90
piglet (dry meal + ad-lib water)	-	1.0	90
wearier (dry meal+ad-lib water)	-	1.9	92
fattening/finishing pigs			
(dry meal + ad-lib water)	70	4.5	90
	90	4.9	90
(water:meal ratio 2.5:1)	70	5.3	90
	90	5.7	90
(water:meal ratio 4:1)	70	8.8	94
	90	9.5	94
1 fattening lamb	45	2.2	89
1 mature sheep	60-80	4.0	89
1000 laying hens	2000	115.0	70
1000 laying hens (air dried)	2000	49.0	30
1000 pullets	800	120.0	30

Note: These quantities of excrement are only given as a guide in devising a Waste Management Plan. They are very diet and system dependent and this should be taken into account when calculating volumes produced by livestock. It is essential also to take full account of any waste and storm water likely to drain to and fall on the system when calculating the volume of storage required for livestock wastes.

APPENDIX II – TYPICAL AMOUNTS OF BEDDING MATERIAL PER ANIMAL USED IN LIVESTOCK HOUSING SYSTEMS

Livestock	Housing System	Litter Used	Typical amount used in 180 days (kg)
Dairy cows	Cubicles	Chopped straw	120
		Sawdust, wood wastes	150
Dairy cows/			
Beef cattle	loose housing	Straw	530
Pigs	Pens	Straw	102
Poultry	Deep litter	Wood shavings	1
Broilers	Deep litter	Straw chopped	38-50 mm
		Wood shavings	
		Chopped straw	
		Chopped paper	0.5 (per bird per batch)

APPENDIX III – QUANTITY OF CLEANING WATER USED BY LIVESTOCK

Livestock Type	Cleaning System	Quantities in Litres	
		Range	Typical
Dairy Cows	Cleaning milking parlour equipment, washing udders etc. :		
	Without a power hose	14-22	18
	With a power hose	27-45	35
Pigs	Cleaning out pens after each batch		
	(10 pigs per pen)[2]	16-24	18

APPENDIX IV

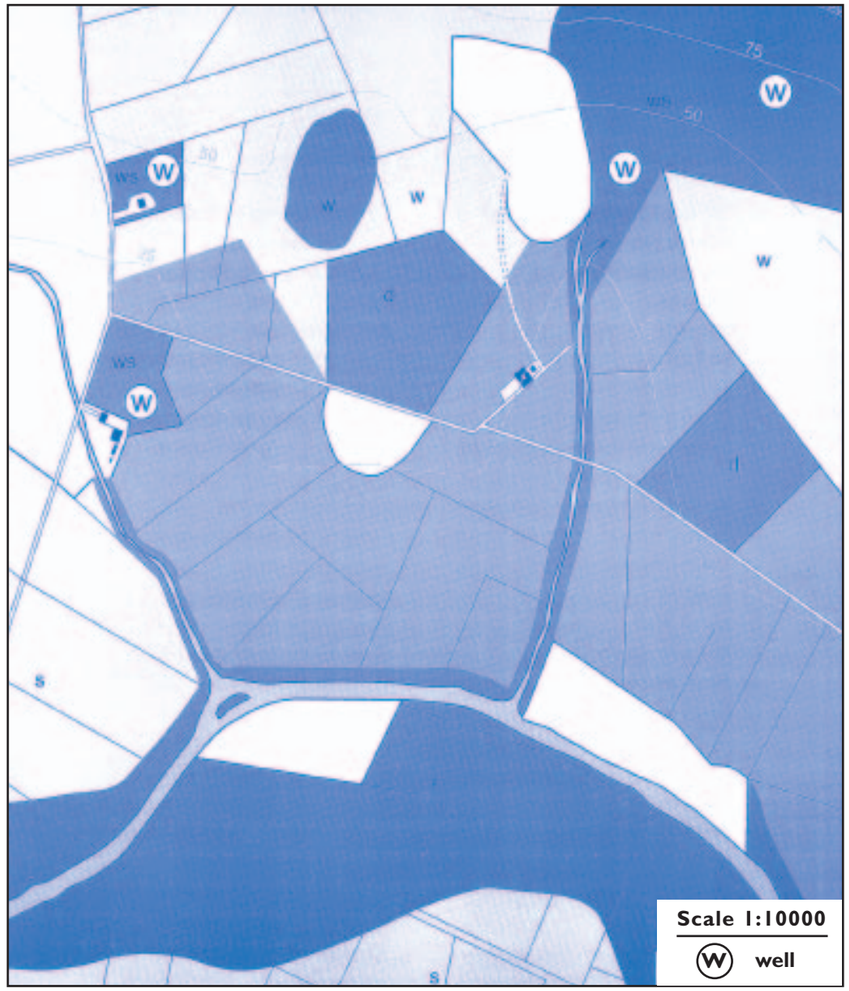
Maximum permissible concentrations of potentially toxic elements in soil after application sewage sludge and maximum annual rates of addition.

PTE	Maximum permissible concentrations of PTE in soil (mg/kg dry solids)				Maximum permissible average annual rate of PTE addition over a 10 year period
	pH[1] 5.0<5.5	pH[1] 5.5<6.0	pH 6.0-7.0	pH [3] >7.0	(kg/ha)[2]
Zinc	200	250	300	450	15
Copper	80	100	135	200	7.5
Nickel	50	60	75	100	3
	For pH 5.0 and above				
Cadmium	3				0.15
Lead	300				15
Mercury	1				0.1
Chromium	400				15
*Molybdenum[4]	4				0.2
*Selenium	3				0.15
*Arsenic	50				0.7
*Fluoride	500				20

* These parameters are not subject to the provisions of EU Directive 86/278/E1EC.

1. For soils of pH in the ranges of 5.0 < 5.5 and 5.5 < 6.0 the permitted concentrations of zinc, copper, nickel and cadmium are provisional and will be reviewed when current research into their effects on certain crops and livestock is completed.
2. The annual rate of application of PTE to any site shall be determined by averaging over the 10 year period ending with the year of calculation.
3. The increased permissible PTE concentrations in soil of pH greater than 7.0 apply only in soils containing more than 5% calcium carbonate.
4. The accepted safe level of molybdenum in agricultural soils is 4mg/kg. However there may be some areas where, for geological reasons, the natural concentration of this element in the soils exceeds this level. In such cases there may be no additional problems as a result of applying sludge, but this should not be done except in accordance with expert advice. This advice will take account of existing soil molybdenum levels and current arrangements to provide copper supplements to livestock.

APPENDIX V – EXAMPLE OF A FARM WASTE MANAGEMENT PLAN



g	gradient	Light Blue	Very low risk, winter and summer applications
s	soil type		possible, access good.
f	flooding		
w	wetness	Mid Blue	Moderate risk during rainfall' care required.
ws	water supply	Dark Blue	High risk, spreading should take place in ideal
d	drainage system		conditions only. Access limited.

APPENDIX VI – USEFUL ADDRESSES

1. Department of Local Government and the Environment

a) Office of Environmental Health
Murray House
Mount Havelock
Douglas
Isle of Man IM1 2SF
Tel: 01624 685953
Fax: 01624 685773
E-mail: envhealth@dlge.gov.im

b) Isle of Man Government
Laboratory
Kingswood Grove
Douglas
IM1 3LY
Tel: 01624 6751511625590
Fax: 01624 625429
E-mail: govlab@gov.im

c) Waste Management Operations Unit c/o
Murray House
Mount Havelock
Douglas
Isle of Man IM1 2SF
Tel: 01624 685901
Fax: 01624 685770

2. Department of Agriculture, Fisheries and Forestry

a) Head Office/Animal Health
Murray House
Mount Havelock
Douglas
Isle of Man IM1 2QF
Tel: 01624 685844
Fax: 01624 685851
E-mail: daff@gov.im

b) Agricultural Advisory Service
Knockaloe Farm
Patrick Village
Peel
Isle of Man IM5 3AJ
Tel: 01624 842335
Fax: 01624 844374
E-mail: knockaloe@daff.gov.im

c) Wildlife and Conservation Office
Knockaloe Farm
Patrick Village
Peel
Isle of Man IM5 3PA
Tel: 01624 842335
Fax: 01624 844374
E-mail: liz.charter@gov.im

3. Isle of Man Water Authority
Tromode Road
Douglas
Isle of Man IM2 5PA
Tel: 01624 695949
Fax: 01624 695956

4. Isle of Man Fire and Rescue Service
Fire Services Headquarters
Elm Tree Hotel
Elm Tree Road
Onchan
Isle of Man IM3 4EF
Tel: 01624 647300
Fax: 01624 647301

5. Isle of Man Constabulary
Police Headquarters
Glencrutchery Road
Douglas
Isle of Man IM2 4RG
Tel: 01624 631212
Fax: 01624 628113

6. Department of Transport

a) Airports Division/Air Traffic Control
Ronaldsway Airport
Ballasalla
Isle of Man IM9 2AS
Tel: 01624 821621
Fax: 01624 821627

b) Highways and Traffic Division
Sea Terminal Building
Douglas
Isle of Man IM1 2RF
Tel: 01624 686665
Fax: 01624 686905

c) Drainage Division
Sea Terminal Building
Douglas, Isle of Man IM1 2RF
Tel: 01624 686669
Fax: 01624 686900

7. Manx National Heritage
Manx Museum
Kingswood Grove
Douglas
Isle of Man IM1 3LY
Te1: 0 1624 648000
Fax: 01624 648001

APPENDIX V11 – ISLE OF MAN WATER AUTHORITY WATER CATCHMENT AREAS

(Available separately from the Water Authority, Tromode Road, Douglas).

APPENDIX VIII – REFERENCE BIBLIOGRAPHY

1. Legislation Affecting Agricultural Activities

Agriculture (Safety, Health and Welfare Provisions) Act 1974
Dogs Act 1990
Health and Safety at Work etc Act 1974
Heath Burning Act 1939
Highways Act 1986 Inland Fisheries Act 1976
Public Health Act 1990
Water Act 1991
Water Pollution Act 1993
The Animal (Waste Food) Order 1983
The Bovine Spongiform Encephalopathy Order 1991

2. British Standards Specifications

NOTE: Care should be taken when referring to these publications to verify that the information and technical criteria given comply with Isle of Man legislative requirements.

BS 5502 Buildings and Structures for Agriculture

Part 50 (1989) Code of Practice for the design, construction and use of reception pits and storage tanks for slurry

Part 22 (1987) Code of Practice for the design, construction and loading

Part 81 (1989) Code of Practice for design and construction of chemical stores

BS 8007 Code of Practice for design of concrete structures for retaining aqueous liquids

BS 5061 Cylindrical Forage Towers and recommendations for their use

BS 799 Part 5 (1987) - Oil Burning Equipment - Specification for oil storage tanks

Obtainable from : British Standards Institution, 389 Chiswick Road, London. W4 4AL (Tel: 020 8996 9000)

3. Health and Safety Publications

NOTE: Care should be taken when referring to these publications to verify that the information and technical criteria given comply with isle of Man legislative requirements.

Effluent Storage on Farms. HSE Guidance Note GS 12 (May 81)

Slurry Storage Systems. HSE (Annex to AIC 1985/6)

Storage of Approved Pesticides: Guidance for farmers and other professional users. HSE Guidance Note CS 1988

Sheep Dipping - Protect Your Health. HSE leaflet AS29

Obtainable from HSE Books, PO Box 1999, Sudbury, Suffolk. CO10 6F5 (Tel: 01787 881165, Fax: 01787 313995)

4. Codes of Practice

NOTE: Care should be taken when referring to these publications to verify that the information and technical criteria given comply with Isle of Man legislative requirements.

Code of Practice for the Safe Use of Pesticides on Farms and Holdings. (MAFF/HSE) 1990

Waste Management Paper No 21 'Pesticide Wastes: A Technical Memorandum on Arisings and Disposal including a Code of Practice '.

Code of Practice for Suppliers of Pesticides to Agriculture, Horticulture and Forestry (MAFF)

Code of Practice for Agricultural Use of Sewage Sludge. (Department of the Environment) 1989.

Obtainable from HMSO Bookshops or HMSO Publications Centre Orders Department PO Box 276, London SW8 5DT (Tel: 0870 600 5522)

The Heather Burning Code (DAFF)

5. Other Publications

NOTE: Care should be taken when referring to these publications to verify that the information and technical criteria given comply with Isle of Man legislative requirements.

Construction Industry Research and Information Association Report No 126 'Farm Waste Storage - Guidelines on Construction '. Obtainable from CIRIA, 6 Storey's Gate, London. SW4P 3AU (Tel: 020 7222 8891).

Farm Waste Management: The Storage of Farm Manures and Slurries	Ministry of Agriculture, Fisheries and Food (MAFF) - Booklet 2273
Farm Waste Management: Advice on Avoiding Pollution from Manures and other Slurry Wastes	MAFF Booklet 2200
Farm Waste Management: Dirty Water Disposal on the Farm	MAFF Booklet 2390
Farm Waste Management: Profitable Utilisation of Livestock Manures	MAFF Booklet 2081
Soil Injection of Sewage Sludge - A Manual of Good Practice	Water Research Centre FR0008
A simple disposal pit for foetal material and small carcasses	MAFF/DAFS Leaflet 648
Intensive Livestock Units - Notes of Guidance Department	Scottish Office, Agriculture and Fisheries
Cryptosporidium in Water Supplies (The Badenoch Report) (1990)	Department of the Environment and Department of Health - HMSO
Guidelines on Housed Livestock	MAFF Booklet UR 105

Codes of Recommendations for the Welfare of Livestock (issued jointly by the Ministry of Agriculture Fisheries and Food, The Scottish Office, Agriculture and Fisheries Department and the Welsh Office, Agriculture Department).

Cattle	Leaflet No. 701
Pigs	Leaflet No. 702
Domestic Fowls	Leaflet No. 703
Turkeys	Leaflet No. 704

Nature Conservation and Pollution from Farm Wastes Nature Conservancy Council(1991)

APPENDIX IX

D.A.F.F.	THE DEPARTMENT OF AGRICULTURE, FISHERIES AND FORESTRY
D.L.G.E.	THE DEPARTMENT OF LOCAL GOVERNMENT & THE ENVIRONMENT
BOD	BIOCHEMICAL OXYGEN DEMAND
ASSI	AREA OF SPECIAL SCIENTIFIC INTEREST
NNR	NATIONAL NATURE RESERVE
HSE	HEALTH & SAFETY EXECUTIVE
MAFF	MINISTRY OF AGRICULTURE FISHERIES & FOOD
HSW	HEALTH & SAFETY ACT 1974
DETR	DEPARTMENT OF THE ENVIRONMENT, TRANSPORT & THE REGIONS
WPA	WATER POLLUTION ACT 1993
EU	EUROPEAN UNION

NOTES