Comhairle Contae Thiobraid Árann
Tipperary County Council

Comhairle Contae Thiobraid Árann,
Oifigí Cathartha,
Cluain Meala,
Co. Thiobraid Árann
Tipperary County Council,
Civic Offices, Clonmel,
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Patrick Doyle,
Programme Officer,
Environmental Protection Agency,
Headquarters,
PO Box 3000
Johnstown Castle Estate,
Co. Wexford.
Y35 W821

14th September 2016

Your ref P1032-02
Our Ref – 96/451

Re – Notification under Section 97 (IE)(a) of the EPA Act 1992, as amended.

Dear Sir,

I refer to the above and your correspondence of 24th August 2016 in relation to same.

I enclose herewith a copy of notification of Grant for application 96/451.

Also enclosed is a copy of the E.I.S., which accompanied the application.

Yours sincerely,

Liz McGrath

For Director of Services

TIPPERARY SOUTH RIDING COUNTY COUNCIL

Local Government (Planning & Development) Acts, 1963 to 1993

NOTIFICATION OF A GRANT

96/451

William Carroll,
Mile Tree,
Clonmel,
Co. Tipperary.

PLANNING REGISTER NUMBER: 451
APPLICATION RECEIPT DATE: 05/07/96

In pursuance of the powers conferred upon it by the above mentioned Acts, Tipperary South Riding County Council have by Order decided to grant PERMISSION to the above named, for the development of land namely:-

700 integrated sow unit in 2 pig buildings,

AT Rathronan,Demesne,Clonmel,

in accordance with the plans and documentation lodged with this application hereby **GRANT** the PERMISSION subject to the 8 conditions set out in the Schedule attached. It should be noted that this PERMISSION will expire on:
18th day of October 2001.

Signed on behalf of
Tipperary S.R. County Council.....
for County Secretary.

Date: 8/10/96

NOTE:

The permission herein granted shall, on the expiration of the period indicated above, cease to have effect as regards:-

(1) In case the development to which the permission relates is not commenced during the period, the entire development and

(2) In case such development is so commenced, so much thereof as is not completed within that period.

It should be noted that an outline permission is a permission subject to the subsequent approval of the Planning Authority and that until such approval has been obtained to detailed plans of the development proposed, the development is NOT AUTHORISED.

You must submit a COMMENCEMENT NOTICE in accordance with the Building Control Regulations 1991 prior to starting any work as a result of this Grant of Permission, except in the case of a permission for retention.

96/451

ENVIRONMENTAL IMPACT STATEMENT

to accompany

AN APPLICATION TO TIPPERARY SOUTH RIDING COUNTY COUNCIL

for

FULL PLANNING PERMISSION FOR A PROPOSED 700 SOW UNIT

at

RATHRONAN DEMESNE, CLONMEL, CO. TIPPERARY.

APPLICANT: MR. WILLIAM CARROLL

Ciarán M. Carroll, B.Agr.Sc., M.An.Sc., Teagasc, Moorepark, Fermoy, Co. Cork.

John Mulqueen, B.Agr.Sc., M.Sc., Teagasc, University College, Galway.

June 1996

ENVIRONMENTAL IMPACT STATEMENT

Proposed 700 Sow Unit at Rathronan, Clonmel, Co. Tipperary for Mr. William Carroll, Miletree, Clonmel, Co. Tipperary.

1. NON TECHNICAL SUMMARY

1.1 This proposal to establish a 700 sow integrated unit at Rathronan Demesne, Clonmel is being put forward by the promoter to secure his future and that of his family in farming. The proposal is fully in line with Government Policy aimed at increasing the competitiveness of the Irish pig meat industry in overseas markets.

1.2 The site chosen for the unit at Rathronan Demesne, is on the 81 hectare (200 acre) farm owned by the developer. It is accessed by a minor link road connecting the Clonmel/Cashel road with the Clonmel/Fethard road. Clonmel is about 3 miles from the site. The increase in service traffic is considered to have an insignificant impact.

1.3 The buildings and their layout are the most up to date for the industry. All clean water is separated from soiled water. Clean water is discharged independently to the adjoining watercourse and all soiled water is piped to underfloor storage tanks.

1.4 Annual pig production is estimated at 15,400 or about 296 per week.

1.5 The pig unit will give direct employment to 5 staff and a trained manager. It will also give rise indirectly to another 30 jobs in the pig meat processing, milling and services sector.

1.6 Annual slurry production is estimated at 9,934m^3 and total underfloor storage is 5403m^3 or 4,149 m^3 after allowing for accumulation of gases, enough for 22 weeks.

1.7 The pig slurry will be spread on 771 hectares (684 hectares after deductions) of well drained productive grassland and tillage land. Based on the volume of slurry produced (9,934m^3) and the land area for spreading (684ha) the average spreading rate for pig slurry is equivalent to 14.5m^3/ha (1,300 gallons per acre). Cattle slurry produced on the farms (2301m^3) will be spread at an average rate of 3.4m^3/ha (300 gallons per acre). However, based on the soil nutrient status of the lands (as determined by soil analysis), there is a requirement for a spreading rate of 45m^3 pig slurry/ha (4,000 gallons per acre). This rate is adequate for crop production and will not give rise to an accumulation of phosphorus in the soil. Experimental measurements indicate that the risk of contamination of ground waters by nitrate-nitrogen is negligible.

1.8 The spreadgrounds only constitute 4.4% of the river catchments of the area in which they are contained and all practicable steps have been taken in the selection of the spreadgrounds and in designing the management of the spreading to ensure that contamination of surface and ground waters will not occur.

1.9 Farmers in the area have pledged a total area of 874 hectare (2159 acres) for slurry spreading. After allowing for on-farm produced farmyard manure and slurry, there is a reserve pool of 463 ha (1144 ac) of soil sampled land (see calculations in section 6.2.1). There is plenty of spreadgrounds for slurry application available.

1.10 An Environmental Impact Assessment was carried out in support of this application. This entailed surveys of land quality in relation to overburden, soil drainage status, soil chemical fertility and farm husbandry practices, surveys of water for quality analyses, geohydrological surveys and surveys and mapping of farmlands for spreadgrounds. Flora, fauna and archaeological monuments were also noted. The following statements may be made:

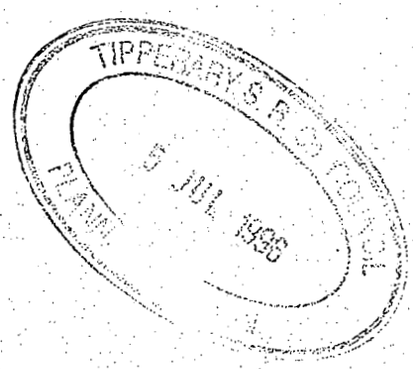
(i) the lands selected as slurry spreadgrounds are deep well drained and are mostly low in phosphorus, one of the main plant nutrients supplied by pig slurry. No contamination of surface waters with run-off waters containing a high phosphorus content can be foreseen with the applied management. Neither will contamination of ground waters with nitrate-nitrogen take place.

(ii) the quality of surface and ground waters leaving the area of the spreadgrounds is excellent.

(iii) the impacts from traffic, noise and odours at the pig unit are insignificant after all practicable steps have been taken to mitigate them.

(iv) land spreading of slurries will be carried out using a vacuum tanker fitted with a low trajectory splashplate and also by the land-link spreading method. Management strategies to control offensive odours are stated.

1.11 Proposals for monitoring surface and ground waters at the site and in the spreadgrounds and for monitoring soil fertility are set down in the Environmental Impact Statement. A register of slurry quantities and rates and location of spreadgrounds will be maintained for inspection and monitoring by Tipperary S. R. County Council.



2. INTRODUCTION

2.1 Relevant Regulations for Environmental Impact Statement (EIS)

This Environmental Impact Statement (EIS) is prepared in accordance with EC Directive 85/337/EEC on the assessment of the effects of public and private projects on the environment, the European Communities (Environmental Impact Assessment) Regulations 1989, S.I. No. 349 of 1989 which gives effect to the Directive in Irish Law and the Local Government (Planning and Development) Regulations 1989 (S.I. 25 of 1989). Under these regulations it is required that an EIS be prepared for pig rearing installations where the capacity would exceed 3000 pig units on all soils (where 1 sow plus progeny to slaughter weight = 10 units). The proposed pig raising facility will carry 6,650 at 95% capacity pig units and accordingly requires the preparation of an EIS which is submitted as part of the Planning Application.

2.2 National and EU Policy

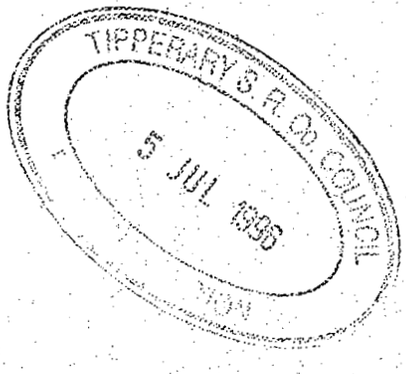
The proposed development is in line with national policy (1) as expressed by the Minister for Agriculture on 10.7.87 in a development plan for the Irish Pig Industry, (2) as expressed in the Pig Production Group Report of 1988 and (3) is in line with projected slaughtering of pigs at meat plants by the IDA aimed at increasing the competitiveness of Irish pig meat in overseas markets. Irish meat plants have been updated in accordance with National and EC policy, entailing the expenditure of large sums of money by the promoters and substantial capital grant-aid by the Irish Government and the EC. At present the throughput of these plants averages 60% of capacity.

2.3 Proposed Development in Context

Mr. William Carroll, Senior has been farming (Dairying and Pigs) at Clashaniska Lower, Clonmel since 1948. The applicant (Mr. William Carroll, Junior) has been involved in full-time farming at Clashaniska Lower, since 1984. Farming is his main source of income and is the only trade and profession he knows. After successful completion of the Teagasc (Athenry) Pig Training Course in 1983, Mr. Carroll (Jnr.) has been engaged in pig farming since. He is familiar with modern pig production requirements including the measures necessary to protect the environment.

2.4 Organisations and Bodies Consulted

Tipperary S. R. County Council
Teagasc, Johnstown Castle, Wexford
Mr. John Mulqueen, Teagasc, University College, Galway.
Mr. Brendan Lynch, Teagasc, Moorepark
Mr. John Fitzgerald, Teagasc, Moorepark
Mr. Cyril Saich, National Parks and Wildlife Service



3. DESCRIPTION OF PROJECT

3.1 Overall Description

The proposal envisages the establishment of a 700 sow unit comprising the facilities necessary for a 700 sow integrated herd, associated feed and manure storage and distribution facilities. Details of the production system and accommodation are given in Appendix 1.

3.2 Size and Scale of the Proposed Development

The size and scale of the proposed development have been chosen based on maintaining an output of about 15,400 pigs per year. The proposal entails the erection of 2 pig buildings, 6 feed storage bins, a feed store house, a small office and canteen along with shower and toilet facilities. All the pig houses are low A-roofed houses with a peak ridge height of 4.7 metres. The feed bins are the tallest structures with a maximum height of 8 metres. All buildings are state of the art and are designed to facilitate the orderly movement and flow of pigs during their life cycle and to transport to a meat plant. All structures will be suitably painted and landscaped to minimise any visual intrusions in the landscape in consultation with Tipperary S. R. County Council. Site and detailed design plans are given in Appendix 9.

In full production, the proposed new will accommodate the following stock:- 560 dry sows, 140 suckling sows and their litters, 70 maiden gilts, 15 boars, 2,370 weaners, 3,554 finishers. It is budgeted that the unit will be operated to 95% capacity.

3.3 Siting and Design

The proposed pig unit is sited on the farm owned by Mr. Carroll in the townland of Rathronan Demesne, Clonmel. The site is entirely in an agricultural area, away from dwelling houses. Thus the noise, sounds and odours are those actually found and those to be expected from agriculture. The nearest dwelling house is about 400 metres from the site excluding the house owned by Mr. Carroll at the site. The proposed pig unit buildings are about 300 metres from the nearest road and about 300 metres from the nearest stream ("Rathronan Stream").

The buildings are state of the art and designed to modern standards of animal welfare and with ease and efficiency of animal flow in mind. They also incorporate adequate ventilation and temperature control for human comfort.

Details of the siting and design are shown in Appendix 9 in Drawings numbered 230596, 230596a, 230596b.

3.4 Types and Quantities of Wastes

The major waste product from the proposed pig unit is manure slurry. The slurry produced from the new unit is estimated (based on REPS/Teagasc figures) to be about 178.75m^3/week, as shown in Table 1. To this must be added 12.5% for extraneous water, bringing the total slurry volume to 201.1m^3 per week. The yearly production of neat slurry amounts to 10,457m^3 and at 95% occupancy to 9,934m^3. All soiled water will be lead to the underground slurry storage tanks and is accounted for above as extraneous water.

Table 1. Estimated Slurry Production from the proposed Unit			
Type of Animal	**No.**	**Neat Excreta Litres/Week/Animal**	**Total m^3/week**
Dry Sows	560	35	19.6
Maiden Gilts	70	35	2.45
Boars	15	35	0.525
Suckling Sows	140	100	14.0
Weaners	2370	15	35.55
Finishers	3554	30	106.62
Total	**6709**	-	**178.75**

The annual pig mortality is estimated as follows: sows - 21; piglets - 1232; weaners - 185; finishing pigs - 154. Pig carcasses will be temporarily stored in sealed metal skips for transport and disposal to the rendering plant at least once per week.

Odours and emissions are minimal from modern pig units and are hardly detectable 100 metres from the unit on the downwind side. Removal of slurry from storage tanks is by tanker armoured suction hose inserted into the tank with minimal odour release. Odours can arise during land spreading of the slurry and measures to minimise these are dealt with under 'Slurry Disposal Proposals', section 3.6 and 'Air Quality', section 5.2.4.

3.5 Slurry Storage Proposals

All slurry will be stored in underslat reinforced concrete tanks, specified to provide a watertight seal and constructed according to Dept. of Agriculture specifications. Copies of specifications S129, S101, S102, S121, S123 prepared by the Farm Development Service of the Depeartment of Agriculture, Food and Forestry are provided in Appendix 8. The total slurry storage capacity available is 5403m^3. After allowing a 225 mm freeboard for the accumulation of gases the net slurry storage capacity is 4149 m^3 which provides 22 weeks storage capacity. Details of the tank constructions are shown in Appendix 8.

3.6 Slurry Disposal Proposals

It is proposed to land spread all the slurry on 771 hectare (1904 acres) gross and 684 hectare (1689 acres) net of productive grassland and tillage land. To date farmers have pledged a total of 874 hectare (2159 acres) of suitable spreadgrounds allowing for a reserve of 463 hectare (1144 acres) of soil sampled land. The factor of safety for the spread grounds is 3.1. The slurry will be spread at rates based on the soil phosphorus (P) index of the lands involved. This soil P index (shown in Table 2) is taken from the Teagasc "Soil Analysis and Fertiliser, Lime, Animal Manure and Trace Element Recommendations" (Johnstown Castle, Wexford, 1994).

Table 2. Phosphorus (P) for grazing, silage and tillage land (kg ha^{-1})						
Soil P index	Grazing	Silage		Tillage		
		1st Cut	2nd Cut	Beet	Potatoes	Cereals
1	40	50	20	70	125	45
2	30	40	15	55	100	35
3	20	35	10	40	40	25
4	0	25	10	20	20	0

The soil P index for each of the lands sampled is shown alongside the soil P values in Table 6.

The fertiliser in the slurry will substitute for chemical fertiliser except where a limited amount (potassium fertiliser) is required for balancing purposes. In all cases, the rate of application will be matched to the nutrient requirements of the crop and the nutrient status of the soil. Areas of low nutrient status (fertility) will benefit by receiving slightly higher rates until the soil nutrient status is satisfactory and fertile soils will receive reduced rates.

It is proposed to spread the slurry by vacuum tanker fitted with a low trajectory splashplate and by the land-link spreading method. This land-link method involves the pumping of slurry from the tank through an "umbilical" pipe/hose on a reel which will travel a distance of up to 1,500 m from the slurry tank. This method of spreading will be used on the 81 ha of land owned by Mr. Carroll at the site of the proposed unit. Using 9m^3 (2000 gallon) and 11m^3 (2500 gallon) tankers will require that up to 1104 tanker loads of slurry are transported and spread. Slurry will be landspread strictly in accordance with the Teagasc Code of Good Practice (Appendix 2).

3.7 Slurry Tankers Owned and Available

The developer owns one vacuum tanker and arrangements will be made with a contractor (Michael Sheehan) to transport and spread slurry. As well as these tankers, vacuum tankers (with low trajectory splashplates) are readily available in the area if required. The land-link spreading will be carried out by Shane Fee, Powerstown, Clonmel.

3.8 Agreement for Slurry Spreading

There is a good demand for pig slurry in the area and to date neighbouring farmers have pledged a total 874 ha (2,159 ac) of suitable land for slurry spreading. These farmers have agreed in writing to take slurry and the details of the agreements signed by the farmers are attached in Appendix 3 along with maps to a scale of 1/10560 identifying the farm spreadgrounds according to a numerical index (Appendix 4).

3.9 Details of Services Required

The proposed site is fully serviced with electricity and telephone lines. The developer will sink his own well at the proposed site to supply water to the unit.

3.10 Details of Feedstuffs

Pig feeds will be purchased from a feed compounder. Pigs will be fed in dry form delivered by auger and controlled electronically for automatic operation. Water will be supplied to the pigs via drip-free nipple drinkers.

Copper may be included in the feeds at a rate of about 0.5kg of copper sulphate per tonne of feed for growing and finishing pigs. This gives rise to a manure slurry with a copper content of 30 mg/L Copper. It is not proposed to supplement the meals with zinc.

3.11 Maximum Soil Contaminant Concentration

The pig slurry spread will not add any contaminant to the spread lands. The elements in pig slurry comprise chiefly carbon, oxygen, hydrogen and nitrogen with lesser amounts of phosphorus, sulphur and copper. At an application rate of 14.5m^3/ha, the application rate of 0.5kg/ha copper is only about 3% of that permitted in EC Directive 86/278 on the application of sewage sludge to agricultural land.

4. DESCRIPTIONS OF ALTERNATIVES

4.1 Alternative Sites Considered

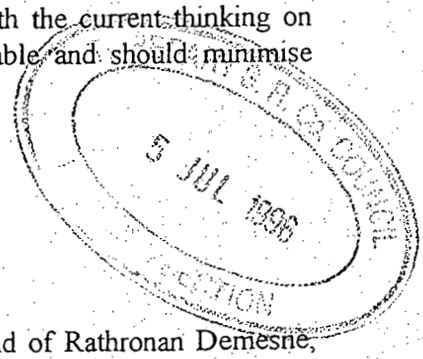
The alternative site considered is the existing pig unit at Clashaniska Lower, Clonmel. However, the developer feels that it is too close to the town of Clonmel to develop further. The proposed development will be operated completely separate from this existing unit. The proposed site was thus purchased with a view to establishing the proposed pig unit. The garden walls surrounding the proposed buildings will serve to protect the environment from a point of visual impact and also from a hygiene point of view. Thus, developing the proposed unit within the garden walls makes it the most suitable site for the development on the 81 ha farm.

4.2 Alternative Site Layout and Designs

Alternative layouts and designs were investigated and considered. The layout and design of the proposed new unit incorporate the most up-to-date concepts in modern pig production in relation to both human and animal welfare including automatic computer controlled feeding and environmental control. The house design lends itself readily to the under-floor storage of slurry in reinforced concrete leakproof tanks. The layout and design of the buildings facilitate the orderly movement and flow of pigs during their lifecycle.

4.3 Alternative Processes Considered

There is no other satisfactory alternative process for pig production. Land spreading is the one practical and economic means of utilising the nutrients in pig slurry and is in line with the current thinking on resource recovery. The method of landspreading proposed is very practicable and should minimise odours emitted from the slurry.



5. DESCRIPTION OF EXISTING ENVIRONMENT

5.1 Location of Structures (See site plan in Appendix 9)

It is proposed to locate the new structure at Rathronan House in the townland of Rathronan Demesne, Clonmel. The location of the proposed unit is accessed by a long tree-lined entrance avenue. The site itself is well landscaped with mature trees. The buildings when erected will be unobtrusive and will be absorbed in the parkland environment. The site is accessed by a minor link road connecting the Clonmel/Cashel road with the Clonmel/Fethard road. Clonmel is about 3 miles from the site. The elevation of the site is about 70 m (228 ft) OD.

5.1.1 Site Investigations

The site investigations are dealt with in sections 5.2.2.1-5.2.2.4. Percolation tests were carried out in accordance with SR6 (1991) Septic Tank Systems, National Standards Authority of Ireland, Eolas, Dublin 9. The results of the percolation tests showed a T value of 22 in the percolation area. This value indicates acceptable percolation rate and suitability of the soil to percolate septic tank effluent.

5.1.2 Load Bearing Capacity of the Soil

The overburdens of the proposed site are derived from predominantly limestone glacial drift with admixtures of sandstone and shale. In common with such deposits in Ireland, they are strong. They are more than adequate to bear the loads imposed on them by the pig structures. No load bearing problems have been encountered with Rathronan House which is located at the same site as the proposed breeding pig unit.

5.1.3 Access and Road Network

The site is accessed from a minor link road connecting the Clonmel/Cashel road with the Clonmel/Fethard road. There is little traffic on this road and the increase in service traffic is considered to have an insignificant impact.

5.2 Land Spreading Area

The bulk of the spreadlands are located about 2 ½ miles north of Clonmel and on either side of the Clonmel-Fethard road. There are all closeby with the most distant spreadland at Kilbragh House, Kilbragh being only 9 miles north west of the proposed site. Land spreading areas were surveyed in the townlands of:

Rathronan Demesne, Orchardstown East, Orchardstown West, Horsepasture, Ballyvaughan, Knockeevan, Caherclogh, Carrigeensharragh, Tooreen and Jossestown.

All wet lands, lands with rock outcrop and lands adjoining watercourses, streams, rivers and wells were excluded.

5.2.1 Ordnance Survey maps (r.f. 1/10560) showing the full extent of land proposed for slurry spreading are enclosed with this E.I.S. (Appendix 5).

5.2.1.1 Spreading areas are outlined in red. The total area of the spread ground is 771 ha. The total area of catchments enclosing the spreadgrounds as shown in Fig. 1 is 17490 ha. Thus the spreadgrounds constitute only 4.4% of the catchments outlined.

5.2.1.2 Watercourses, streams and rivers, etc. are shown blue on maps.

5.2.1.3 Dwelling Houses, etc. within the spreading area are shown green on maps.

5.2.1.4 Archaeological monuments listed in the "Sites and Monuments Constraints Maps" and the "Sites and Monuments Records of the Archaeological Survey of Ireland" (Office of Public Works) were consulted in relation to the spreadgrounds.

The monuments listed on the proposed spreadgrounds are shown in Table 3 and on the O.S. maps.

Landspreading of farm manures and slurries does not entail any soil disturbance and no damage to any of the listed archaeological monuments can accrue. A cordon sanitaire (5m) will be observed around all sites and monuments. Land spreading of chemical fertilisers and farmyard manures and slurries is traditional on all farms in the area and the proposed land spreading is merely a continuation of this process.

Table 3. Archaeological monuments listed on and near the Proposed Spreadgrounds

Tipperary Sheet No.	Townland	Monument No.	Description
61	Railstown (Near Kilbragh)	125	Church and Graveyard (in ruins)
69	Kilbragh	17	Ringfort
70	Killerk North (Near Jossestown)	71	Castle (site of)
70	Jossestown	95	Enclosure
70	Jossestown	98	Ringfort
70	Clonacody (Near Jossestown)	99	Castle (possible)
77	Orchardstown East	32	Well
77	Doon (Near Horsepasture)	83	Rectangular Enclosure
77	Doon (Near Horsepasture)	84	Enclosure
77	Caherclogh	57	Well
77	Caherclogh	58	Enclosure
77	Caherclogh	59	Enclosure
77	Moanroe (Near Caherclogh)	34	Earthwork
77	Milltown Britton (Near Tooreen)	40	Ringfort
77	Milltown Britton (Near Tooreen)	42	Ringfort
77	Carrigeensharragh	39	Enclosure
77	Knockeevan	25	Castle and Dwelling (possible)
77	Knockeevan	26	Enclosure
77	Ballyvaheen (Near Knockeevan)	28	Enclosure

Monuments No. 25, 28, 39, 40, 42, 71, 83, 84, 95, 99, and 125 are not on the spreadlands.

5.2.1.5. All unsuitable land within the spreadground areas is excluded and indicated on the maps.

5.2.1.6. Proposed Spreading Rates of Slurry

It is proposed to spread slurry at the rates based on the Teagasc Soil P index (see Table 2).

The average application rate over the spreadgrounds is 14.5m^3/ha (1290 gallons/ac). This will ensure that the nutrients viz. 4.6kg/t N, 0.9kg/t P and 2.6kg/t K are utilised. Thus, the chemicals (nutrients) in the pig slurry (organic) are being substituted for nutrients formerly derived from bag fertilisers (inorganic) manufactured in chemical plants (N compounds) and those mined (P and K compounds). The total area of suitable spreadgrounds available is 771 ha (see table 6). After allowing for fences, roads, gardens and a cordon sanitaire about houses, roads, streams, archaeological sites, etc., the total spreadgrounds available is 684 ha. Thus, the average application rate of 14.5 m^3/ha (9934 m^3 ÷ 684 ha). If the average application rate was increased to 16.5 m^3/ha the suitable land area available would be reduced to 602 ha.

5.2.1.7 All the spreadground lands are indexed on the maps and referred to an index list in Appendix 4.

5.2.2. Soil, Surface and Ground Waters

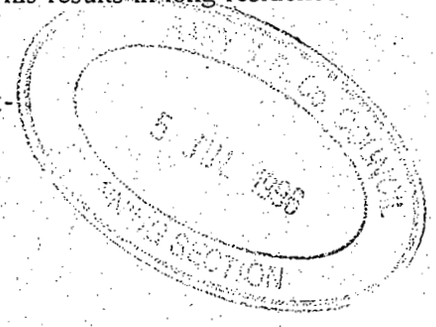
5.2.2.1 Types and Depths of Soils and Overburdens

The solid bedrock's are Carboniferous limestones. But these rocks are overlain for the most part by deep glacial drifts deposited by the last glaciation about 10,000 years ago. The soils have been surveyed and mapped by Finch (1971) who classed the well drained soils as Elton Series. The Elton is a deep grey-brown podsolic soil, well drained and of loam texture (Finch, 1971) derived from glacial drift of limestone origin. {The podsolic term indicates that iron has been mobilised down from the topsoil and deposited as a rusty brown colour in the underlying 200 - 600 mm soil layer}. A typical Elton soil was excavated at Rathronan Demesne (Test Pit 1 in Table 4). A more gravelly soil was excavated in Ballyvaughan townland and is described in Table 4, Test Pit 2.

Table 4	Description of Test Pits (all depths in mm).
Test Pit 1	Rathronan Demesne in disused kitchen garden
0-250	very dark brown organic rich loam topsoil
250-800	reddish brown loam; some roots
800-2000+	brown to grey brown stony loam; moist; no watertable after 48 hours and no bedrock; permeable as indicated by percolation test in base
Test Pit 2	Ballyvaughan on the Land of Eamon Phelan
0-300	brown loam topsoil; many roots
300-500	grey brown gravelly loam; permeable; few roots
500-1000+	light brown gravelly loam; permeable; no roots

5.2.2.2Geohydrology of the Spreadlands

The proposed pig unit is to be located near Rathronan House in Rathronan Demesne townland. The solid bedrocks are opened up by solution channels and are classed as bedrock aquifers by the Geological Survey of Ireland. The volume of recharge and it's timing are determined by the thickness of the overburden. With deep overburdens as in these spreadlands the water table responds slowly to recharge and the response continues for long periods (Hosty and Mulqueen, 1996). This results in long residence times in the soil for plant nutrients and hence efficient absorption.



The depth to groundwater table was measured in wells (see maps) as follows:-

Existing Unit, Clashaniska Lower, - >30 Metres
J. Lynch, Clashaniska Upper - 15.6 Metres

5.2.2.3 Direction of Groundwater Flow

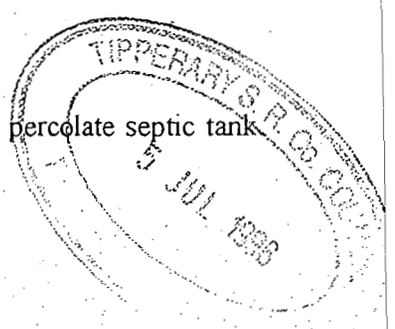
The spreadlands are drained by the River Moyle and its tributaries. The river Moyle rises in the hills above Rosegreen and flows in a south-easterly direction to the north of Ballyclerihan where it bends easterly and then south-easterly to join the river Anner along the boundary of Milltownbritton and Mullenaranky townlands. The stream draining Ballyvaughan, Horsepasture, Rathronan and Rathronan Demesne, Orchardstown East and Orchardstown West - the 'Rathronan stream' - flows eastwards from Newchapel and Orchardstown to the south of Fortwilliam House and under Brackford Bridge to join the river Anner along the boundary of Mullenaranky and Clonwalsh townlands. The river Anner then flows south by Newtown Anner Demesne into the river Suir downstream of Twomilebridge, about 2 miles east of Clonmel. On a microscale there are local gradients of the groundwater from the crests of hills and ridges to the lowlands.

5.2.2.4 Soil and subsoil permeability

The soil and subsoil saturated permeabilities are estimated in the range 100-500 mm/day. However, these values far exceed the recharge, which at maximum comprises the daily rainfalls in the November - January period (when evapotranspiration is negligible). In the growing season, the daily recharge is greatly reduced as a result of evapotranspiration. The soils of the spreadlands are well suited to take hydraulic loads of 1-5 mm once-off per year, arising from the spreading of pig manure.

Percolation tests were carried out at Rathronan Demesne in accordance with SR6 (1991) Septic Tank Systems, National Standards Authority of Ireland, Eolas, Dublin 9. A test hole 2 metres long, 1 metre wide and 2 metres deep was excavated 48 hours ahead of the tests. This hole was dry on the day of the tests. Results of the percolation tests were:

1. Test Hole 1	Start - 11.43; Finish time - 1.10;	t_1 = 22 mins
2. Test Hole 2	Start - 11.50; Finish time - 1.19;	t_2 = 22 mins.
		T = 22



A T value of 22 indicates acceptable percolation rates and suitability of the soil to percolate septic tank effluents.

5.2.2.5 Aquifer category and protection policy

The aquifer is a bedrock aquifer in Waulsortian Limestone (Sevastopulo, 1981). The limestones are complex. From the pig unit at Rathronan Demesne northwards, the lands are floored by the following formations:

Rathronan, Croane, Kilsheelan, Silverspring (limited), Waulsortian Mudbank Complex, Silverspring and Kilsheelan (Keegan, 1994). These formations are distinguished by the conditions under which they were formed [e.g. mudbank limestones are pure grey limestones of a fine grained texture (mud or silt grade) forming mound or sheet-like banks separated by limestones formed in interbank fingering lagoons (Sevastopulo, 1981)].

The limestones were deformed by earth movements. These movements gave rise to faulting and jointing along with the bedding planes already present. These formed paths for water movement which opened up cavities by solution to give rise to joint, fissure and cavern flows (secondary permeability). The aquifer underlying the site of the pig unit and the spreadlands has been classed in Keegan (1994) as a regionally important aquifer with karst flow.

But the aquifer is covered over at the pig unit and in all the selected spreadlands with a thick mantle of glacial drift of mainly limestone origin. At the pig unit site (Rathronan Demesne) there is in excess of 2 metres of soil overburden overlying the bedrock and about Clonacody House, there is 27 metres of overburden (Keegan, 1994). The spreadlands have each been surveyed and our experience of such surveys, in similar lands e.g. at Garryntemple and Loughlohery (pig units) and Lisheen (proposed mine) in Co. Tipperary and in numerous other counties with limestone aquifers along with experience of pumping tests in such aquifers, has enabled us to select only those lands with in excess of about 1 metre of soil overburden on the spreadlands. We consider that the overburden on the spreadlands selected offers good protection to the aquifer.

Although the aquifer underlying most of the spreadlands is classed in Keegan (1994) as of moderate to low vulnerability, a few spreadlands overlie an aquifer classed in Keegan (1994) as of high to extreme vulnerability. However, this classification is a regional classification. While the site of the pig unit at Rathronan Demesne is classified in Keegan (1994) as "Karst flow/extreme vulnerability" in the regional classification, the classification is not valid for the site where the aquifer is protected by more than 2 metres of stiff tenacious overburden with a saturated permeability of 0.4 metres and a recharge rate maximum of 25 mm/day (equivalent to the advance of the wetting front of 50-60 mm/day with a residence time of at least 33 days in 2 metres of soil). It is no accident that the aquifer of Rathronan Demesne and of the other spreadlands contains high quality waters (Appendix 7). Neither can the regional classification of aquifer vulnerability be applied to the other spreadlands where thick limestone overburdens overlie the limestone aquifer. Moreover, the fissures and cracks in the upper 300-800 mm layer of these limesotnes are infilled with soil where the overburden depth is significant, giving additional protection. [Such depths are known from the Lisheen Mine area].

Pig manure is applied as once-off application of 1-5 mm per year in the growing season. This amount, spread over a dispersed area of about 771 hectare, is so small that it can have no significant impact on a regional aquifer in which a cone of depression for a significant drawdown could extend to 1.5 km or more.

A review of septic tank theory and practice for the EPA has shown that 0.9 metres of unsaturated soil beneath the base of a percolation trench filters out all BOD, bacteria, viruses etc. with the daily application of 74 mm/day every day 365 days per year (McDowell - Boyer, Hunt and Sitar, 1986; Siegrist and Boyle, 1987). In the case of pig slurry applied at rates of 1-5 mm on one day of the year only (as current practice in Ireland) the liquid is thoroughly filtered by filtration on the grass (crop) and soil, by straining on the soil particles, by physico-chemical interactions with the soil e.g. absorption and by biochemical interactions e.g. carbonaceous oxidation and plant uptake. Nitrate-N is the least absorbed onto the soil and could be leached if applied in excess when not taken up by plant roots. The good quality of the groundwater and the high standard of husbandary show that nitrate-N is not being leached to any significant extent. This proposal entails only applications of pig manures to meet crop demands.

In conclusion, the limestone aquifer under the spreadlands and the site of the pig unit is well protected with overburden and no risk of significant contamination arises from this proposal.

5.2.2.6 Karst features

The solid bedrocks which underlie most of the spreadgrounds are carboniferous limestones. But these are covered with thick layers of glacial deposits. No karst features are included in the spreadgrounds.

5.2.2.7 Slopes and run-off susceptibility

Slopes on the spreadlands are gentle and are spreadable by conventional farm tractors and tankers. The lands are closest to the T. Gleeson Surface run-off susceptibility Category 7 - negligible surface run-off but excluding the categories 7 (a) and 7 (b).

5.2.2.8 Local climatology and hydraulic loading

Rainfall amounts and evapotranspiration (Table 5) are the parameters of importance in relation to hydraulic loading. These indicate that storage must be provided at least for the months of November, December and January when rainfalls are high, evapotranspiration is low and trafficability of the land may be difficult from time to time. In January pig manure maybe spread during dry spells from time to time as growth begins early in the south. It is also recommended that storage be provided to cover the months of October and February to cater for wet years. From February onwards, plant growth begins to take off as soil and air temperatures increase and soils drain out. Land spreading of farm slurries from this time on when the land is trafficable to tractors and tankers without rutting does not result in surface run-off or leaching of nutrients. Weekly weather forecasts provided by the Meteorological Office in the Irish Farmers Journal enable land spreading to be scheduled each week.

The once-off application of 1-5 mm of pig slurry per year is negligible in relation to the rainfalls in the growing season. Even with an infiltration capacity of 100 mm/day (low) a 4 mm slug would completely infiltrate the soil in one hour, so the risks of surface run-off of slurry are negligible when applied on the unsaturated soils of the spreadlands during the growing season. Mean monthly rainfall and evapotranspiration for Clonmel are shown in Table 5.

Table 5. Average monthly rainfall (R) and potential evotranspiration (Ep) at Clonmel.

Month	J	F	M	A	M	J	J	A	S	O	N	D	Total
R(mm)	108	81	72	60	69	53	62	77	91	89	91	110	963
Ep(mm)*	4	13	29	55	78	83	80	66	41	18	5	3	475

* MAFF (1967)

5.2.2.9 Existing Land Use and Cropping

The spreadgrounds consist of both grassland (for grazing and silage production) and tillage land (roots and cereals). Farm management standards on all farms included for land spreading is good.

5.2.2.10 Existing nutrient levels and chemical loading capacity of soils.

The soil type in the spreading areas are Grey Brown Podzolics (Soil association number 34, An Foras Taluntais, 1980). Grey Brown Podzolic soils are deep well-drained soils of loam texture and of high base status. These soils have a wide use range. Owing to their depth, free drainage, medium texture and good moisture holding capacity, they are first class grassland soils. They are also good tillage soils and are suitable for cereals and crops.

The nutrient status of the soil was determined by soil analysis. Soil samples were taken from lands representing 874 ha (2159 ac). Full details of the analyses are shown in Appendix 7 and average P values for each farm are shown in Table 6. Results of the chemical analysis (Morgan's Test) carried out at

Teagasc Laboratories, Johnstown Castle, Wexford showed that soil phosphorus (P) levels in the selected spreadgrounds are generally well below that required for optimum production (15mg P/kg) and could benefit from the application of slurry. Farms in low phosphorus categories will benefit from additional pig slurry over and above the average application rate (14.5m^3/ha) as set down in section 3.6 (Table 2) in the early years to raise the soil phosphorus status to levels satisfactory for crop growth.

Table 6. Average Soil P Levels by Farm in the Spreadlands

No.	Name	Area (ha)		Soil P (mg/kg)	P Index
		Total	Suitable		
1	Bergin, D.	154	154	3.7	2
2	Carroll, W.	81	81	4.2	2
3	Delahunty, K.	57	45	7.7	3
4	Flaherty, M.	25.5	20	9.0	3
5	Hennessy, J.	61	61	5.3	2
6	Phelan, E.	19	13	4.1	2
7	Power, E.	52	52	4.0	2
8	Purcell, E. J.	65	59	7.0	3
9a	Purcell, G.	16	10.5	8.7	3
9b	Purcell, G.	65	65	5.3	2
10	Purcell, J.	105	88	7.7	3
11	Purcell, T.	32	27	4.7	2
12	Quirke, Pat	17	17	6.8	2
13	Quirke, P. F.	18	0	11.4	4
14	Sheehan, M.	25.5	25.5	2.6	1
15	Slattery, D.	81	53	12.3	4
Total	-	**874**	**771**	**6.5 (Ave.)**	**2 (Ave.)**

Approximately 85 ha (210 acres) have been excluded because the P values were greater than 15 mg/kg. These excluded areas are marked on the maps. Farm No. 13 [18 ha(44 acres)] has also been excluded since it is sown to cereals, has a P Index of 4 and thus requires no phosphorus. This land will be monitored in the future and when the P Index has dropped it will be included in the spreadlands and receive pig slurry at the recommended rates. This leaves a total suitable land area of 771 ha (1,904 acres).

Farm No. 2 (owned by the developer) is currently under 48.5 ha (120 acres) of tillage and 32.5 ha (80 acres) grassland. After this year the tillage land will be re-seeded for grassland for silage production.

5.2.3 Surface and Ground Waters

5.2.3.1 Water Quality Analyses

Six samples of water were taken (2 wells and 4 streams) and analysed at Teagasc Laboratories, Johnstown Castle, Wexford. Results are shown in Appendix 7. They reflect the quality of both surface (PBW2, PBW4, PBW5, PBW6) and ground (PBW1, PBW3) waters. The results in Appendix 7 also show the Maximum Admissible Concentration for Drinking Waters as set down in the Drinking Water Directive 80/778/EEC and given effect by Statutory Instrument S.I. No. 81 of 1988. The maximum admissible concentrations for Surface Waters are set down in the Surface Water Directive 75/440/EEC and given effect by Statutory Instrument S.I. No. 294 of 1989.

Surface waters are graded as A1 (highest quality), A2 or A3 waters. All surface water samples (PBW2, PBW4, PBW5, PBW6) are in the Grade A1 category.

The ground water samples (PBW1 and PBW3) are in the Drinking water category.

5.2.4 Air Quality

The odours emitted from a pig unit originate from the manure, animals and feed. Animal and feed odours are the minor components. Smells from a modern pig unit rarely carry for distances exceeding 100 metres. The Rathronan Demesne area is a farming area and as such farming odours are to be expected. These include the odours that arise from land spreading of slurry. Every effort will be made to minimise malodours (e.g. the use of low trajectory splashplates should reduce odour emissions). The Teagasc Code of Good Practice for slurry spreading (Appendix 2) will be carefully adhered to. Thus the proposed new unit will have a minimal impact in relation to the air quality of the area.

5.2.5 Noise Levels

Noise levels are measured in decibels and a weighting factor, A, is applied to approximate the frequency response of the human ear. This weighted decibel scale, dB(A), correlates well with human sensations of loudness, disturbances and annoyance.
Background noise levels in rural areas of Ireland are in the 45-50 dB(A) range. Typical noise levels at pig units are marginally higher at about 54 dB(A) when pigs are resting. During the feeding period (10-15 minute) this noise level will increase to about 85 dB(A) at the unit. However, these noises are not greatly above normal background noise levels at a distance of 100 metres from the unit. Therefore, they are unlikely to be a nuisance. Typical levels of feed delivery trucks and tractors with slurry tankers may range from about 70 dB(A) to 85 dB(A). Noise from the ventilation systems on the unit will be barely audible outside the buildings.

5.2.6 Traffic Levels

Existing traffic levels about the site of the new unit are quite low. Traffic going into and out of the unit will consist of staff cars (about 6 per day), feed delivery (2-3 per week), pig sales (1-2 per week) and slurry tankers.

Slurry will be transported in a 2000 gallon ($9m^3$) and 2500 gallon ($11\ m^3$) tanker. At an annual slurry production figure of $9,934m^3$ this works out at up to 1104 loads per year (an average of 5 loads per day over the nine month period excluding Sundays). The road structure in the Rathronan area is well able to take this small amount of extra traffic. Use of the land-link spreading method on the 81 ha of land at the proposed will reduce the number of tanker loads to be spread.

6. DESCRIPTION OF IMPACTS AND MITIGATION MEASURES

Impacts may be positive (e.g. increased employment), negative (e.g. offensive odours) or neutral (e.g. in relation to temperatures).

6.0 Employment and Human well-being

The pig unit will employ 5 staff, and a trained manager. The unit will also indirectly lead to another 30 jobs in pig meat processing plants, feed compounding/handling and the services sectors.

The pig unit will be designed to operate with the best available technology under the supervision of a trained manager. The working conditions will meet the standards of the British Control of Substances Hazardous to Health Regulations (COSHH) which implement EC Directive 80/07/EEC.

6.1 Structures

6.1.1 Landscape and Visual Aspects

The proposal entails the erection of 2 pig buildings, 6 feed storage bins, a feed store house, a small office and canteen along with shower and toilet facilities. All the pig houses are low A-roofed houses with a peak ridge height of 4.7 metres. The feed bins are the tallest structures with a maximum height of 8 metres. All structures will be suitably painted and landscaped to minimise any visual intrusions in the landscape. The developer will comply with all requirements of Tipperary S. R. County Council in relation to location, colour scheme and screening of the structures and will enter into consultation in these aspects with Tipperary S. R. Co. Council if planning approval is granted.

6.1.2. Slurry Storage and Surface and Groundwater

Slurry will be stored in underfloor reinforced concrete tanks constructed according to Department of Agriculture specifications. There will be no impact on surface or ground waters. Tanks will be dipped every 2 weeks and records will be kept in a register available for inspection by Tipperary S.R. Co. Council

6.1.3 Noise Levels

Noise levels at feeding time (10-15 minutes) and from delivery trucks are referred to in section 5.2.5. Noise levels from the pigs at times other than at feeding are insignificant. The other noises which arise from the ventilation system and feed augers will be barely audible outside the buildings.

6.1.4 Odours and Emissions

The odours emitted from a pig unit originate from the manure, animals and feed. Animal and feed odours are the minor components. Smells from a modern well managed pig unit rarely carry for distances exceeding 100 metres and as the nearest dwelling house is about 400 metres from the unit, the impact of odours and emissions from the unit is considered to be insignificant.

6.1.5 Increased Traffic

Traffic going into and out of the unit will consist of staff cars, feed delivery, pig purchases and sales and slurry tankers as dealt with in section 5.2.6. The road structure is well able to take the proposed extra traffic density.

6.1.6 Mortality, Transport and Disposal of Carcasses

Even under good management mortality will occur and annual estimates are as follows: Sows - 21; piglets - 1232; weaners - 185; finishing pigs - 154. Pig carcasses will be temporarily stored in sealed metal skips for transport (John Molloy, Clonmel) and disposal at the rendering plant (National By-products Ltd., Castleblake, Rosegreen, Co. Tipperary) at least once per week.

6.1.7 Accidental Spillages

Slurry is the only material of concern. Since slurry tankers must be pressurised for delivery of the slurry the risk of any sizeable leakage or spillage is minimal. In the case of an accidental spillage occurring the developer will notify Tippperary S. R. County Council and will take the necessary measures to clean up such a spillage. Slurry tankers will be kept clean.

6.1.8 Rodent Control

Rodent control is essential to ensure good hygiene on any unit. Rodents will not be a problem on the proposed new unit as the developer will lay bait every week (supplied by Star Fuels and the local Co-op).

6.2 Landspreading

6.2.1 Nutrient Status, Land Requirements and Slurry Spreading Rates

Potential impacts arise from hydraulic and chemical loading of the soil. It has already been estimated in section 5.2.2.4 that the minimum infiltration rate is about 100mm/day. A 14.5m^3/ha slug of slurry will completely infiltrate the slowest soil in 21 minutes (i.e. (1.45/100) x 24 x 60)) and there is no risk of direct run-off of the slurry.

In relation to chemical loading, the application of the pig slurry entails the substitution of nutrients from chemical fertilisers by those from organic manures. There is no net increase in the application of plant nutrients leading to accumulation, particularly of phosphorus and nitrogen.

The nutrient status of the soil was determined by chemical analysis. The rate of slurry application will be based on the nutrient status of the soil. A schedule of the average soil phosphorus levels and phosphorus requirement of the spread grounds on each farm is represented in Table 7 below.

Table 7. Average Soil P levels and requirements by Farm

No.	Name	Soil P (Mg/kg)	P Index	P requirement (Kg)
1	Bergin, D.	3.7	2	6155
2	Carroll, W.	4.2	2	5070
3	Delahunty, K.	7.7	3	1125
4	Flaherty, M.	9.0	3	620
5	Hennessy, J.	5.3	2	2440
6	Phelan, E.	4.1	2	690
7	Power, E.	4.0	2	2075
8	Purcell, E. J.	7.0	3	1475
9a	Purcell, G.	8.7	3	210
9b	Purcell, G.	5.3	2	3607.5
10	Purcell, J.	7.7	3	2440
11	Purcell, T.	4.7	2	945
12	Quirke, Pat	6.8	2	540
13	Quirke, P. F.	11.4	4	0
14	Sheehan, M.	2.6	1	1147.5
15	Slattery, D.	12.3	4	820
	Total			**29360**

The farms in the spread grounds overwinter their cattle indoors and the slurry produced is returned to the land. Cattle slurry contains 0.6kg P per cubic metre (6.9% D.M.). Pig slurry contains 0.9kg P per cubic metre (3.2% D.M.). Table 8 shows the total volume of cattle slurry produced on each farm and the volume of pig slurry required to meet the phosphorus requirements shown in Table 7.

Table 8. Volume of Cattle Slurry produced and volume of pig slurry required to supply all the P requirements

No.	Farm	Cattle Slurry (M^3)	Pig Slurry (M^3)
1	Bergin, D.	675	6389
2	Carroll, W.	225	5483
3	Delahunty, K.	-	1250
4	Flaherty, M.	283.5	500
5	Hennessy, J.	305.6	2508
6	Phelan, E.	90	706.7
7	Power, E.	305.6	2102
8	Purcell, E. J.	-	1639
9a	Purcell, G.	-	233
9b	Purcell, G.	-	4008
10	Purcell, J.	-	2711
11	Purcell, T.	-	1050
12	Quirke, Pat	56.7	562
13	Quirke, P. F.		0
14	Sheehan, M.		1275
15	Slattery, D.	360	671
Total		**2301.4**	**31088**

The total phosphorus requirement of the land is 29,360kg. The total quantity of phosphorus supplied in the cattle slurry is 1381kg and the remainder could be made up by 31,088m^3 of pig slurry (27,979 kg P). Only 9,934m^3 of pig slurry are available supplying 8,941 kg of phosphorus, leaving an opportunity to apply 19,038 kg of phosphorus to the soil as pig slurry.

Based on the phosphorus requirement from pig slurry (27,979kg) and the spreading area available (684 ha after deductions) there is a P requirement of 41kg/ha (45m^3 pig slurry/ha). Thus the amount of land required to spread the pig slurry produced is 221 ha (i.e. 9934m^3 ÷ 45m^3). As there are 684 ha of suitable soil sampled land available, the safety factor could be 3.1 with a resulting reserve of 463 ha (1144 ac). If the average application rate was increased from 14.5 m^3/ha to 16.5 m^3/ha (as mentioned in section 5.2.1.6), the suitable land area available would be reduced to 602 ha. Thus the safety factor could be 2.7 with a resulting reserve of 381 ha (941 acres). Thus, there is more than adequate area of spread grounds available for the proposed new unit.
In relation to heavy metals, i.e. copper and zinc, it has been demonstrated in section 3.10 (zinc) and 3.11 (copper) that these metals do not give rise to a cause for concern. No mitigation measures are required.

6.2.2 Slurry Disposal and the Quality of Surface and Ground Waters.
Slurry will be disposed of from the unit by landspreading on grassland (both silage and grazing) and tillage land. The slurry will be spread on grassland during the growing season (February through September) and on tillage land at the time of cultivation. This management will avoid contamination of streams and rivers. Moreover, under the proposed spreading schedules, no accumulation of phosphorus will take place. There is no leaching of phosphorus. Applying the slurry during the growing season will ensure that nitrate-nitrogen (which is leachable) will be fully taken up by the grass roots and that leaching potential is minimal. The impacts are insignificant to surface and ground waters. A Cordon Sanitaire will be strictly observed around all rivers (10 m), streams (10 m), wells (50 m), etc. thus protecting those water bodies from contamination.

6.2.3 Air Quality and Slurry Disposal

The Rathronan Demesne area and the surrounding areas which will be used for slurry spreading are entirely in a farming area and as such farming odours are to be expected. These include the odours that arise from land spreading of slurry. As only 4.4% of the entire catchment block containing the spreadgrounds is to be used, the effect of spreading is insignificant in the overall context.

However, every effort will be made to minimise malodours. All slurry will be spread by using a low trajectory splashplate. No slurry will be spread within 100 metres of any dwelling house without the written permission of the owner and occupier thereof. It is customary for farmers in the locality who will receive slurry from the unit to spread the slurry to the boundary of the gardens surrounding their houses. Practically all farmers will adopt this practice. In the case of non-farming residences the cordon sanitaire will be strictly observed. No slurry will be spread within 5 metres of public roads. At all times the Teagasc Code of Good Practice for slurry spreading (Appendix 2) will be followed.

6.2.4 Waste Management

Slurry will be landspread on 684 ha (1689 ac) of productive farmland at the rates based on the soil P index (Table 2, section 3.6) and specified in section 5.2.1.6. A slurry spreading register will be maintained showing the amount of slurry spread, the area and owner of the farmland spread over and rate per acre. The register will be available for inspection by Tipperary S. R. County Council.

6.2.5 Mitigation Measures

6.2.5.1 Reduction of odour emissions

This issue is addressed in section 6.2.3. These are reduced and minimised by good design and management of the pig unit and by using the low trajectory splash plate.

6.2.5.2 Periods and rates of spreading of slurries

This issue is addressed in section 3.6, 5.2.1.6, 6.2.1 and 6.2.2.

6.2.5.3 Reduction and risk of disease spread

The economic viability of a pig unit depends primarily on production costs and low mortality. High standards of hygiene are essential to ensure that disease is controlled and contained. The proposed unit is isolated from the main roads (300 metres to the nearest minor road) and will be situated well away from the other units. The garden walls surrounding the proposed buildings will serve to protect and maintain the unit from a hygiene point of view. The breeding and finishing of pigs on the same unit protects against import and spread of disease. Access to the unit will be strictly restricted to control the spread of disease to the pig herd. The procedures for dealing with dead animals as discussed in section 6.1.6 are standard for the industry.

6.3 General

6.3.1 Flora and Fauna

None of the spreadgrounds is listed by the Office of Public Works as an Area of Scientific Importance (National Heritage Inventory - "Areas of Scientific interest in Ireland", An Foras Forbartha 1981).

Vegetation type within the spreadgrounds reflect production farmland which has been manured, etc. for centuries. Likewise the fauna is typical of farmland. Birds and animals to be noted in the area are Crow, Blackbird, Hare, Magpie, Jackdaw, Thrush, Fox, Badger, Starling, Chaffinch. Listing consulted on this was the "National Parks and Wildlife Service". The ecosystems are confined mainly to hedgerows and care will be taken not to spread slurry on the hedgerows. Thus, land spreading of slurry will have no impact on the above animals or vegetation. Some positive effects are likely i.e. increase in bird population at the site and in the spreadgrounds - more food available.

6.3.2 Archaeology and Cultural Heritage
This issue is addressed in section 5.2.1.4.

6.3.3 Impact of Increased Traffic Volume
The proposed traffic movement into and out of the pig unit is shown in Table 9.

Table 9. Traffic Movement into and out of the proposed unit.

Traffic Type	Expected No.
Staff Cars/day	6
Feed Delivery/week	2-3
Pig Sales/week	1-2
Slurry Tankers/day	5

The road structure in the Rathronan Demesne area is well able to take this small amount of extra traffic. ere will be adequate parking space available on the site for all traffic associated with the pig unit. Access to the unit from the road is gained through a well developed gate entrance with adequately good visibility on either side of the entrance.

7. MONITORING

7.1 Groundwater

Water samples will be taken yearly from the sites sampled for this study (see section 5.2.3.1) or other agreed sites (in consultation with Tipperary S. R. County Council) and analysed for physical, chemical and bacteriological properties at an independent laboratory to determine groundwater quality. A record of these analyses will be maintained for inspection by Tipperary S. R. County Council.

7.2 Surface Waters

Water samples will be taken every 2 years from the sites sampled for this study (see section 5.2.3.1) or other agreed sites (in consultation with Tipperary S. R. County Council) and analysed for physical, chemical and bacteriological properties at an independent laboratory to determine the quality of the surface waters in the spreadground areas. A record of these analyses will be maintained for inspection by Tipperary S. R. County Council.

7.3 Soils

Soils in the spreadgrounds will be sampled every 3 years and analysed chemically at the Teagasc Soil Laboratory, Johnstown Castle, Wexford. These analyses will be maintained for inspection by Tipperary S. R. County Council. Whenever necessary, adjustments will be made to the rate of spreading and to the spreading landpool to take into account the results of the soil analyses. Prior to any such adjustments, Tipperary S. R. County Council will be notified in writing for approval.

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Table of Contents

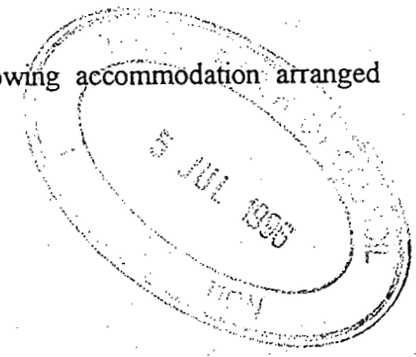
96/451

APPENDIX 1

DETAILS OF THE PROPOSED PRODUCTION AND ACCOMMODATION

The project consists of the development of housing and facilities for a 700 sow integrated herd. Finished pigs will be sold to a meat processing plant (currently being sold to Roscrea Fresh Foods, Roscrea, Co. Tipperary).

Sows will be accommodated in the service house and dry sow house as required in the breeding cycle. In the service house, sows and gilts are served by boars and/or by artificial insemination. After service, the sows will be accommodated during the gestation period (about 115 days) in the dry sow house. About 5 days before farrowing sows will be moved to the farrowing house which they occupy for about 28 days along with an additional 7 days pre-natal occupancy and post-natal cleaning. On weaning at about 8kg weight, the piglets are then transferred in special barrows to the weaner house where they are fed dry feed with ad libitum access to water from drip free nipples. They remain in this house for about 28 days to reach a weight of about 18kg. They will then transfer to the second stage weaner house where they are fed dry feed for 21 days to about 32kg. Finally, they will transfer to the finishing house where they are fed dry feed for about 70-80 days to about 90-100kg slaughter weight. Additional pigs required for the breeding programme to maintain itself are maiden gilts. With the exception of the barrowed piglets, all other pigs are transferred from house to house by walking them on slatted passageways overlying channels which deliver any soiled water to the underfloor slurry storage tanks through drainage pipes.



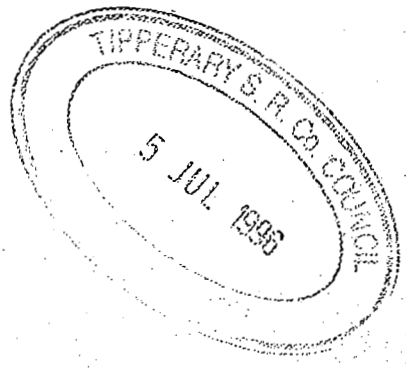
Accommodation comprises the most modern buildings with the following accommodation arranged according to the life cycle:

a. service house and dry sow house
b. farrowing house
c. first stage weaner house
d second stage weaner house
e. finishing house

Additional facilities comprise feed bins and a feed store house. The separate bins hold the feeds of different compositions and nutritive values used to feed the pigs during the progress of their life cycle. The feeds are augured to the various houses. These stages are programmed and controlled electronically. The layout and structural details of the accommodation and facilities are shown in detail in Appendix 8.

APPENDIX 2

TEAGASC CODE OF GOOD PRACTICE FOR SPREADING OF SLURRY



Teagasc

CODE OF PRACTICE

SLURRY SPREADING

The spreading of slurry on land is an environmentally safe and efficient farm practice when the following precautions are taken.

- Do not spread slurry:
  - on wet or waterlogged soils
  - on frozen or snow covered soils
  - near watercourses or wells

  (allow a 15 m wide margin when spreading slurry near a watercourse, 40m near a lake).

- Spread earlier rather than later in the growing season where possible.

- Apply at a rate which takes account of crop nutrient requirements.

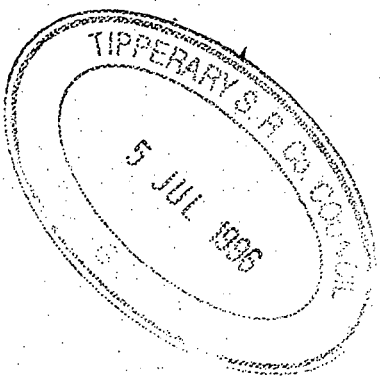
- Check weather forecast and do not spread if heavy rain is imminent within 48 hours.

- Use a low trajectory splashplate on the slurry tanker. Switch off pump immediately tanker empties.

- Take account of wind direction to avoid offensive odour drift.

APPENDIX 3

SLURRY SPREADING AGREEMENTS



(1)

Teagasc

SLURRY SPREADING AGREEMENT

[redacted]

To whom it may concern.

I DENIS BERGIN of KILBRAGH

give permission to WILLIAM CARROLL

to dispose of pig slurry by spreading on 380 of land in my ownership

as outlined in Section 1 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

Signed: [redacted]

Date: 4/6/96

(1)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern.

I Mr. W. Carroll of Rathroser

give permission to William Carroll

to dispose of pig slurry by spreading on 200 of land in my ownership

as outlined in Section 2 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

Signed: William Carroll

Date: 4/6/96

(2)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern,

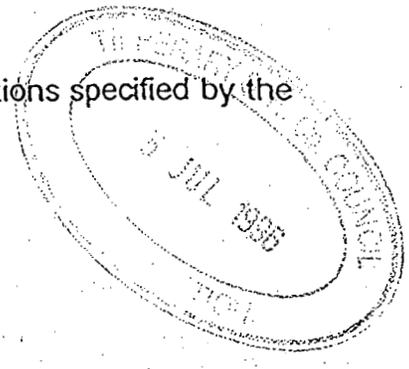
I Kieran Delahanty of Orchardstown E.

give permission to William Carroll

to dispose of pig slurry by spreading on 4.0. of land in my ownership

as outlined in Section 3 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.



Signed: [signature]

Date: 4/6/96

(6)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern.

I Mr. Mk Flaherty of Rathronan

give permission to William Carroll

to dispose of pig slurry by spreading on 63 of land in my ownership

as outlined in Section 4 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

Signed: x Michael Flaherty

Date: 4/6/96.

(1)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern.

I JOHN HENNESSY of KNOCKEVAN

give permission to WILLIAM CARROLL

to dispose of pig slurry by spreading on 150 of land in my ownership

as outlined in Section 5 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

Signed: John Hennessy

Date: 4/6/96

(9)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern.

I M. E. Phelan of Horsepasture

give permission to William Carroll

to dispose of pig slurry by spreading on 47 of land in my ownership

as outlined in Section 6 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

Signed: Eamon Phelan

Date: 4/6/96.

(8)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern.

I Mr E. Power of Horsepasture

give permission to William Carroll.

to dispose of pig slurry by spreading on 129 of land in my ownership

as outlined in Section 7 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

TIPPERARY S.R. CO COUNCIL 5 JUL 1996

Signed: Eamon Power

Date: 4/6/96

(5)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern.

I M. E. J. Purcell of Fortwilliam

give permission to William Carroll

to dispose of pig slurry by spreading on 160 of land in my ownership

as outlined in Section 8 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

Signed: Edmund J Purcell

Date: 4/6/96.

(2)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern.

I GERARD PURCELL of KILMORE

give permission to WILLIAM CARROLL

to dispose of pig slurry by spreading on 200 of land in my ownership

as outlined in Section 9 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

Signed: Gerard Purcell.

Date: 4/6/96

(3)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern.

I Mr. J. Purcell of Orchardstown

give permission to William Carroll

to dispose of pig slurry by spreading on 300 of land in my ownership

as outlined in Section 10 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

TIPPERARY S.R. CO. COUNCIL
8 JUL 1996

Signed: James Purcell.

Date: 4/6/96.

(1)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern.

I Tobt Purcell of Kilkerk North

give permission to William Carroll

to dispose of pig slurry by spreading on 80 of land in my ownership

as outlined in Section 11 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

Signed: Toby Purcell

Date: 4/6/96

(7)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern,

I PAT QUIRKE of FORTWILLIAM

give permission to WILLIAM CARROLL

to dispose of pig slurry by spreading on 4.4 of land in my ownership

as outlined in Section 12 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

Signed: [signature]

Date: 19/2/96.

(4)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern,

I Mr P.F Quirke of Fortwilliam

give permission to William Carroll

to dispose of pig slurry by spreading on 43 of land in my ownership

as outlined in Section 13 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

TIPPERARY S.R. CO. COUNCIL
5 JUL 1996

Signed: [signature]

Date: 19 - 2 - '96.

(1)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern.

I MICHAEL SHEEHAN of CARRIGEENSHARRAGH

give permission to WILLIAM CARROLL

to dispose of pig slurry by spreading on 03 Hects of land in my ownership

as outlined in Section 14 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

Signed: Michael Sheehan

Date: 4/6/96

(2)

Teagasc

SLURRY SPREADING AGREEMENT

To whom it may concern.

I DENIS SLATTERY of KNOCKEVAN

give permission to WILLIAM CARROLL

to dispose of pig slurry by spreading on 200 of land in my ownership

as outlined in Section 15 of the 6" O.S. map supplied.

Spreading shall be carried out subject to the terms of conditions specified by the Planning Authority.

Signed: X Denis Slattery

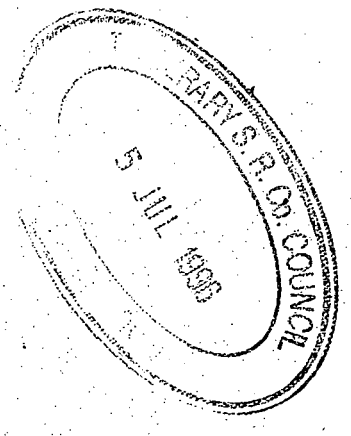
Date: 4/4/96

APPENDIX 5

MAPS OF SPREADGROUNDS

APPENDIX 6

SOIL ANALYSIS RESULTS



Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5636

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	Rec: WITH SLURRY t/ha Lime	kg/ha N	P	K	REMARKS
1	PBD301	1	WHEAT - WINTER	4.4	73	No	7.5	0	13	0	
2	PBD302	2	WHEAT - WINTER	2.4	43	No	4.0	0	23	0	
3	PBD303	3	GOOD PERMANENT GRASS	2.9	106	No	6.0	96	18	0	
4	PBD304	4	WHEAT - WINTER	5.0	129	No	8.5	0	13	0	
5	PBD305	5	WHEAT - WINTER	7.0	50	No	3.5	0	0	0	
7	PBD306	6	GOOD PERMANENT GRASS	8.0	120	No	5.5	96	0	0	
8	PBD307	7	GOOD PERMANENT GRASS	4.9	22	No	0.0	96	8	0	
9	PBD302	8	SUGAR BEET	4.6	88	No	10.5	0	33	167	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5636

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	Rec: WITH SLURRY t/ha Lime	kg/ha N	P	K		REMARKS
11	PBD303	9	SUGAR BEET	3.3	60	No	12.5	0	33	167		
12	PBD304	10	WHEAT - WINTER	3.8	20	No	5.5	0	13	0		
13	PBD305	18	WHEAT - WINTER	2.1	20	No	5.5	0	23	0		
14	PBD306	12	GOOD PERMANENT GRASS	2.3	30	No	7.5	96	18	0		
15	PBD313	13	SUGAR BEET	4.9	20	No	5.5	0	33	257		
16	PBD314	14	GOOD PERMANENT GRASS	2.8	127	No	9.0		18	0	²	
17	PBD315	15	GOOD PERMANENT GRASS	7.1	126	No	0.0	225	10	35	#	
18	PBD316	16	GOOD PERMANENT GRASS	2.6	148	No	7.0	225	40	35	#	

These recommendation assume no slurry distributed.

² Incomplete Data on: Stocking Rate

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Signed:

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5636

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
20	PBD317	17	GOOD PERMANENT GRASS	1.7	166	No	8.0	225	40	0	
21	PBD318	18	GOOD PERMANENT GRASS	2.6	154	No	8.5	225	40	0	
22	PBD319	19	GOOD PERMANENT GRASS	3.4	98	No	8.5	225	30	60	
23	PBD320	20	GOOD PERMANENT GRASS	4.6	110	No	9.0	225	30	35	
24	PBD321	21	GOOD PERMANENT GRASS	3.5	95	No	10.0	225	30	60	
25	PBD322	22	GOOD PERMANENT GRASS	5.2	61	No	2.5	225	30	60	
26	PBD323	23	GOOD PERMANENT GRASS	2.4	43	No	6.0	225	40	75	
27	PBD324	24	GOOD PERMANENT GRASS	3.8	53	No	0.0	225	30	60	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5636

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
29	PBD325	25	GOOD PERMANENT GRASS	4.3	94	No	8.5	225	30	60	
30	PBD326	26	GOOD PERMANENT GRASS	5.1	128	No	5.0	225	30	35	
31	PBD327	27	GOOD PERMANENT GRASS	16.6	148	No	0.0	225	0	35	
32	PBD328	28	GOOD PERMANENT GRASS	5.8	57	No	3.5	225	30	60	
33	PBD329	29	GOOD PERMANENT GRASS	7.0	20	No	0.0	225	10	75	
34	PBD330	30	GOOD PERMANENT GRASS	20.7	20	No	0.0	225	0	75	
35	PBD331	31	GOOD PERMANENT GRASS	12.4	43	No	5.0	225	0	75	
36	PBD332	32	GOOD PERMANENT GRASS	9.3	27	No	0.0	225	10	75	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5636

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
38	PBD333	33	GOOD PERMANENT GRASS	7.4	19	No	1.5	225	10	75	
39	PBD334	34	Set-aside.	7.5	126	No	0.0	0			
40	PBD335	35	GOOD PERMANENT GRASS	11.1	62	No	0.5	225	0	60	
41	PBD336	36	FEEDING BARLEY -	4.8	31	No	2.5	175	35	95	
42	PBD337	37	FEEDING BARLEY -	28.8	39	No	0.0	175	0	95	
43	PBD338	38	FEEDING BARLEY -	22.4	73	No	0.0	175	0	75	
44	PBD339	39	FEEDING BARLEY -	12.9	26	No	0.0	175	0	95	
45	PBD340	40	FEEDING BARLEY -	8.6	53	No	0.0	175	25	75	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Signed

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5636

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
47	PBD341	41	FEEDING BARLEY -	8.2	106	No	0.0	175	25	60	
48	PBD342	42	FEEDING BARLEY -	7.6	111	No	4.0	175	25	60	
49	PBD343	43	FEEDING BARLEY -	4.8	49	No	0.0	175	35	95	
50	PBD344	44	FEEDING BARLEY -	7.0	287	No	9.0	175	25	0	
51	PBD345	45	FEEDING BARLEY -	9.5	256	No	9.0	175	25	0	
52	PBD346	46	FEEDING BARLEY -	10.4	61	No	0.0	175	0	75	
53	PBD347	47	FEEDING BARLEY -	5.8	80	No	5.5	175	35	75	
54	PBD348	48	FEEDING BARLEY -	11.7	119	No	0.0	175	0	60	

Note: Metric system used in analysis.
Tons/ha + 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Signed:

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5636

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
65	PBD357	57	FEEDING BARLEY -	21.9	48	No	0.0	175	0	95	
66	PBD358	58	GOOD PERMANENT GRASS	5.1	58	No	0.0	225	30	60	
67	PBD359	59	GOOD PERMANENT GRASS	2.7	74	No	11.0	225	40	60	
68	PBD360	60	FEEDING BARLEY -	12.4	20	No	0.0	175	0	95	
69	PBD361	61	FEEDING BARLEY -	2.5	31	No	6.0	175	45	95	
70	PBD362	62	FEEDING BARLEY -	3.6	56	No	0.0	175	35	75	
71	PBD363	63	FEEDING BARLEY -	4.2	96	No	5.0	175	35	75	
72	PBD364	64	FEEDING BARLEY -	3.6	66	No	4.5	175	35	75	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5636

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
56	PBD349	49	FEEDING BARLEY -	5.1	73	No	6.0	175	35	75	
57	PBD350	50	FEEDING BARLEY -	9.1	83	No	0.0	175	25	75	
58	PBD351	51	FEEDING BARLEY -	17.0	99	No	0.0	175	0	75	
59	PBD352	52	FEEDING BARLEY -	14.2	65	No	0.0	175	0	75	
60	PBD353	53	FEEDING BARLEY -	9.0	46	No	0.0	175	25	95	
61	PBD354	54	FEEDING BARLEY -	8.5	54	No	0.0	175	25	75	
62	PBD355	55	FEEDING BARLEY -	24.0	74	No	0.0	175	0	75	
63	PBD356	56	GOOD PERMANENT GRASS	12.6	189	No	0.0		0	0	²

² Incomplete Data on: Stocking Rate

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Signed:

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5636

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
74	PBD365	65	FEEDING BARLEY -	4.5	39	No	4.0	175	35	95	
75	PBD366	66	FEEDING BARLEY -	3.6	111	No	0.0	175	35	60	
76	PBD367	67	FEEDING BARLEY -	2.5	90	No	4.5	175	45	75	
77	PBD368	68	FEEDING BARLEY -	3.7	119	No	6.0	175	35	60	
78	PBD369	69	FEEDING BARLEY -	14.2	198	No	0.0	175	0	0	
79	PBD370	70	FEEDING BARLEY -	20.7	100	No	0.0	175	0	75	
80	PBD371	71	FEEDING BARLEY -	6.0	75	No	2.5	175	35	75	
81	PBD372	72	FEEDING BARLEY -	5.9	66	No	0.0	175	35	75	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE
CLONMEL

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5637

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
11	PBD393	93	FEEDING BARLEY -	3.0	45	No	3.0	175	45	95	
12	PBD394	94	FEEDING BARLEY -	5.5	106	No	3.0	175	35	60	
13	PBD395	95	FEEDING BARLEY -	5.5	66	No	0.0	175	35	75	
14	PBD396	96	FEEDING BARLEY -	2.8	76	No	2.5	175	45	75	
15	PBD397	97	SUGAR BEET	3.6	20	No	0.0	160	55	360	
16	PBD398	98	FEEDING BARLEY -	4.5	55	No	2.5	175	35	75	
17	PBD399	99	GOOD PERMANENT GRASS	7.2	80	No	0.0	225	10	60	
18	PBD400	100	GOOD PERMANENT GRASS	5.4	49	No	4.5	225	30	75	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Signed:

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE
CLONMEL

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5637

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K
1	PBD385	85	FEEDING BARLEY -	4.4	57	No	10.5	175	35	75
2	PBD386	86	FEEDING BARLEY -	2.1	33	No	12.0	175	45	95
3	PBD387	87	FEEDING BARLEY -	2.8	97	No	7.0	175	45	75
4	PBD388	88	FEEDING BARLEY -	1.9	36	No	5.0	175	45	95
5	PBD389	89	FEEDING BARLEY -	2.4	37	No	4.0	175	45	95
6	PBD390	90	FEEDING BARLEY -	4.0	48	No	0.0	175	35	95
8	PBD391	91	FEEDING BARLEY -	2.5	28	No	0.0	175	45	95
9	PBD392	92	FEEDING BARLEY -	1.8	38	No	4.0	175	45	95

REMARKS

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5636

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
83	PBD373	73	FEEDING BARLEY -	11.8	58	No	0.0	175	0	75	
84	PBD374	74	Set-aside.	10.5	69	No	0.0				
85	PBD375	75	FEEDING BARLEY -	3.8	67	No	0.0	175	35	75	
86	PBD376	76	FEEDING BARLEY -	12.2	58	No	0.0	175	0	75	
87	PBD377	77	FEEDING BARLEY -	8.7	37	No	0.0	175	25	95	
88	PBD378	78	FEEDING BARLEY -	4.2	54	No	4.5	175	35	75	
89	PBD379	79	SUGAR BEET	6.9	20	No	0.0	160	40	360	
90	PBD380	80	FEEDING BARLEY -	7.8	93	No	6.0	175	25	75	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Signed:

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

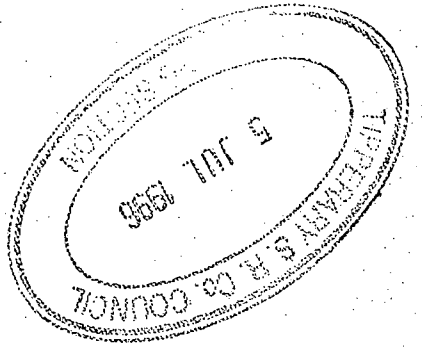
Farmer: BILL CARROLL
MILE TREE

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5636

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
92	PBD381	81	GOOD PERMANENT GRASS	10.2	67	No	2.5	225	0	60	
93	PBD382	82	GOOD PERMANENT GRASS	17.2	103	No	0.0	225	0	35	
94	PBD383	83	FEEDING BARLEY -	12.7	54	No	3.0	175	0	75	
95	PBD384	84	FEEDING BARLEY -	5.4	39	No	4.0	175	35	95	



Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

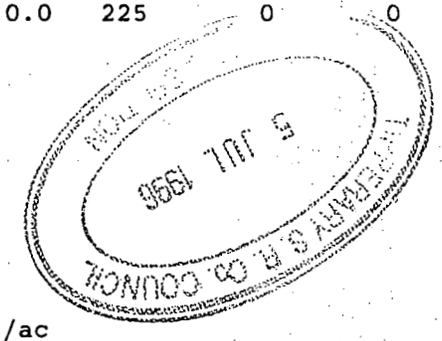
Farmer: BILL CARROLL
MILE TREE
CLONMEL

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5637

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
38	PBD417	117	GOOD PERMANENT GRASS	11.9	298	No	0.0	225	0	0	
39	PBD418	118	GOOD PERMANENT GRASS	14.4	219	No	1.0	225	0	0	
40	PBD419	119	GOOD PERMANENT GRASS	14.5	200	No	2.5	225	0	0	
41	PBD420	120	GOOD PERMANENT GRASS	14.3	116	No	5.5	225	0	35	
42	PBD421	121	GOOD PERMANENT GRASS	18.1	254	No	2.0	225	0	0	
43	PBD422	122	GOOD PERMANENT GRASS	11.1	221	No	7.0	225	0	0	
44	PBD423	123	GOOD PERMANENT GRASS	12.2	275	No	8.0	225	0	0	
45	PBD424	124	GOOD PERMANENT GRASS	24.7	224	No	0.0	225	0	0	



Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE
CLONMEL

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5637

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
20	PBD401	101	GOOD PERMANENT GRASS	4.8	104	No	3.0	225	30	35	
21	PBD402	102	GOOD PERMANENT GRASS	7.9	300	No	5.5	225	10	0	
22	PBD403	103	GOOD PERMANENT GRASS	3.1	103	No	5.5	225	30	35	
23	PBD404	104	GOOD PERMANENT GRASS	3.7	300	No	4.5	225	30	0	
24	PBD405	105	GOOD PERMANENT GRASS	3.1	102	No	6.5	225	30	35	
25	PBD406	106	GOOD PERMANENT GRASS	3.2	169	No	5.5	225	30	0	
26	PBD407	107	GOOD PERMANENT GRASS	1.9	56	No	5.5	225	40	60	
27	PBD408	108	GOOD PERMANENT GRASS	11.6	207	No	3.0	225	0	0	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE
CLONMEL

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5637

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
29	PBD409	109	GOOD PERMANENT GRASS	4.4	113	No	8.0	225	30	35	
30	PBD410	110	GOOD PERMANENT GRASS	4.9	128	No	10.5	225	30	35	
31	PBD411	111	GOOD PERMANENT GRASS	9.7	93	No	0.0	225	10	60	
32	PBD412	112	GOOD PERMANENT GRASS	17.2	197	No	1.5	225	0	0	
33	PBD413	113	GOOD PERMANENT GRASS	16.4	266	No	1.5	225	0	0	
34	PBD414	114	GOOD PERMANENT GRASS	7.5	168	No	6.0	225	10	0	
35	PBD415	115	GOOD PERMANENT GRASS	15.4	157	No	0.5	225	0	0	
36	PBD416	116	GOOD PERMANENT GRASS	12.6	300	No	2.5	225	0	0	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Signed:

Advisor: MR. F. BURKE,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: BILL CARROLL
MILE TREE
CLONMEL

Samples Received: 22/02/96

Report Dated: 06/03/96

Analysis Set: 5637

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
47	PBD425	125	SUGAR BEET	1.8	43	No	7.5	80	70	360	
48	PBD426	126	SUGAR BEET	0.7	69	No	5.0	80	70	270	
49	PBD427	127	SUGAR BEET	0.7	20	No	0.0	80	70	360	
50	PBD428	128	SUGAR BEET	1.5	122	No	0.0	80	70	180	
51	PBD429	129	FEEDING BARLEY -	35.2	218	No	0.0	100	0	0	
52	PBD430	130	GOOD PERMANENT GRASS	12.4	76	No	6.0		0	60	[2]
53	PBD431	131	FEEDING BARLEY -	11.2	38	No	0.0	75	0	95	

[2] Incomplete Data on: Stocking Rate

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Advisor: MR. E. O'REILLY, C.A.O.,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: D BERGIN
KILBRAGH
ROSEGREEN
CASHEL CO TIPP

Samples Received: 28/02/96

Report Dated: 13/03/96

Analysis Set: 5667

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
22	PBA509	12	GOOD PERMANENT GRASS	2.3	159	No	9.5	100	40	0	
23	PBA510	13	GOOD PERMANENT GRASS	2.9	180	No	11.0	100	40	0	
24	PBA511	14	GOOD PERMANENT GRASS	4.9	123	No	8.5	100	30	35	
25	PBA512	15	GOOD PERMANENT GRASS	6.3	128	No	4.0	100	10	35	
26	PBA513	16	GOOD PERMANENT GRASS	5.8	86	No	2.0	100	30	60	
27	PBA514	17	GOOD PERMANENT GRASS	5.6	146	No	11.0	100	30	35	
29	PBA515	18	GOOD PERMANENT GRASS	5.8	120	No	11.0	100	30	35	
30	PBA516	19	GOOD PERMANENT GRASS	3.1	101	No	11.0	100	30	35	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Signed:

Advisor: MR. E. O'REILLY, C.A.O.,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: D BERGIN
KILBRAGH
ROSEGREEN
CASHEL CO TIPP

Samples Received: 28/02/96

Report Dated: 13/03/96

Analysis Set: 5667

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
13	PBA501	4	GOOD PERMANENT GRASS	2.1	54	No	7.5	100	40	60	
14	PBA502	5	GOOD PERMANENT GRASS	4.6	78	No	5.5	100	30	60	
15	PBA503	6	GOOD PERMANENT GRASS	3.5	78	No	4.5	100	30	60	
16	PBA504	7	GOOD PERMANENT GRASS	4.5	122	No	6.0	100	30	35	
17	PBA505	8	GOOD PERMANENT GRASS	4.7	121	No	5.0	100	30	35	
18	PBA506	9	GOOD PERMANENT GRASS	2.6	112	No	10.0	100	40	35	
20	PBA507	10	GOOD PERMANENT GRASS	2.2	92	No	11.5	100	40	60	
21	PBA508	11	GOOD PERMANENT GRASS	3.0	128	No	8.0	100	40	35	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

Signed:

Advisor: MR. E. O'REILLY, C.A.O.,
TEAGASC, RIVER HOUSE,
CLONMEL,
CO. TIPPERARY.

JOHNSTOWN CASTLE SOIL ANALYSIS SUMMARY

Phone 053-42888 FAX 053-42213

Farmer: D BERGIN
KILBRAGH
ROSEGREEN
CASHEL CO TIPP

Samples Received: 28/02/96

Report Dated: 13/03/96

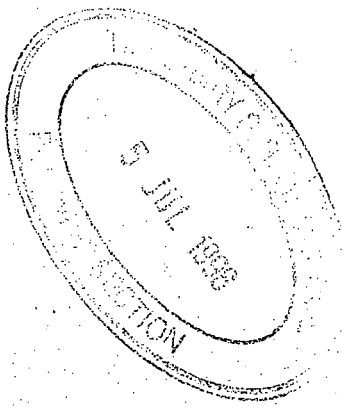
Analysis Set: 5667

Ref	Sample	Field	Crop	LAB RESULTS -- ppm -- P	K	Trace Elems	RECOMMENDATIONS t/ha Lime	kg/ha N	P	K	REMARKS
31	PBA517	20	GOOD PERMANENT GRASS	3.3	115	No	9.5	100	30	35	
32	PBA518	21	GOOD PERMANENT GRASS	2.5	67	No	9.5	100	40	60	
33	PBA519	22	GOOD PERMANENT GRASS	2.1	104	No	12.5	100	40	35	
34	PBA520	23	GOOD PERMANENT GRASS	2.1	72	No	10.0	100	40	60	

Note: Metric system used in analysis.
Tons/ha ÷ 2.5 = tons/ac. Kg/ha x 0.8 = units/ac

APPENDIX 7

WATER ANALYSIS RESULTS



Teagasc
Agriculture and Food Development Authority

JOHNSTOWN CASTLE
RESEARCH AND DEVELOPMENT CENTRE
WEXFORD TEL 053-42888 FAX 053-42004
FAX LAB/RESEARCH 053-42213

TEAGASC,

Johnstown Castle Laboratories, Wexford

Analytical Report No. 31/736-741

Client :- Bill Carroll, Miletree, Clonmel

Adviser :- Ciaran Carroll, Teagasc, Moorepark

Material :- Water

Date Received :- 6/3/96

Sample Identification:- PBW1 - PBW2

Methods :-

pH	**WAP.D-1**
Phosphorus, Total Oxidised Nitrogen, Ammonium-Nitrogen	**WAP.P-1**
Metals - Copper, Zinc, Iron, Manganese, Calcium, Magnesium, Sodium, Potassium	**WAP.Q-1**
Aluminium	**WAP.T-1**
Total Coliforms - Membrane Filtration Method	**WAP.N-1**
Faecal Coliforms - Membrane Filtration Method	**WAP.O-1**
BOD - 5 Day	**WAP.G-1**
COD	**WAP.J-1**
Hardness - Ca and Mg hardness	**WAP.C-1**
Conductivity	**WAP.E-1**

TIPPERARY S.R. CO. COUNCIL 5 JUL 1996

This test report relates only to the sample supplied. It may not be reproduced, except in full, without the approval of the Officer-in-Charge at the Johnstown Castle Laboratories.

Comment on Sample Analyses :-

Signed :- Joe Scott Date :- 25/3/96

Joe Scott

eagasc
AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

JOHNSTOWN CASTLE
RESEARCH AND DEVELOPMENT CENTRE
WEXFORD TEL 053-42888 FAX 053-42004
FAX LAB/RESEARCH 053-42213

Analytical Report No. 31/736-741

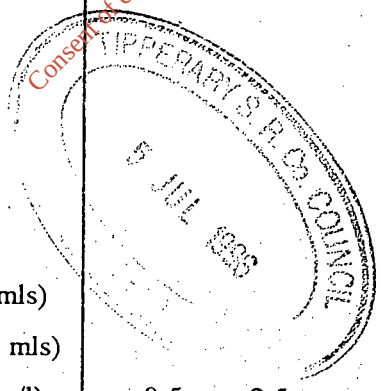
Test	Results			E.C. 1988 Maximum Admissible Concentration for Drinking Water
Ident	**PBW4**	**PBW5**	**PBW6**	
pH @ 19.4°	8.1	7.9	8.1	6.0 - 9.0
Phosphorus (mg/l)	0.009	0.019	0.024	2.18 mg/l
Total Oxidised Nitrogen (mg/l)	3.5	4.4	4.6	11.3 mg/l as N
Ammonium-Nitrogen (mg/l)	<0.1	<0.1	<0.1	0.23 mg/l as N
Copper (mg/l)				0.5 mg/l
Zinc (mg/l)				1.0 mg/l
Iron (mg/l)				0.2 mg/l
Manganese (mg/l)				0.05 mg/l
Calcium (mg/l)				200 mg/l
Magnesium (mg/l)				50 mg/l
Sodium (mg/l)				150 mg/l
Potassium (mg/l)				12 mg/l
Aluminium (μg/l)				200 μg/l
Total Coliforms (per 100 mls)				0
Faecal Coliforms (per 100 mls)				0
B.O.D. (mg/l)	1.3	1.2	1.4	
C.O.D. (mg/l)				
Hardness (mg/l $CaCO_3$)				
Hardness Category				
Conductivity (μS cm^{-1} at 25°C)	680	695	695	1,650 μs/cm at 25°C

teagasc
AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

JOHNSTOWN CASTLE
RESEARCH AND DEVELOPMENT CENTRE
WEXFORD TEL 053-42888 FAX 053-42004
FAX LAB/RESEARCH 053-42213

Analytical Report No. 31/736-741

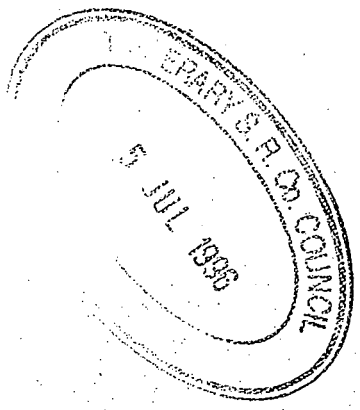
Test	Results			E.C. 1988 Maximum Admissible Concentration for Drinking Water
Ident	**PBW1**	**PBW2**	**PBW3**	
pH @ 19.4°	7.3	7.9	7.5	6.0 - 9.0
Phosphorus (mg/l)	0.061	0.009	0.008	2.18 mg/l
Total Oxidised Nitrogen (mg/l)	3.6	3.5	3.3	11.3 mg/l as N
Ammonium-Nitrogen (mg/l)	<0.1	<0.1	<0.1	0.23 mg/l as N
Copper (mg/l)				0.5 mg/l
Zinc (mg/l)				1.0 mg/l
Iron (mg/l)				0.2 mg/l
Manganese (mg/l)				0.05 mg/l
Calcium (mg/l)				200 mg/l
Magnesium (mg/l)				50 mg/l
Sodium (mg/l)				150 mg/l
Potassium (mg/l)				12 mg/l
Aluminium (μg/l)				200 μg/l
Total Coliforms (per 100 mls)				0
Faecal Coliforms (per 100 mls)				0
B.O.D. (mg/l)	<0.5	2.5	2.2	
C.O.D. (mg/l)				
Hardness (mg/l $CaCO_3$)				
Hardness Category				
Conductivity (μS cm^{-1} at 25°C)	680	660	710	1,650 μs/cm at 25°C



VAT REGISTRATION NO. I.E. 0650202 O

APPENDIX 8

Specifications prepared by the Farm Development Service of the Department of Agriculture, Food and Forestry (S129, S101, S102, S121, and S123)



An Roinn Talmhaíochta agus Bia

S129
February 1993

Farm Development Service

Minimum Specification for Farmyard Drainage, Concrete Yards and Roads

1. General

Three separate drainage systems are required

1.1 Clean Water System

(i) To divert all existing land drains around the farmyard site

(ii) To trap and drain clean rainwater which may flow on to the site from higher ground when the soil is saturated

(iii) To dispose of rainwater from roofs and clean surface areas by discharging directly to a ditch, stream or river.

1.2 Soiled Water System to convey to storage:

(i) Water from open concrete surfaces that is soiled by manure or silage

(ii) Liquid that drains from dungsteads, manure pits or urine run-off from animal housing.

(iii) Washings from milking premises, dairies, assembly or holding yards.

(iv) Washings from animal housing, or mushroom houses.

This run-off liquid is polluted and must always be collected in a soiled water tank prior to disposal by land spreading.

1.3 Silage Effluent System:
To collect via channels as specified in S120 and S128 and pipe to either a purpose built tank or to a soiled water tank if otherwise required on the site. Silage effluent may also be stored in leak-proof open slurry tanks and in tanks under buildings provided the tanks have been emptied of slurry prior to silage making. The effluent shall be stored for as short a period as possible because of its corrosive effects on concrete. The dangers from lethal gases are always present and safety precautions should be adhered to when slurry or silage effluent and slurry are agitated in enclosed tanks and tanks within buildings. The dangers are more acute when silage effluent is mixed with slurry.

2. Clean Water Drainage

2.1 Collection
Rain water shall be collected from all roofs within the farmyard by leak-proof gutters or valleys, discharging directly or through hopper heads to rainwater pipes which discharge over gully traps or through back inlet gully traps to piped drains. Half round gutters 150mm, 125mm and 110mm laid to falls of 1 in 600 will drain roof areas 220m², 150m² and 90m² respectively where rainwater pipe is at end of run. Where rainwater pipe is at the centre of run the area drained is approximately 25% extra: R.W. pipes shall be min. 75mm diam.

Where a pipeline is laid in steep sloping ground it will be necessary to provide a back drop manhole as specified in clause 3.5.

Pipelaying shall be commenced at the outfall. The trench shall not be greater in width than the pipe outside diameter plus 300mm. Where necessary the trench down to a point 150mm over the top of the pipe may be of greater width.

Pipes shall be laid on a 100mm thick cushion of clay or sand. All pipe jointing shall be in accordance with manufacturer's instructions. After the pipes and fittings are laid true to line, level and gradient and firmly supported throughout their full length, the sidefill material shall be placed in layers of 100mm and firmly compacted up to 100mm over the top of the pipes. Thereafter the remainder of the backfill shall be placed and compacted in 300mm layers with particular care taken under roads and paved yards to avoid any subsidence.

Concrete pipes shall be to I.S.6: 1974 and uPVC pipes to I.S. 424:1990

2.5 Protection of drains in special cases

Because of problems with falls in existing farmyards it may be necessary to lay drains above or at ground level. In such cases the pipes shall be totally encased in 150mm of concrete. uPVC pipes shall be wrapped with plastic sheeting before concrete is poured.

Shallow pipelines, with less than 0.9m cover, under roads shall be encased in concrete.

2.6 Clear pipes and channels

Special care shall be taken to remove all mortar, earth or other material out of pipes and channels and to keep them clean at all times.

3. Manholes or Inspection chambers

3.1 Manholes shall be constructed with mass concrete or solid concrete block walls not less than 150mm thick to depths up to 600mm and 225mm walls for greater depths. The manhole base shall be of 150mm thick concrete 300mm wider than the outside walls, see fig. 1. Internal walls of manholes constructed of concrete block shall be rendered with 2 coats of cement mortar, finished fine with a steel trowel and made thoroughly watertight. Smooth shuttering and well compacted concrete shall be used for mass concrete walls to ensure smooth watertight finish.

3.2 Manhole dimensions shall be as follows

Depth to Invert (m)	Length (m)	Width (m)
0.6	0.6	0.45
0.6 to 0.9	0.75	0.6
0.9 to 1.8	1.05	0.75

3.3 Each manhole shall be provided in a safe manner with a cover and frame, heavy or medium duty, depending on the possible traffic over it. It shall be level with the surrounding surface.

3.4 Manhole Channels

The manhole channel shall be of half round pipe section, equal in diameter to the largest inlet pipe, bedded in cement mortar and extending the full

6. Yard Gully

Yard gully shall have a minimum 300 x 300 mm cast iron cover and frame fixed into concrete paving over a sump at least 300mm deeper than the invert of the outlet pipe. Alternatively, approved proprietary types may be used.

7. Gully traps

A trapped gully shall always be used in dairies and milking premises. Such a gully shall also be used to collect roof-water, see fig 8. A suitable grid cover shall be provided. Gully traps are not suitable in locations where there is likely to be heavy traffic.

8. Armstrong Junctions

These junctions are suitable for collecting 100mm uPVC drains at invert depths of up to 600mm. The location of such junctions should be away from heavy traffic.

Note: All gully traps and armstrong junctions shall have a minimum 150mm concrete surround.

9. Concrete

Concrete shall be purchased on the basis of a characteristic 28 day crushing strength of 30N. Minimum cement content shall be 280kg/m^3. Cement shall be certified to I.S. 1:1991 or certified as equivalent to that standard by an accredited certifying body within the EC. Slump shall be between 50mm and 100mm and maximum aggregate size shall be 20mm.

10. Concrete to Yards & Roads

10.1 Preparation of Site Remove all top soil and soft material to a minimum depth of 150mm or down to a solid stratum and dispose off site. Lay hard-core and compact in 150 mm layers using a suitable vibrating or heavy roller. Gradients should correspond to these required in the finished paving.

10.2 Thickness of Concrete the thickness of concrete shall not be less than 125mm at any point. Particular care shall be taken to maintain the thickness under dished channels.

10.3 Placing of Concrete Strong formwork shall be accurately levelled and fixed to the correct falls for the site and to the predetermined drainage points. Concrete shall be placed in alternate bays not more than 4.5m long and 6.0m wide. Alternatively, for larger areas, it is more efficient to lay the concrete in alternate continuous strips 3m to 4m wide with a contraction joint at 5m intervals and in line with joints in adjacent bays, if possible. The contraction point shall be formed by using a 6mm steel bar to press a 100m wide polythene strip into the freshly laid concrete, see figures 10 and 11. Expansion joints shall be provided where the area of concrete is large (more than 90m in any direction). A 12mm strip of soft fibreboard extending the full depth of the concrete is suitable for this purpose. On completion the top 20mm of the board should be cut out and the cavity filled with a proprietary expansion joint sealer. Alternatively a bitumen impregnated fibreboard or the equivalent

may be used. Concrete shall be spread uniformly between the forms and compacted with a tamper or vibrating beam. Finish may be either notched or brushed.

Note: It is recommended that light gauge polythene sheet is placed under the concrete slab.

10.4 Curing of Concrete As soon as the concrete surface is firm enough to resist damage (within about 1 hour) the slab shall be sprayed lightly with water and maintained in a damp condition for seven days. This is best achieved by covering the wetted slab with polythene. Alternatively, a curing liquid applied to manufacturers instruction may be used. If frost is anticipated the slab shall be covered with at least 100mm of straw. Concrete shall not be poured under 4°C in a falling thermometer.

11. Storage Requirements for soiled Water

Where possible all soiled water in the farmyard should be collected in one tank to facilitate a single disposal system.

There are two options:

(a) Short term storage prior to land spreading

(b) Long term storage prior to land spreading.

12. Storage Tanks

12.1 A single compartment storage tank shall be provided only where it is proposed to spread the soiled water by vacuum tanker on a regular basis. In practice it is only suitable for small units and where the land available for spreading can take winter traffic. Tank construction shall be in accordance with S130.

12.2 A three compartment storage tank, each compartment approximately equal in size for the efficient removal of floating and settleable solids, shall be provided for an irrigation system of soiled water disposal. Tank construction shall be in accordance with S130.

12.3 Storage tank shall be sited so that:

(i) The pipe runs are as short as possible

(ii) Distance from any dairy or milking premises is an absolute minimum of 5m and wherever possible 10m from such buildings

(iii) There is easy access

12.4 Figure 12 shows diagrammatically the arrangement of a three stage, soiled water settlement tank. Compartments 1 and 2 provide first and second stage settlement of soiled water. Compartment 3 is the pumping chamber. A diagonal stagger to the 'H' pipes and inlet and outlet pipes assists settlement. Access points shall be provided in the tank cover for dislodging. Pumphouse may be located either over or close to the pumping chamber.

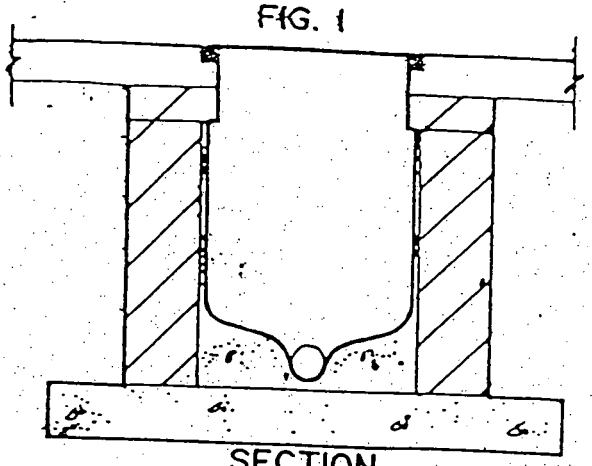
13. The following table sets out guidelines for storage requirements using the different disposal systems

Table

System of Disposal	Interval of Spreading	Design Considerations	Storage Requirements
Vacuum Tanker and Holding Tank	7-10 days	Soils of suitable permeability	Soiled water from all sources for a 10 day period (minimum 60mm rainfall on soiled areas)
Manually operated pump and sprinkler system, and 3 chamber holding Tank	Irregular 4-10 days	Soils of suitable permeability; regular movement of sprinklers. Danger of dry running of pumps	Soiled water from all sources for a 10 day period (minimum 60mm rainfall on soiled areas)
Automatic pump and sprinkler system and 3 chamber holding tank.	Daily	Soils of suitable permeability. Regular movement of sprinklers.	The highest daily rainfall, equivalent to 7 normal days (30 mm) on soiled areas plus 3 day storage of other soiled water/washings from milking premises etc.
Automatic pump and mobile irrigation system. and 3 chamber holding Tank	Daily	Soils of suitable permeability	Ditto as above
All Systems	Irregular - from daily up to 12 week intervals	(a) Difficult Soils viz. low moisture. deficits. Poor trafficability, moderate/steep gradients. Proximity to lakes and water courses. (b) Shallow free-draining soils over permeable sub-strata (c) Areas with a known pollution problem	*Soiled water from all sources for up to 12 weeks where no alternative spreading options are available Rainfall - a minimum 25mm or 30mm per week as appropriate on soiled areas over the storage period *Allowance should be made where a dairy farmer is not engaged in winter milk production.

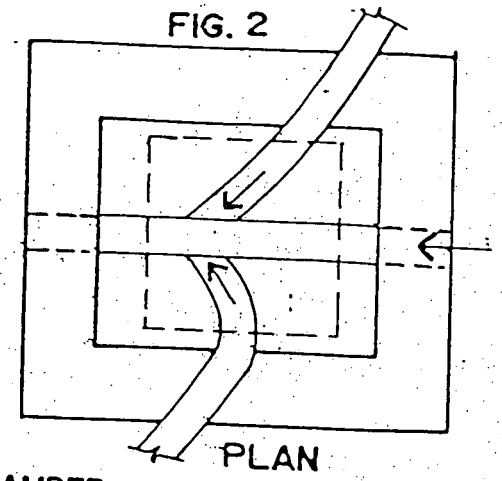
Note: To reduce construction, landspreading and maintenance costs, soiled areas should be reduced to an absolute minimum, or roofed, if feasible, in difficult soil areas and/or areas with known pollution problems and high rainfall

FIG. 1



SECTION

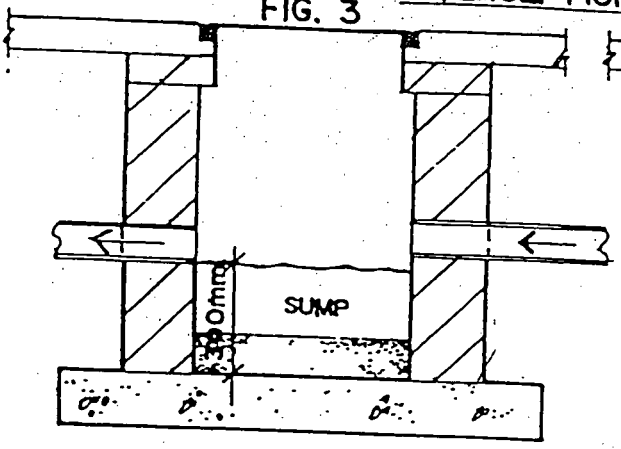
FIG. 2



PLAN

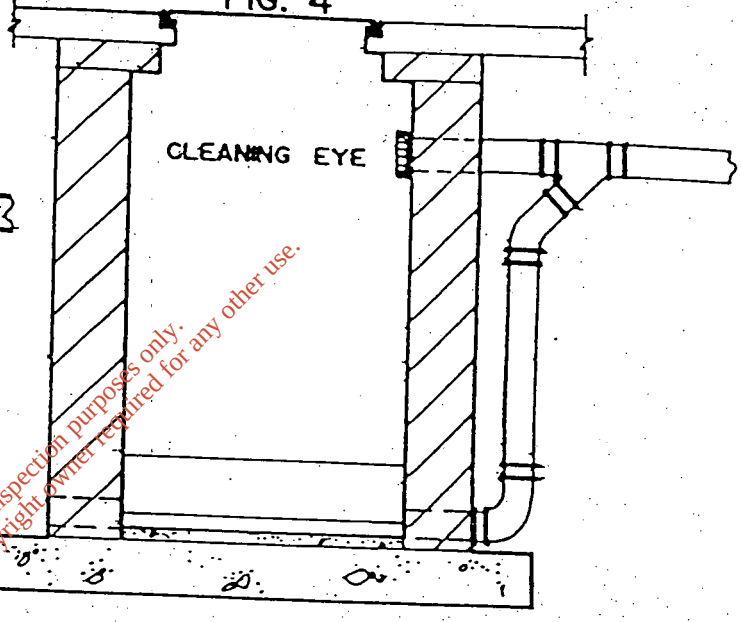
INTERCEPTION CHAMBER

FIG. 3



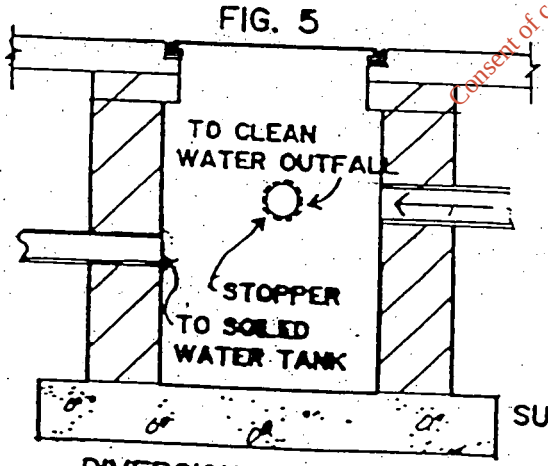
INTERCEPTION CHAMBER WITH SILT TRAP

FIG. 4



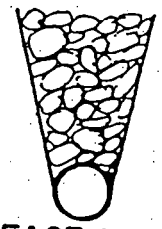
BACKDROP MANHOLE

FIG. 5



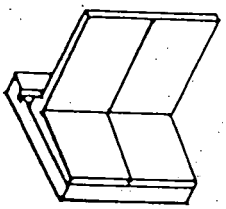
DIVERSION CHAMBER

FIG. 6



SURFACE WATER TRAP DRAIN

FIG. 7



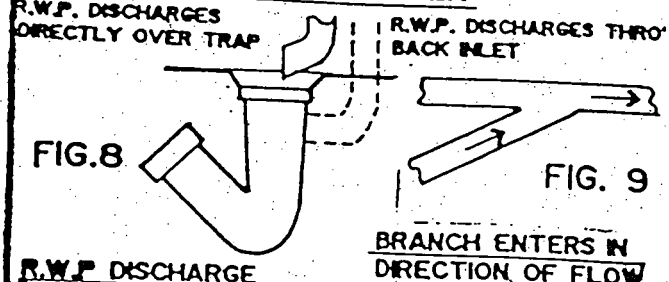


FIG.8

R.W.P DISCHARGE

FIG. 9

BRANCH ENTERS IN DIRECTION OF FLOW

EFFLUENT DRAINAGE ARRANGEMENT FOR WALLED SILO WHERE PRECAST CONCRETE RETAINERS ARE USED

FARM DEVELOPMENT SERVICE

S129

Minimum specification for Framework, Roof and Side Cladding of Haybarn and Lean-to Structures

Stanchions:

Stanchions must be centred not more than 4.80m apart. Where a lean-to is to be attached to an existing haybarn the lean-to uprights must be accurately centred to match the haybarn uprights. Rolled steel joists (R.S.J.) or Universal beams (U.B.) shall conform to the requirements of Table I.

Table 1 - Haybarn Stanchions

Stanchion Size h(mm) x b(mm) x W(kg/m)		
Span of Haybarn	British Section	European Section
7.62 or less minimum height to underside of wall plate 3.60m Maximum height 4.20m	152 x 89 x 17.1 R.S.J. OR 152 x 76 x 17.86 R.S.J.	180 x 91 x 18.8 I.P.E.
Up to 10.66m average height to underside of wall plate 5.5m or less	178 x 102 x 21.5 R.S.J.	200 x 100 x 22.4 I.P.E.
10.97m to 13.71m average height to underside of wall plate 6.00m or less	203 x 133 x 25 U.B. OR 203 x 102 x 25.3 R.S.J.	220 x 110 x 26.2 I.P.E.

Lean-to Stanchions: *

(i) For spans up to and including 9.14m: 152mm x 89mm R.S.J. @ 17.1kg/m or 152mm x 76mm R.S.J. @ 17.86kg/m.
ii) For spans in excess of 9.14m and up to 13.71m: 178mm x 102mm R.S.J. @ 21.5kg/m

In back to back lean-tos the central stanchion shall be as follows:

Each span under 9.14m: 203mm x 133mm U.B. @ 25 kg/m. One or both spans over 9.14m: 203mm x 133mm U.B. @ 30/kg/m or 251mm 146mm U.B. @ 31 kg/m.

All stanchion foundations shall be excavated neat to the required size and depth. Large holes formed by heavy-duty mechanical excavators will not be acceptable as the foundation block should bear against undisturbed soil. The size of the foundation block shall be as follows:-

(a) for haybarns and central stanchions in back to back lean-tos: 900mm x 900mm x 900mm
(b) for low level stanchions in lean-tos: 750mm x 750mm x 750mm

Stanchions shall be embedded in the foundation block for the depth of the block less a maximum of 100mm to allow for adjustment. Where there are no plans to lay a concrete floor to sheds or lean-tos, the concrete base should be brought above ground level and finished off mushroom-like. Concrete for foundation blocks shall be 25N if readymix or 1:2:4 if made on site.

*Alternative materials may be allowable, but only with prior Departmental approval.

The top of each stanchion must incorporate a proper bearing plate for trusses or rafters.

Lean-tos: Height and Slope:

Lean-tos should have a minimum height at the low side suitable for the intended purpose but in no case should the height be less than 2.4m. For a cubicle house 2.6m and for a loose house 3m is required.

On lean-tos to existing sheds reasonable tolerance will be allowed on roof slope, but steps should be taken to offset the undesirable features of very flat roofs, e.g. sealed overlaps.

The desirable and minimum rise of lean-to roofs of various spans is shown in Table 2.

Table 2

Lean-to span	6.70m	7.62m	9.14m	10.66m	12.19m	13.71m
Desirable Rise	1.16m	1.34m	1.62m	1.88m	2.13m	2.41
Minimum Rise	0.90m	1.00m	1.20m	1.40m	1.60m	1.80

Roof Trusses (haybarn):

For spans up to 7.62m timber may be used. The main horizontal tie shall be at least 175mm x 75mm and the remaining members at least 125mm x 75mm. Bolted connections shall always incorporate approved type toothed washers - single or dual face as appropriate.

More generally, and in all spans over 7.62m triangulated steel roof tusses shall be used. Members shall not be less than the dimensions shown in table 3, which applies to both round roofs and A roofs.

Table 3 - Haybarn roof trusses

Span of Haybarn	Top Member of Truss mm	Bottom member of		Short struts (in compression)		Short ties (in tension) mm
		Intermediate Truss mm	End Truss mm	Intermediate Truss mm	End Truss mm	
6.7m	50x50x6	50x6 FLAT	50x50x6	50x50x6	50x50x6	50x6 FLAT
7.62m	60x60x6	50x6 FLAT	50x50x6	50x50x6	50x50x6	50x6 FLAT
9.14m	60x60x6	50x50x6	50x50x6	50x50x6	50x50x6	50x50x6
10.66m	70x70x6	65x50x6	65x50x6	50x50x6	50x50x6	50x50x6
12.19m	80x80x6	60x60x6	60x60x6	50x50x6	50x50x6*	50x50x6
13.71m	80x80x8	70x70x6	70x70x6	50x50x6*	50x50x6*	50x50x6

* Where struts are longer than 1.8m they shall be 60x60x6.

Trusses shall be carefully fabricated using clean steel, preferably shot blasted, and good quality welding shall be required. Triangulation patterns should relate to the number of purlins to be carried and purlin cleats should be located as closely as possible to node-points i.e. where different members come together. Wallplates shall be a minimum of 150mm x 75mm and purlins shall be 125mm x 75mm at a maximum spacing of 2.40m.

Roof trusses: (lean-tos):

For spans up to 7.62m an R.S.J. may be used as a rafter. This should be 178mm x 102mm x 21.56kg/m. For all spans up to 13.71m a triangulated steel truss may be used. Members shall not be less than the sizes shown in table 4.

Trusses shall be fabricated as for shed trusses above. Wall plates shall be a minimum of 150mm x 75mm. Timber purlins shall be similar and spaced at a maximum of 1.82m. Where asbestos cement sheeting is used for roofing, purlin spacing and purlin sizes shall be as recommended by the manufacturers.

Purlin Cleats for timber purlins shall be at least 150mm wide and shall extend to a height of at least 2/3 the purlin depth. They shall be securely fastened to the trusses. For steel purlins use cleats as recommended.

Where a truss is hung from as against resting on the support stanchion it shall rest on a supporting angle iron cleat welded or bolted to the stanchion and the top and bottom truss members shall be secured to the stanchion using 2 No. 16mm bolts to each member. In the case of a bow truss the connection plate shall be secured by 4 No. 16mm bolts and the plate must bear flush against the stanchion. Bolts and nuts shall be standard grade black bolts of grade 4.6 minimum. Where an R.S.J. is used as a rafter, stanchion tops shall be bevelled at the desired roof angle and suitable cap plates welded to the stanchion tops. Rafters shall be securely fixed to the cap plates using two 16mm bolts as above. Additionally there shall be a bracing piece between the rafter and the high level stanchion consisting of at least 60 x 60 x 6mm angle iron, 1.5m long and secured by a 16mm bolt at each end.

Table 4 - Lean-to Roof Trusses

Span	Top rafter for trusses of average depth of 1m or more Millimetres	Top rafter for trusses of average depth less than 1m. Millimetres	Bottom Rafter Millimetres	Struts in compression Millimetres	Ties in Tension Millimetres
6.70m	60x60x6 OR 65x50x6	60x60x6 OR 65x50x6	50x50x6	50x50x6	50x6 FLAT
7.62m	60x60x6 OR 65x50x6	60x60x6 OR 65x50x6	50x50x6	50x50x6	50x6 FLAT
9.14m	70x70x6	80x80x6	60x60x6 OR 65x50x6	50x50x6	50x50x6
10.66m	80x80x6	100x65x8	60x60x6 OR 65x50x6	50x50x6	50x50x6
12.19m	80x80x8	100x75x8	70x70x6	60x60x6 OR 65x50x6	50x50x6
13.71m	100x75x8	125x75x8	70x70x8	60x60x6 OR 65x50x6	50x50x6

Stanchion elimination:

Where it is desired to eliminate an internal stanchion in order to yield more unhindered floor space, a lattice truss shall be provided to span not more than two standard bays. It shall contain a stub girder at the exact would-be location of the missing stantion. Such lattice truss shall normally be 900mm deep but never less than 600mm. Its design should have prior approval of the Department which may require an incremental increase in the size of the supporting stanchions and/or the opposing stanchion(s).

Roof Covering and Cladding-Standards:

(a) Corrugated steel may be either zinc coated or aluminium-zinc coated in compliance with I.S.145, 1985. Coating type shall be either Z450 or AZ185 and normal sheet thickness shall be 0.6mm except for round roofs where it shall be 0.75mm. All sheets must be indelibly marked in accordance with clause 10 of the above standard. For round roofs it shall be pre-curved in lengths appropriate to the particular roof.

Where sheds are used for intensive cattle housing steel sheeting shall be prepainted and otherwise as at (f) below.

(b) Corrugated asbestos sheets shall conform with I.S.7, Part 2, 1983.

(c) Profiled aluminium sheets shall conform to B.S.4868 and minimum thickness shall be 0.5mm.

(d) Box profiled steel, zinc or aluminium-zinc coated, shall conform to the qualitative requirements of I.S.145, 1985. The profile shall be an approved one and information on the structural strength shall be available. Where high tensile steel is used the gauge may be reduced but never below 0.45mm.

(e) Translucent sheeting shall conform generally with B.S.4154. It shall be ultra violet inhibited (U.V.I.) and mould resistant.

(f) Pre-painted material shall consist of a steel core, zinc or aluminium-zinc coated and of thickness 0.6mm or 0.75mm as indicated. The surface finish shall consist of a factory applied paint system to one or both sides. All such material must be identifiable and approved as per the relevant performance specification available from the Department.

Note: Many cladding materials are to-day marketed under brand-names. The one material can be represented by a variety of brand-names. Therefore seek advice and assurance that the particular material conforms to the requirements of this specification.

Roof Covering and Cladding --- Erection:

Roofs shall have at least single corrugation side laps with seam fastening (bolts or rivets) at intervals not exceeding 600mm. With box profile material the normal overlap shall be used, and erection shall be as recommended by the manufacturer. All overlaps shall be with the prevailing wind direction and end laps may never be less than 150mm.

All fixings shall be suitable for the type of purlin or rail used and shall be as recognised in the trade or as recommended by the manufacturer. Sheets shall be fixed in the recommended manner in at least three places per sheet per purlin/rail. Suitable washers shall be used with each fixing (except rivets) and these shall be storm-proof and ultraviolet inhibited (U.V.I.). Fixings shall normally be galvanised but stainless steel may be required in certain circumstances.

Spaced sheeting:

This type of roof may be indicated where animals are housed intensively. It is particularly compatible with the use of corrugated materials provided there is an upstand on each side of the sheet. Such sheets may require to be specially ordered.

DEPARTMENT OF AGRICULTURE, FOOD AND FORESTRY S102

Minimum Standards for Roof Cladding and Side Cladding, June 1993

NOTE :The cladding requirements in this specification supersede the requirements in all FDS specifications issued before this date.

:Every sheet of cladding material must have an identifiable indelible stamp. The Department operates a NO STAMP: NO GRANT policy. [A.3 below is the only exception]

:Only sheets listed below will be accepted for grant-aid, provided that they are installed according to their manufacturers' instructions.

A. ALL BUILDINGS FOR THE HOUSING AND FEEDING OF ANIMALS: MILKING PREMISES: DAIRIES

A.1. Corrugated asbestos-cement sheets to I.S.7: part 2: 1983; or fibre-cement sheets [pr-EN 494].

: TEGRAL [identifying stamp - TEG 6]
: LINCO [incised stamp on top of sheet - SIL + code no.s]

A.2. The proprietary pre-painted metal sheets listed below, which have been tested by EOLAS to comply with the Draft Performance specification (May 1st, 1989). The identifying stamps have been approved by the Department, and give the following information:-

: AGRIBILD: 0.6mm - Tegral [also 0.75mm]
: AGRICLAD - Gamble Simms 22 Gauge
: CORRIFARM 0.55mm BS/DPL/DSL [also 0.7mm] 10.5/3
: COUNTRY-CLAD IRL .55mm [also .7mm] 10/3
: DURACLAD 350/0.55/SS [AB]/BROHOME/PN.HJ.BOC
: EP COLORFARM AP.55 BS/DSL
: FARMBUILD/B.S.C. - E.D.M./24 S.W.G.
: KINGSPAN FARMCLAD
: IRISH STEEL - STEELILE COLOUR 0.55 [also 0.70]
: EP COLORFARM AP .5 BS/DSL [box-profile form only; min. depth 26mm]
: COLOR FARM AP [box-profile form only; min depth 26mm]

Note: All prepainted metal sheets shall be separated from timber purlins by a D.P.C. strip, the width of the purlin, fixed by flat-head galvanised nails.

A.3. : ONDULINE [Bitumen/fibre sheet] [No identifying stamp]
[Note: max. purlin spacing 600mm, or 450 mm below 15° pitch]

A.4.: ROCKWELL: BT: 1.2mm PVC [U.P.V.C. corrugated sheeting]

B. STORAGE BUILDINGS: HAYBARNS, PRODUCE HOUSES, ETC.

B.1 All products listed above.

B.2 Galvanised steel sheets or Aluminium-zinc coated sheets provided the stamp contains the following:-

(i) Brand-name, or manufacturers name, or trademark.
(ii) Z450 (galvanised) or AZ185 (aluminium-zinc)
(iii) I.S. 145: 1985 [B.S. 3083 is accepted only with Z450]
(iv) 0.6mm; or 0.75mm (for round roofs)

Table I: Fan Size

Number of Finishing Pigs	x	120 CMH (Cubic Metres/Hour)
" " Weaners	x	45 CMH
" " Dry Sows	x	150 CMH
" " Farrowing Pens	x	330 CMH

Note: Inlet Area = $0.3M^2$ per 2,000 CMH fan output.

(2) By natural ventilation either by controlled openings at high level, or along the ridge, or by flue or duct constructed as outlined above and fitted with a butterfly valve manually operated to control the rate of airflow. For outlet size see Table II. The top of the flue shall be at least 1.8m above the inlet and cowled over. In a monopitch house, ventilation may be by a pivoted front vent, manually operated.

Table II: Chimney Size

Number of Finishing Pigs	x	$0.006\ M^2$
" " Dry Sows	x	$0.012\ M^2$
" " Farrowing Pens	x	$0.040\ M^2$

Note: Inlet Area = twice the chimney size.

(3) In the ACNV system, openings shall normally be continuous along both sides of the house, and flaps (Table III) shall be close fitting, strongly constructed, and preferably insulated. Ridge outlets with flaps may also be used as part of a designed system, and in monopitch houses front vent flaps are used. Automatic control equipment shall be installed to monitor internal conditions at least once every fifteen minutes, and adjust the flaps as necessary.

Table III: Inlet area for each side wall.

Number of Finishing Pigs	x	$0.025\ M^2$
" " Weaners	x	$0.013\ M^2$
" " Dry Sows	x	$0.020\ M^2$

Note: Ridge outlet (if used) shall be half the total inlet flap area.

5. Lighting
Windows shall preferably be double-glazed, and be of an adjustable hopper-type with closed cheeks.
Artificial lighting is best provided by fluorescent tubes in hose-proof fittings at a minimum of 40w per $10m^2$. All electrical work shall conform with "National Rules for Electrical Installations", and in particular with part 2.4 thereof.

6. Doors
The minimum number of doors shall be fitted for satisfactory working of the house. Doors shall be ledged, braced, and sheeted, or of other suitable construction, and fitted in rebated frames.
All external woodwork shall be given two coats of lead-free paint.

7. Fittings
Farrowing Crates, Dry-Sow Stalls, shall have a galvanised or rust-protective painted coating, or be of an acceptable proprietary manufacture.

8. System Building
Prefabricated or system-built structures are acceptable subject to the prior approval of the Department of Agriculture and Food.

9. Animal Wastes and Effluents
Provision shall be made for the storage and disposal of all dung, liquid manure, and soiled water, in accordance with the Department of Agriculture "Guidelines and Recommendations on Control of Pollution from Farmyard Wastes" (1985 revised edition).

The following points must be adhered to in regard to spaced sheet construction.

(a) The gap shall be of average width 15mm; - at any point it may be 15 ± 5mm.

(b) The first two sheets at gable ends shall be laid with overlaps as normal.

(c) Sheets shall have extra fixings as follows: one fixing per purlin through each of the corrugations forming the edge of the sheet; further fixings per sheet per purlin so that no more than two consecutive corrugations may be free of a fixing device.

(d) Purlins must be preservative treated.

(e) In certain circumstances X-bracing in the plane of the roof may be called for to restore rigidity. Such bracing shall consist of 50 x 50 x 6 angle iron on each slope of each end-bay. Where asbestos is used, such bracing shall always be provided.

Note:- Spaced roof sheeting may, in conjunction with other outlets above eaves level, be relied upon to provide outlet ventilation. If it is to be relied on solely, the average gap width may have to be increased up to a max. of 20mm. Inlet ventilation must be provided separately.

Bracing and Wind Stays:

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Purlins etc.

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Purlin cleats (timber purlins) must be at least 150mm wide, and should extend to 2/3 the height of the purlin (minimum) and be securely fastened to the trusses.

Steel purlins shall be of an approved variety and shall be sized and installed in accordance with the manufacturer's printed instructions. It is advisable when using metallic sheet material in damp or humid environments to break the contact between such sheets and the purlins. This can be done by using a bitumastic tape; a 100mm wide strip of builders felt or plastic damp proof membrane or, on metal purlins only, a lead free primer coat and a top coat along the contact surface. However, in such environments, it may be wise to completely paint metal purlins in order to give enhanced resistance to rusting.

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Gutters and downpipes:

All roofs must be fitted with gutters and downpipes composed of 18 s.w.g. galvanised steel or other approved material. They must be complete with all necessary brackets and supports and securely fixed. Gutter brackets to be fabricated from 25mm x 6mm flat steel. Galvanised gutters should not be used with Aluminium - zinc coated roofing.

On sheds up to 4 bays long 125mm half round (H.R.) gutters and 75mm downpipes will normally suffice. On larger structures combining a shed and a lean-to, 150mm H.R. gutters shall be used together with 100mm downpipes. The table below shows the number of bays which can be drained by a standard 150mm half round gutter. The span or combined span is the distance from the gutter to the highest point of the roof(s) which it drains.

Table 5

Span or combined span	6.1m	7.62m	9.14m	10.66m	12.19m	13.71m	15.24m	18.28m
No. of Bays (slope not less than 10mm/Bay)	8	6	5	5	4	3	3	2

All downpipes must discharge direct (or indirectly via a rain-water tank) to a suitable disposal point. This will normally be achieved by fitting a shoe to the bottom end of the downpipe and discharging at a height not exceeding 150mm over a gully which will convey the water to the disposal point. But if the yard is a soiled area the downpipe must be carried through the yard surface to the outfall drain via an inspection chamber. Where cattle or machinery can come in contact with downpipes they shall be suitably protected up to a height of 1.25m.

Side Cladding:

Side cladding may consist of any of the materials listed under roof cladding. In addition the following types of cladding may be used where ventilation is required:

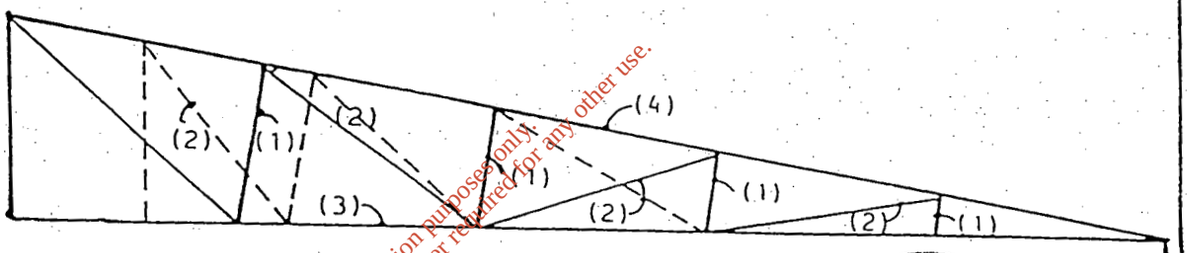
(a) Space-boarding using fully treated timber; gap width of 25mm; board thickness of 25mm (min.) and an open ratio of between 25% and 50%. In animal housing if used above eaves level, this forms a recommended ventilation outlet. Suitable grounds, made up from 75mm x 50mm timber shall be secured to the truss and the laths nailed in the normal way.

(b) Approved modern fabric-type mesh materials of 25% - 50% permeability used and installed as per the manufacturer's instructions. This form of cladding may not be used above eaves level on gable ends. Such materials must be guaranteed to have a useful life of at least 10 years under normal conditions.

The cladding shall be supported by rails which shall conform generally with the requirements of Purlins. Timber rails shall be 150mm x 75mm and steel rails as per the manufacturer's recommendations. Single side lap or normal overlap shall generally suffice - overlaps being away from the prevailing wind. Sheets shall have at least 3 fixings per rail in the same manner as roofing, and seam fastening shall be provided at intervals not exceeding 600mm.

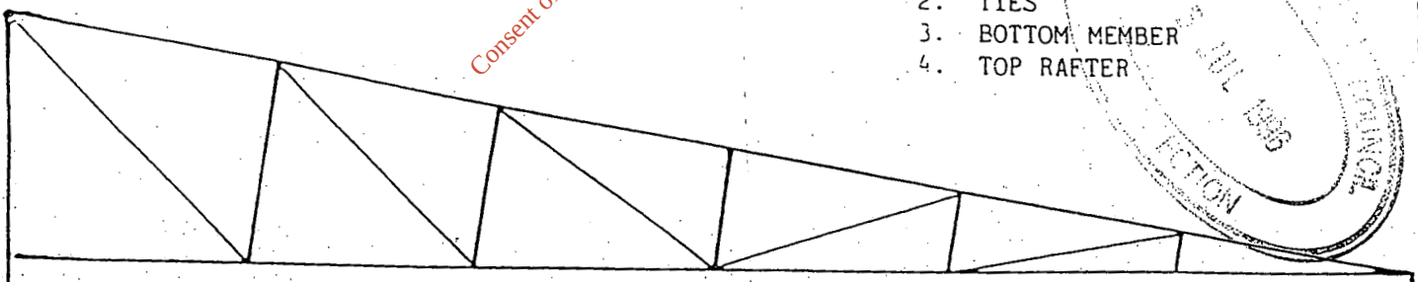
Where side cladding is provided down to ground level, the bottom rail shall be not more than 450mm over shed floor level; the next at 1.2m above this and the remaining rails at not more than 1.8m. Where a wall is erected forming part of the side of a building, cladding rails shall be provided at 1.8m (max.) centres including the rail immediately atop the wall. On sheds wider than 7.62m where end cladding is provided below wall plate level, an extra stanchion shall be provided at mid point to support the cladding rails.

LEAN-TO TRUSSES



7.62M LEAN-TO TRUSS. 6.7M SHOWN

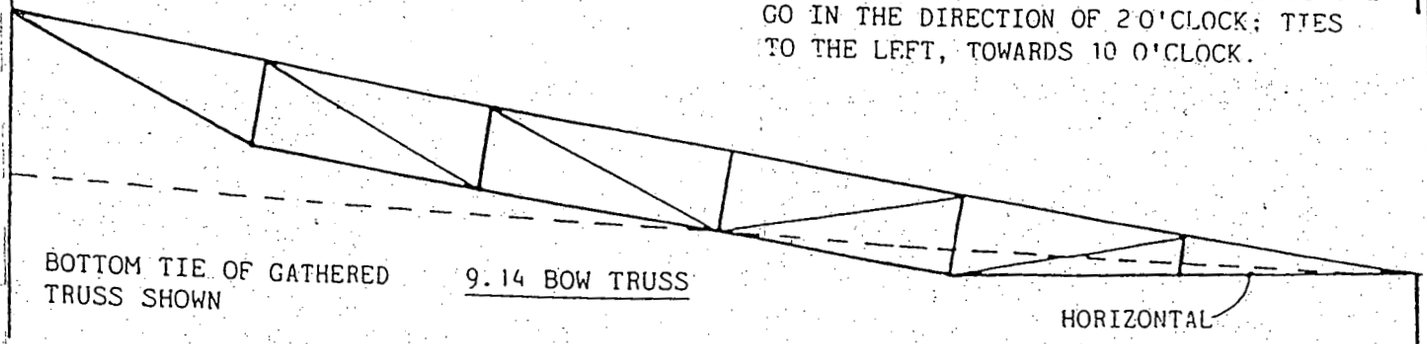
1. STRUTS
2. TIES
3. BOTTOM MEMBER
4. TOP RAFTER



9.14M END TRUSS

NOTE:

TIES TO RIGHT OF STRUT AT OR NEAR CENTRE GO IN THE DIRECTION OF 2 O'CLOCK; TIES TO THE LEFT, TOWARDS 10 O'CLOCK.

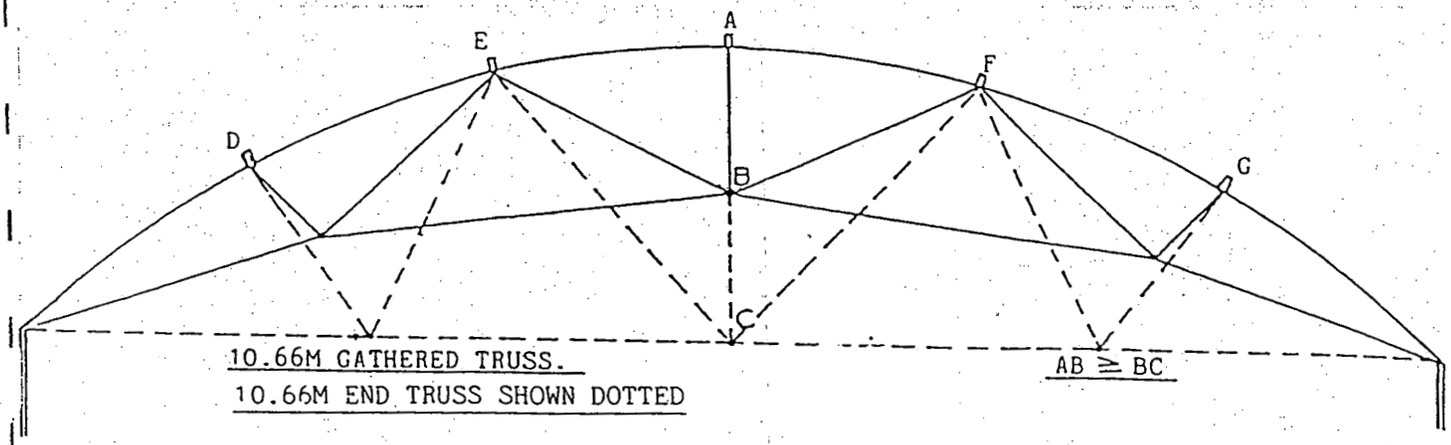


BOTTOM TIE OF GATHERED TRUSS SHOWN

9.14 BOW TRUSS

HORIZONTAL

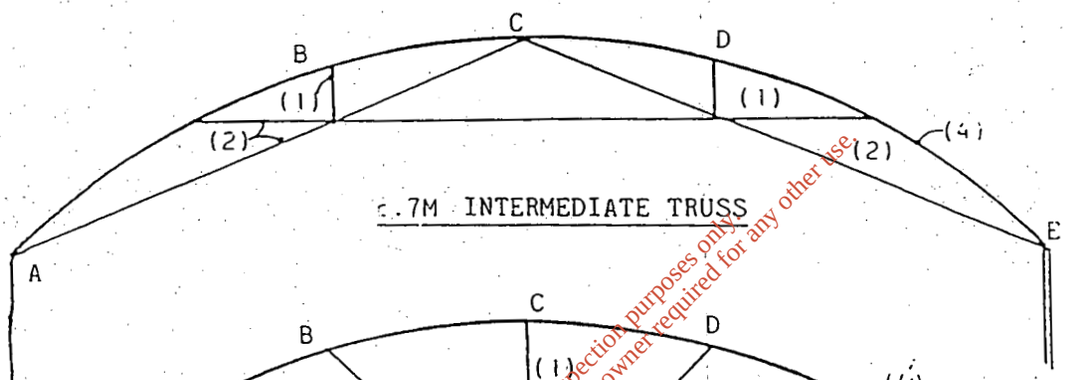
Hay Barn Trusses



10.66M GATHERED TRUSS.
10.66M END TRUSS SHOWN DOTTED

AB ≥ BC

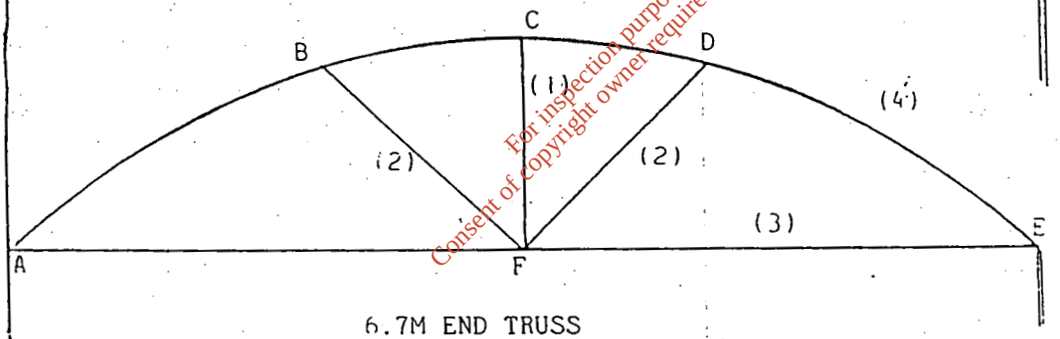
Note: Closing sheet EF must be as long as is practical - no joint at A. If seam fastening is not desired by purchaser, purlin spacing must be reduced to 1.8m max



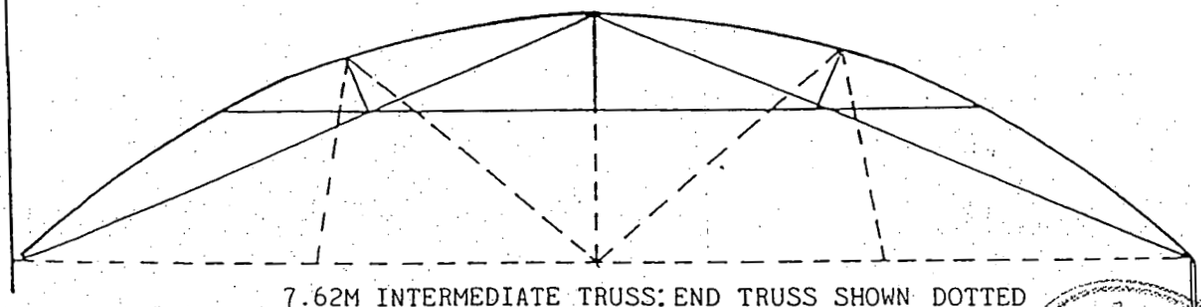
6.7M INTERMEDIATE TRUSS

FOR ROUND TRUSSES:

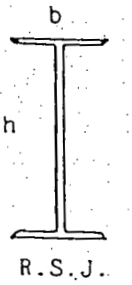
AE = SPAN
FC = RISE = SPAN / 5
ABCDE = 1.1 X SPAN
AB; BC: 2.4 M MAX.



6.7M END TRUSS



7.62M INTERMEDIATE TRUSS: END TRUSS SHOWN DOTTED



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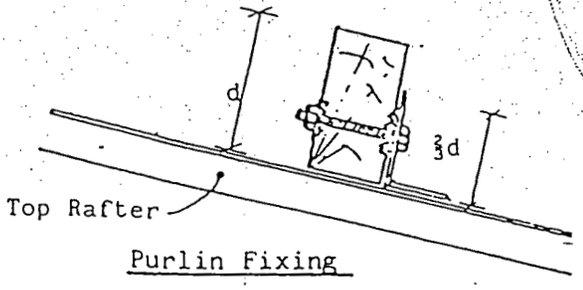

Purlin Fixing

Table I: Fan Size

Number of	Finishing Pigs	x 120 CMH (Cubic Metres/Hour)
"	" Weaners	x 45 CMH
"	" Dry Sows	x 150 CMH
"	" Farrowing Pens	x 330 CMH

Note: Inlet Area = $0.3M^2$ per 2,000 CMH fan output.

(2) By natural ventilation either by controlled openings at high level, or along the ridge, or by flue or duct constructed as outlined above and fitted with a butterfly valve manually operated to control the rate of airflow. For outlet size see Table II. The top of the flue shall be at least 1.8m above the inlet and cowled over. In a monopitch house, ventilation may be by a pivoted front vent, manually operated.

Table II: Chimney Size

Number of	Finishing Pigs	x 0.006 M^2
"	" Dry Sows	x 0.012 M^2
"	" Farrowing Pens	x 0.040 M^2

Note: Inlet Area = twice the chimney size.

(3) In the ACNV system, openings shall normally be continuous along both sides of the house, and flaps (Table III) shall be close fitting, strongly constructed, and preferably insulated. Ridge outlets with flaps may also be used as part of a designed system, and in monopitch houses front vent flaps are used. Automatic control equipment shall be installed to monitor internal conditions at least once every fifteen minutes, and adjust the flaps as necessary.

Table III: Inlet area for each side wall.

Number of	Finishing Pigs	x 0.025 M^2
"	" Weaners	x 0.013 M^2
"	" Dry Sows	x 0.020 M^2

Note: Ridge outlet (if used) shall be half the total inlet flap area.

5. Lighting

Windows shall preferably be double-glazed, and be of an adjustable hopper-type with closed cheeks.

Artificial lighting is best provided by fluorescent tubes in hose-proof fittings at a minimum of 40w per $10m^2$. All electrical work shall conform with "National Rules for Electrical Installations", and in particular with part 2.4 thereof.

6. Doors

The minimum number of doors shall be fitted for satisfactory working of the house. Doors shall be ledged, braced, and sheeted, or of other suitable construction, and fitted in rebated frames.

All external woodwork shall be given two coats of lead-free paint.

7. Fittings

Farrowing Crates, Dry-Sow Stalls, shall have a galvanised or rust-protective painted coating, or be of an acceptable proprietary manufacture.

8. System Building

Prefabricated or system-built structures are acceptable subject to the prior approval of the Department of Agriculture and Food.

9. Animal Wastes and Effluents

Provision shall be made for the storage and disposal of all dung, liquid manure, and soiled water, in accordance with the Department of Agriculture "Guidelines and Recommendations on Control of Pollution from Farmyard Wastes" (1985 revised edition).

The following points must be adhered to in regard to spaced sheet construction.

(a) The gap shall be of average width 15mm; - at any point it may be 15 ± 5mm.

(b) The first two sheets at gable ends shall be laid with overlaps as normal.

(c) Sheets shall have extra fixings as follows: one fixing per purlin through each of the corrugations forming the edge of the sheet; further fixings per sheet per purlin so that no more than two consecutive corrugations may be free of a fixing device.

(d) Purlins must be preservative treated.

(e) In certain circumstances X-bracing in the plane of the roof may be called for to restore rigidity. Such bracing shall consist of 50 x 50 x 6 angle iron on each slope of each end-bay. Where asbestos is used, such bracing shall always be provided.

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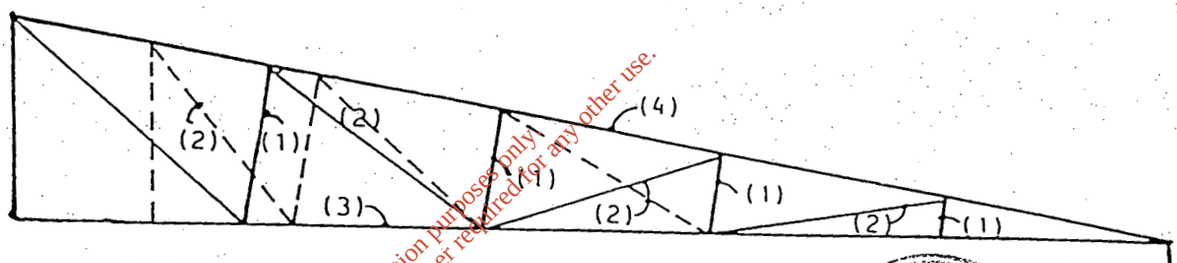

7.62M LEAN-TO TRUSS. 6.7M SHOWN

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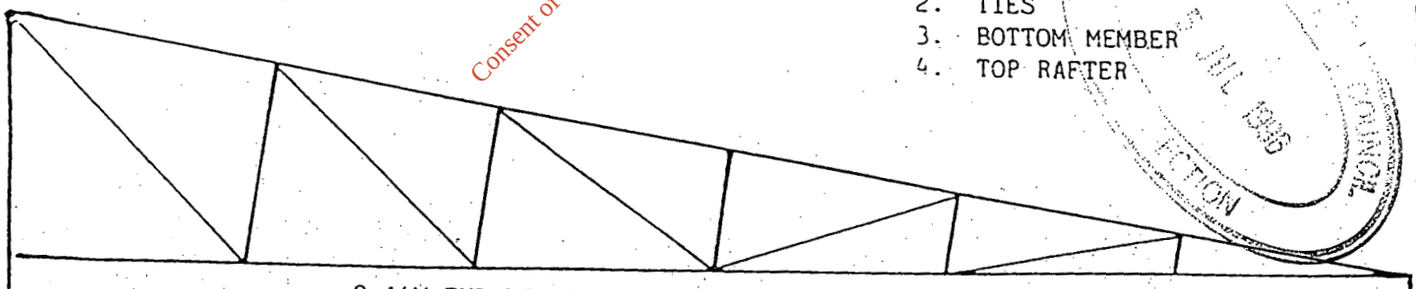
2. TIES
3. BOTTOM MEMBER
4. TOP RAFTER



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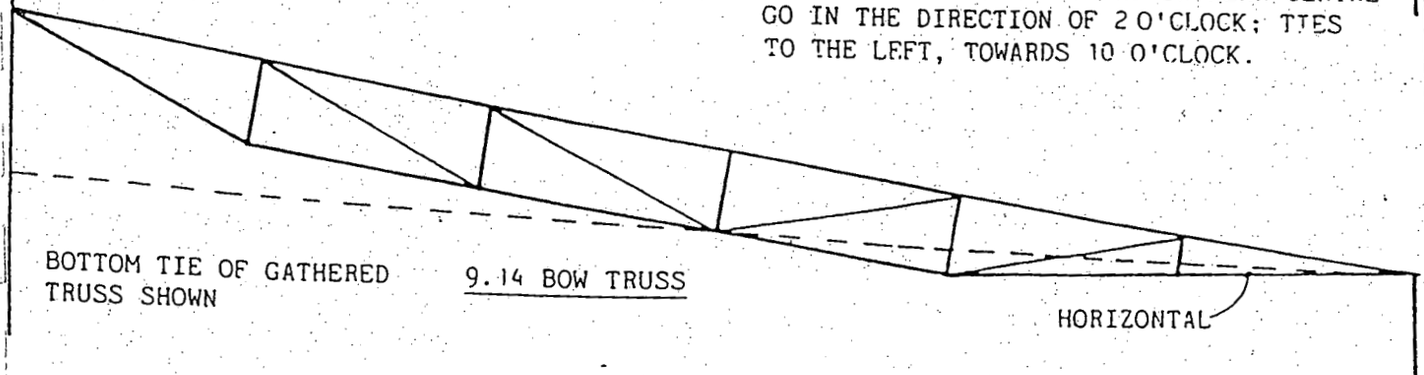
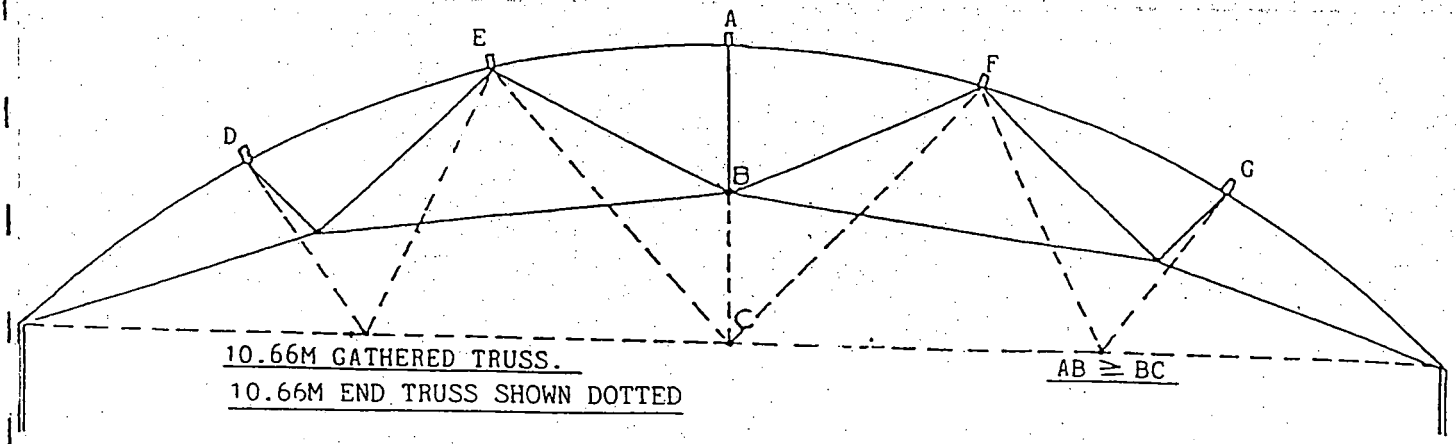


BOTTOM TIE OF GATHERED TRUSS SHOWN

9.14 BOW TRUSS

HORIZONTAL

Hay Barn Trusses



10.66M GATHERED TRUSS.
10.66M END TRUSS SHOWN DOTTED

AB ≧ BC

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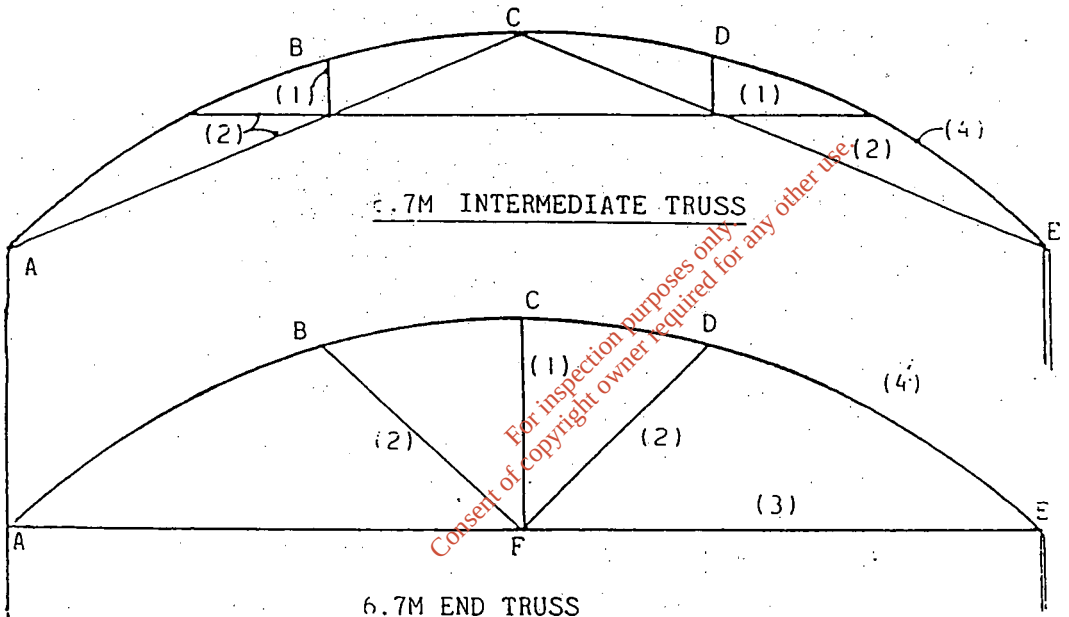

6.7M INTERMEDIATE TRUSS

FOR ROUND TRUSSES:

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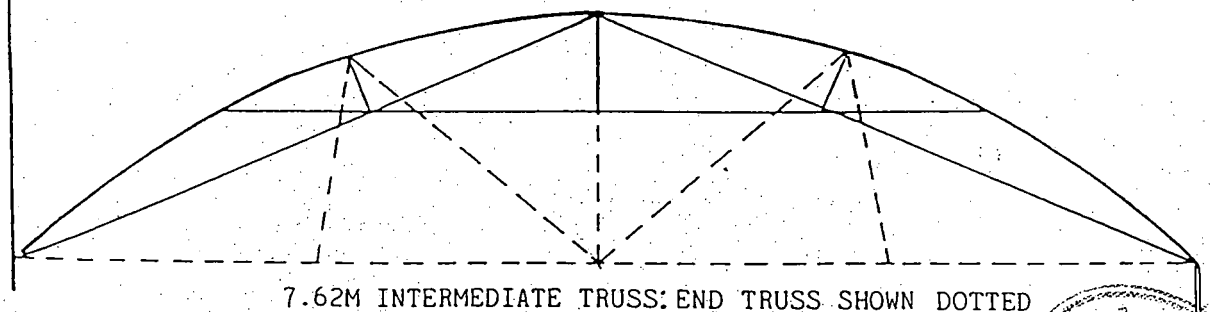
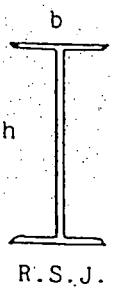
FC = RISE = SPAN / 4

ABCDE = 1.1 X SPAN
AB; BC: 2.4 M MAX.

6.7M END TRUSS



7.62M INTERMEDIATE TRUSS: END TRUSS SHOWN DOTTED



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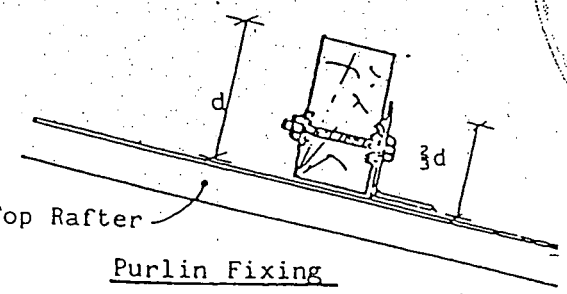


Purlin Fixing

AN ROINN TALMHAIOCHTA AGUS BIA
FARM DEVELOPMENT SERVICE
Minimum Specification for Pig Housing

S121

September 1988

1. Site

The site should be dry and should facilitate the efficient working of the unit, as well as the proper management of slurry and soiled water. Clean water from roofs and yards to be disposed of separately. An adequate supply of water and electricity should be available.

2. Concrete:

Concrete shall be purchased on the basis of a characteristic 28 day crushing strength of 25N/mm^2. The cement content to produce this may vary but in no case shall it be less than 280kg/m^3. Slump shall be between 50mm and 100mm and maximum aggregate size shall be 40mm. Cement used in concrete and concrete products shall be certified to I.S.1:1987 or to an international standard or a national standard of another Member State of the European Community which provides an equivalent guarantee of safety and suitability.

Where concrete is made on site, all aggregates must be stored separately on a clean hard base and cement shall be stored off the ground and under cover. Batching shall be based on the use of one or more whole bags of cement and shall be by weight or volume as follows:

(i) Weight Batching:		(ii) Volume Batching:
50kg bag of cement)	Yield Approx.	(One bag of cement (50 kg)
125 kg damp sand)		(0.8m^3 damp sand (80 litres)
240 kg coarse aggregate)	= .18m^3 =	(.155m^3 coarse aggregate (155L)

In either case only add sufficient water to make a good workable mix, but in any event never more than 25 litres per bag of cement.

3. Structure

Foundations shall be excavated to a depth of 600mm below original ground level or until firm strata is encountered. Footings shall be at least 225mm deep and as wide as the wall to be carried plus 225mm on each side.

Exterior walls shall be:-

(1) Continuous cavity of two 100mm leaves, properly tied by purpose-made ties leaving a 50mm air cavity: top of cavity and openings for windows, doors and air-inlets to be closed in a suitable manner and fitted with a vertical D.P.C. Insulation to be by boards fixed to the inner leaf [25mm. extruded polystyrene or 35mm oil-impregnated fibreglass; or, if protected by a vapour barrier on the inner side, 25mm expanded polyurethane or 35mm expanded polystyrene]. The cavity may also be filled with injected ureaformaldehyde foam or with polystyrene beads again protected by a vapour barrier.

or (2) 225mm cavity block, cavities to be closed at wall plates and window ledges. Wall to be insulated with 30mm extruded polystyrene or, if protected by a vapour barrier, 30mm expanded polyurethane or 40mm expanded polystyrene. All insulation to be protected against damage by machinery or animals.

All walls shall be smooth plastered internally to a height of 1.1m with 5:1 sand/cement mix and be well-pointed, smooth-finished or dashed externally. A damp-proof course shall be fitted not less than 100mm above floor/yard level.

Internal walls shall be of 100mm solid block or 225mm cavity block, plastered both sides to 1.1m and fitted with a damp-proof course. When these walls support the roof the floor under them shall be thickened to 225mm. On unfirm ground, the thickened slab shall be reinforced.

Roof timbers shall be sized to give full support to the cladding over the chosen span. Timber shall be good quality, free from serious defects and shall be preservative treated. Cladding shall be corrugated asbestos, or other material approved by the Department.

Roof insulation to be one of the following:-

(1) 50mm extruded polystyrene; or 50mm expanded polyurethane or 60mm expanded polystyrene, protected on the under side by a vapour barrier.
(2) 75mm glass wool on continuous vapour barrier supported by a fibre-reinforced board, or oil-bound hardboard ceiling.
(3) 50mm of sprayed expanded polyurethane foam.
(4) Other material of equivalent insulating value and with vapour barrier if required.

Insulating boards should be well taped along all joints, or joints sealed with mastic to prevent vapour transmission. Roofs shall be constructed to prevent rodent access to insulation material.

Roofwater. Gutters and downpipes shall be fitted to all roofs. Downpipes shall be protected from animals, machinery, etc., and arranged so that water discharging from them cannot flow onto any soiled yards.

Floors for the sleeping areas shall be insulated over a damp-proof membrane. The membrane shall extend to overlap the damp proof course in walls adjoining the sleeping area.
Floor construction shall be 50mm surface screed of 4:1 sand/cement on insulation boards (25mm expanded polyurethane or extruded polystyrene, or 35mm expanded polystyrene) on polythene on a 75mm layer of 1.3.6 concrete laid to a fall of 1 in 24 on 150mm well-compacted hardcore.
Floors may also be slatted over tanks or channels, using concrete slats or slats of other proprietary systems (galvanised metal, reinforced plastic, etc.)

Slurry Channels shall be constructed of 150mm solid concrete blocks plastered with 3:1 sand/cement mix; or of 150mm mass concrete walls thoroughly compacted. Shuttering shall be kept in position for at least 24 hours, and if the resulting finish is not smooth the walls shall be plastered as for block walls. Vertical joints shall be avoided.
Channel floors shall be 125mm concrete, normally laid level, but a fall of not greater than 1 in 150 may be used together with water-tight barriers at the ends.

Passages for feeding or access shall be level and not lower than the highest point in the dung passage. Passages shall be 300mm above outside ground level.

Troughs to be half-round glazed earthenware, or plastic set in concrete, or other suitable construction. Proprietary feeders are also acceptable.

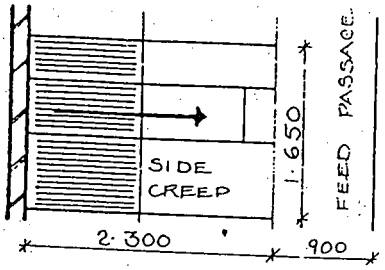
4. Ventilation shall be mechanical; natural; or automatically-controlled natural ventilation (ACNV).

Air inlets shall be automatic or hand-regulated box-type that divert air towards the ceiling, and fitted with a control shutter. Inlets shall not be more than 1.5m from the corners or more than 4m apart; depth of inlet between 75mm and 225mm; distance from ceiling at least 225mm. Where natural ventilation only is used, the total area of inlets shall be twice the area of chimney or other type of outlet (Tables II and III). With fan extraction, inlets shall be sized appropriate to fan capacity. (Table I).

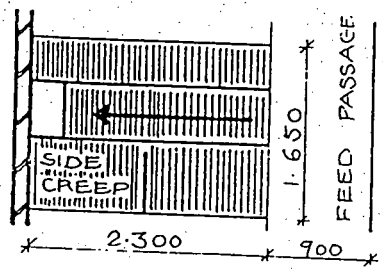
Air outlets may be as follows.

(1) By extractor fans, with speed and thermostatic control, and with overload safety device. Fan shall be of sufficient power to operate against strong winds and rated to give adequate air changes for the house when fully stocked. (Table I). Fan may be fixed in a wall-opening, or in a duct, or flue leading out through the roof to finish 450mm above the ridge. The duct or flue may be constructed of timber, fibre-reinforced board or other suitable material, insulated with 50mm of expanded polystyrene, or equivalent, protected by a vapour barrier.

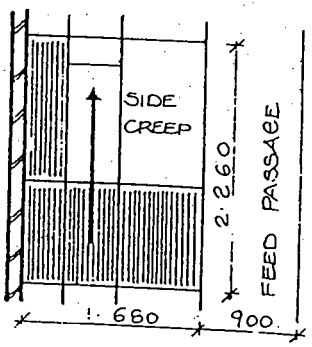
FARROWING PEN ARRANGEMENTS



SOW HEAD-ON TO FEED-PASSAGE/SIDE CREEP.

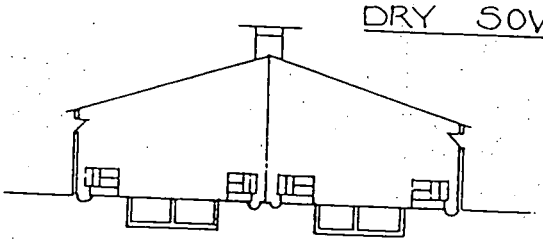


SOW HEAD-ON TO BACK WALL, AUTOMATIC FEEDING.

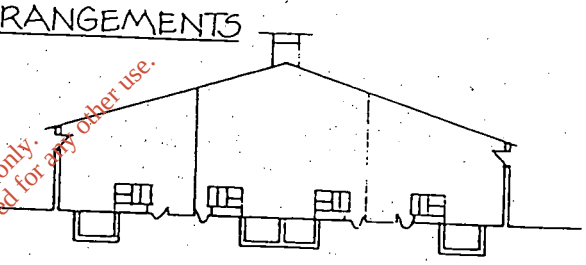


SOW PARALLEL TO FEED PASSAGE/SIDE CREEP.

DRY SOW ARRANGEMENTS

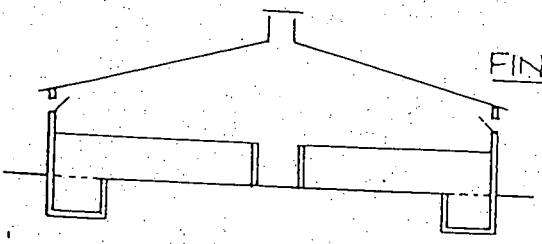


HOUSE WITHOUT FEED PASSAGES MECHANICAL/MANUAL FEEDING

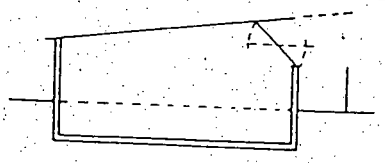


HOUSE WITH FEED PASSAGES MANUAL/MECHANICAL FEEDING

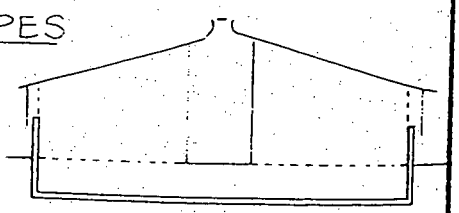
FINISHING HOUSE TYPES



'A' ROOF TYPE - MECHANICAL/NATURAL/ACNV VENTILATION. PART OR TOTALLY SLATTED.

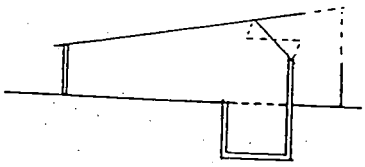


MONOPITCH TYPE - NATURAL/ACN VENTILATION. PART OR TOTALLY SLATTED.

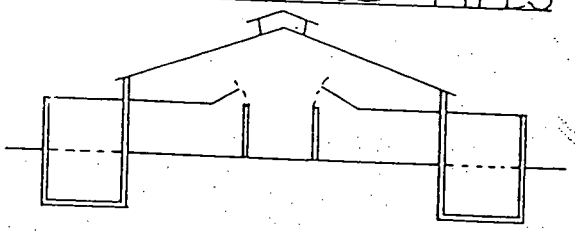


'POWER HOUSE' - MECHANICAL VENTILATION TOTALLY SLATTED.

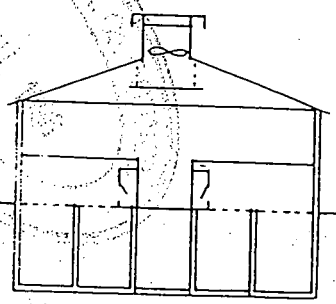
WEANER HOUSE TYPES



SOLARI HOUSE [PENS PART OR TOTALLY SLATTED]



VERANDAH/YORKSHIRE HOUSE : NATURAL VENTILATION



FLAT DECK HOUSE : MECHANICAL VENTILATION AND HEA

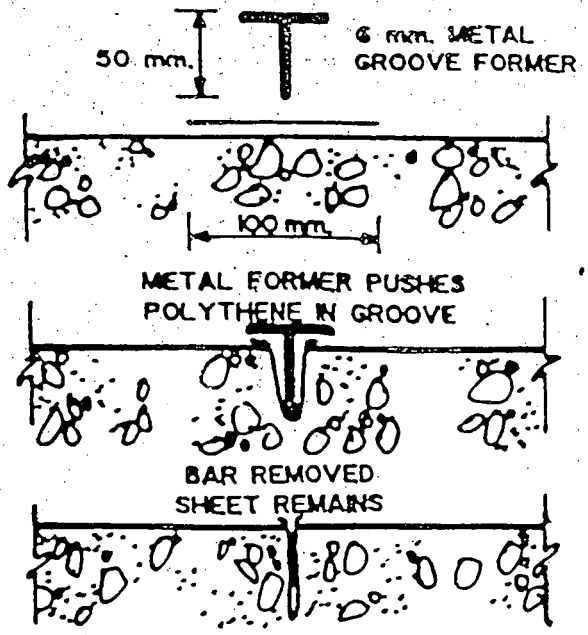
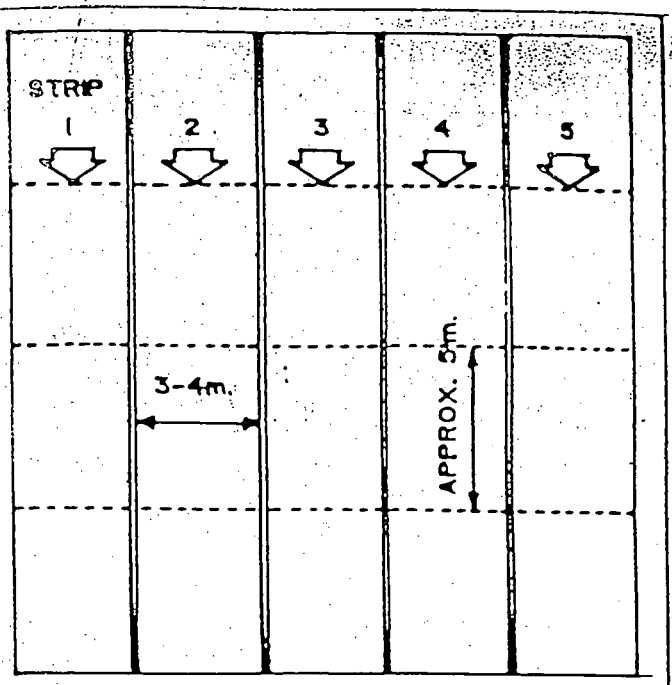


FIG. 10



STRIPS 1, 3 & 5 ARE CONCRETED FIRST
STRIPS 2 & 4 FOLLOW LATER
DOUBLE LINES INDICATE BUTT JOINTS
------- INDICATE CONTRACTION JOINTS
ARROWS INDICATE DIRECTION OF WORK

FIG. 11

ALTERNATIVE METHOD OF FORMING CONTRACTION JOINTS IN CONCRETE PAVED YARDS not suitable for silage bases

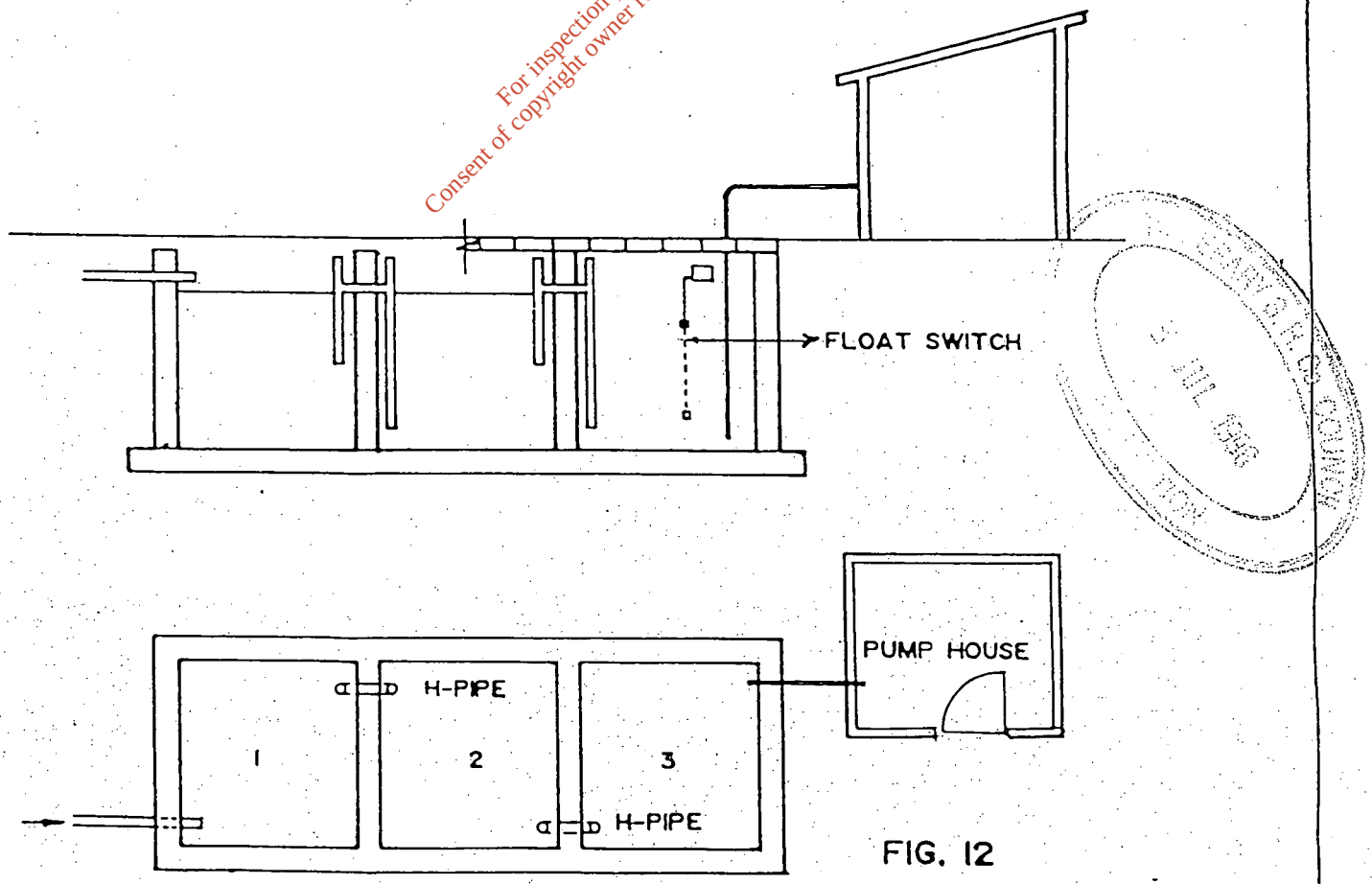


FIG. 12

SOILED WATER SETTLEMENT TANK FEATURES

AN ROINN TALMHAIOCHTA BIA AGUS FORAOISEACHTA S.123

FARM DEVELOPMENT SERVICE March 1994

Minimum Specification for Slatted Livestock Units and Reinforced Tanks

NOTE: This edition of S.123 incorporates S. 130 (reinforced concrete tanks). The layout of both specifications has been entirely revised. This specification now consists of nine sections, as follows:

1. Design of Tanks and Buildings
2. Siteworks
3. Concrete Work
4. Reinforcement
5. Components
6. Superstructure
7. Services
8. Safety
9. Certificates

NOTE: This is a minimum specification: grant - aid will be paid only on buildings constructed (at least) to the standards given. Where the word "SHALL" is used, then that standard (at least) must be followed. Where a procedure is "RECOMMENDED", this is advice only on good practice.

SECTION 1.: DESIGN OF TANKS AND BUILDINGS

1.1 GENERAL DESIGN: Proper design of tanks and buildings depends on stocking density; feed-face length; the length of storage period; the management plan for landspreading of slurry and effluents; the chosen systems of agitation and emptying; and the economics of construction. All these decisions must be taken before construction starts.

1.2 TANKS WITHIN BUILDINGS: All tanks shall be provided with facilities for the full agitation of slurry from point(s) outside the building. This may be done by the extensions of standard tanks beyond the building, or by a specially designed external access point to an otherwise enclosed tank. Under no circumstances shall such extended tanks or access points be roofed over or enclosed. Access points may be constructed inside the house only for emergency use.

NOTE: External agitation shall also be provided for in all schemes involving conversion of existing buildings.

1.3 CIRCULATION: Long narrow tanks (less than 3.8m wide and more than 22m long) are not recommended except for open single-sided houses. It is recommended that all tanks, where possible, should have a circulation system. One recommended design is a set of transverse tanks set across the width of the house, each with a spine wall and with a separate external agitation point. [See Fig.1]

1.4 SPINE WALLS: For ease in agitation and for structural reasons pillar-and-beam type construction should be avoided: solid spine walls, with opes, are strongly recommended for the support of slats and suspended passages.

Spine walls shall be positioned at the centre of the tank, and the gap between the spine wall and the end of the tank away from the agitation end shall preferably be half the width of the tank.

1.5 AGITATION: The design of the tank at the agitation ends, and the design of the external agitation points, shall suit the chosen systems of agitation and emptying. Manufacturers' specifications and dimensions on guide rails, dividing walls, access chambers etc, shall be followed. Some systems require agitation every 4-6 weeks. [See also section 8.2 on safety procedures).

1.6 COVER TO EXTENDED TANKS: To eliminate draughts and ingress of rainwater all extended tanks shall be covered by re-inforced solid concrete slabs. However, gang slats with not less than three ribs, (and preferably with four to six ribs,) may be used where external slurry collection is necessary. Single slats shall not be used. Where extensions to tanks may be subject to wheeled traffic, slabs and slats shall be designed to accommodate a 4 tonne dynamic wheel load. Slabs, or slats, not designed for wheeled traffic shall be protected by concrete kerb(s), minimum height 300mm.

Agitation/emptying points shall be provided by access openings within the slab or slats. These shall be covered with hinged galvanised sectional steel plates with a safety child-proof fitting. Alternatively, hinged galvanised steel covers in larger, heavier, sections shall incorporate a hinged galvanised safety grid underneath. Other specially designed external access points to enclosed tanks shall be provided with covers which incorporate the same, or equivalent, safety features. [All covers shall comply with the loading requirements in Part 2 of I.S.242:1981, and shall be galvanised to B.S. 729:1971.].

NOTE: Size and exact location, of agitation/emptying points shall be designed to fit the chosen system.

1.7 TANK GASES: To maximise ventilation during agitation of slurry, and to reduce gas build-up in the house, sliding doors, unsheeted gates, or unobstructed openings shall be provided to both ends of the central passageway in houses which exceed 15m in length.

1.8 EXTERNAL TANKS: shall be constructed using the full concrete and reinforcement specifications in Sections 3. and 4. below. Tank covers, where installed, shall conform to 1.6 above. Open external tanks shall be designed with full allowance for rainfall within the tank area. External slurry tanks shall have at least two well-separated agitation points. Safety fencing around tanks shall conform to clause 8.3 below. The layout of soiled water tanks, and sedimentation chambers, shall follow S129 (Farmyard Drainage).

NOTE: Where there is any expectation of a future conversion to a roofed unit, the design and setting out of external tanks shall be as for internal tanks.

1.9 BLOCKWORK TANKS AND CHANNELS: Tanks, and channels, not more than 1.2m in depth, may be constructed with 225mm solid concrete blocks. Any block wall longer than 10m shall be braced, or shall incorporate [at max. 10m intervals] a 450 X 450mm pillar extended on the outer face of the wall. Walls shall be plastered both sides to a thickness of 12mm. [3:1 washed sand/cement with plasticiser incorporated] No tank or channel in contact with silage effluent shall be constructed of blockwork.

SECTION 2: SITEWORKS

2.1. SITE: The site shall be carefully chosen with a view to minimising constructional and operational problems. It shall be well separated from potential fire hazards and sheltered if possible. Particular care shall be taken in siting Silage Effluent/Slurry/Soiled Water tanks to avoid any likelihood of polluting wells or watercourses. In such circumstances where soil overburden is shallow or very permeable, extreme care shall be exercised to prevent any pollutant getting into the backfill.

2.2 GROUNDWATER: Water table levels shall be checked by digging two holes deeper than the proposed tank floor level and covering them temporarily. After 48 hours the water level is noted. Where this is above tank floor level, flotation and structural problems may occur. Where the groundwater level is a problem, the water table shall be permanently lowered by providing field drain pipes with porous fill around the tank at floor level connected to an outlet drain. Any springs within the floor area of the tank shall be piped to this drain system under floor hardcore. If ground levels do not permit an outlet then a new site should be sought, or the walls and floor of the tank shall be increased in thickness to counteract the flotation of the empty tank. Engineering advice should be sought.

2.3 FLOODING: Flooding of open excavation around completed tank can cause floatation and severe structural damage to concrete tank. Precautions should be taken to ensure this does not happen, by preventing flood water from getting into the excavation, by the addition of an outlet drain, or by partially filling the tank with water.

2.4 EXCAVATION: Excavation shall be to a solid foundation, at least 500mm beyond the tank wall on all sides. Excavation shall be levelled, and suitable hardcore or gravel to a depth of at least 150mm shall be fully compacted with a plate vibrator over the whole area. In some excavations it may be necessary to lay a 75mm layer of site concrete to provide a working surface before placing steel on the concrete floor.

2.5 ROCK: Where solid rock is encountered in excavations it shall be removed below the required depth and a 75mm cushion of broken stone shall be replaced over the bed rock, consolidated with a plate vibrator, and blinded over with gravel or fine sand.

SECTION 3: CONCRETE WORK

3.1 CONCRETE FOR SILAGE EFFLUENT: For purpose-built silage effluent tanks and channels, concrete shall be purchased on the basis of a characteristic 28 day crushing strength of 40N/mm². Minimum cement content shall be 350 kg/m³. The slump of unplasticised concrete shall not exceed 75 mm. Maximum aggregate size shall be 20mm.

3.2. CONCRETE: For all other purposes including slurry tanks to which silage effluent may be directed, concrete shall be purchased on the basis of a characteristic 28 day crushing strength of 30N/mm². Minimum cement content shall be 280 kg/m³. Slump of unplasticised concrete shall not exceed 100mm, and maximum aggregate size shall be 20mm.

NOTE: Where silage effluent is allowed into a slurry tank the effluent shall discharge via a pipe at least 300mm from the inner face of the tank wall.

3.3 MATERIALS: Cement used in concrete and concrete products shall be certified to I.S.1. 1991, and shall bear the Irish Standard Mark, or shall be certified by N.S.A.I. to be equivalent to I.S.1, 1991. All aggregates shall be to I.S. 5, 1990. Plasticisers and other admixtures shall be to B.S. 5075, Parts 1 and 2, 1982; and Part 3, 1985. All admixtures shall be used in strict accordance with manufacturer's instructions, and shall be added only by the concrete-mix manufacturer.

3.4 CERTIFICATES: A numbered certificate, signed and stamped, shall be required for all concrete delivered to site. The certificate, the "Concrete Manufacturers' Specification Certificate", is produced in triplicate. The top certificate, printed on light blue paper, shall be retained by the applicant and given to the Farm Development Service for inspection upon completion of the works.

3.5 TESTS: It is recommended that concrete be tested in accordance with B.S. 1881, to ensure that it is as specified. The Department reserves the right to require that concrete should be so tested.

3.6 CURING OF CONCRETE: All concrete shall be cured by keeping it thoroughly moist for at least seven days. Wetted floor slabs and tank walls shall be protected by polythene sheeting, kept securely in place. Alternatively proprietary curing agents may be used in accordance with manufacturer's instructions. When frost is adanger, straw bales shall be placed over the polythene on slabs. Concrete shall be at least 28 days old before being subjected to full load, or to silage or silage effluent.

3.7. TANK FLOOR: The floor slab shall be not less than 225mm thick throughout. It shall extend 250mm outside the walls. Timber or steel forms 225 mm deep, shall be fixed around floor perimeter before placing footing and wall steel, and floor steel mesh where specified in Section 4. The concrete shall be thoroughly compacted, and compaction around steel reinforcement shall be carried out with a poker vibrator. The floor shall be finished smooth.

3.8. TANK WALLS: Walls shall be 225mm minimum, or 300mm minimum where tank walls are to support super structure and slats. Spine walls shall be a minimum of 250mm. Steel shuttering is recommended for tank walls but panels with timber may be used. All shuttering must be clean and tight fitting to prevent loss of grout. To maintain cleanliness and facilitate removal they should be oiled lightly with proprietary mould oil prior to each use. Care must be taken that oil does not get into reinforcing bars and prevent bonding. All shuttering must be properly tied and braced to withstand the pressure of the concrete.

3.9 WALL/FLOOR JOINT: A key shall be formed in the floor at the centre of the proposed wall by using a splayed oiled timber runner temporarily fixed in the freshly poured concrete and withdrawn before final set. Alternatively a 150mm patent water bar or approved water-stop shall be fixed along the centre line of the proposed wall. Care shall be taken that the water bar is tied to the vertical steel to keep it in position during the pouring of the concrete floor. [Fig.2]

A layer of water, cement, and fine material from the aggregate forms after a concrete pour. Within an hour or so (depending on weather) the surface of the proposed joint shall be sprayed with water and brushed off with a soft brush to expose the coarse aggregate. If left overnight, a stiff brush may be needed. The best joints are obtained by light brushing soon after pouring.

3.10 CONTRACTION JOINTS IN TANK WALLS: Where a tank wall exceeds 17 metres in length provision shall be made for substantially increasing the horizontal steel in the tank wall, or alternatively forming a induced type contraction joint with water bar. Where extra horizontal steel is adopted it shall be provided to all external walls of the tank to the following table:-

Length of Wall	No of Extra bars in each face
17m - 19m	1
19m - 24m	2
24m - 30m	3

(Spacing of horizontal steel shall be adjusted to accommodate the extra steel).

Alternatively an induced crack type vertical contraction joint shall be provided as per Fig 3. Fifty per cent of the horizontal steel shall be discontinued across the joint (Remove 50mm of horizontal steel on each side of joint from every second bar). A 200mm patent water stop shall be provided in the centre of the wall with 200 mm rearstop placed on the subbase across the wall footing. All Waterstops, and junctions, shall be fixed as per manufacturers' instructions. The joint shall be brushed out and sealed with acid-resistant sealer. In tanks longer than 17m, such induced vertical joints shall be installed, equidistantly, at intervals of not more than 13m.

3.11 POURING CONCRETE TO TANK WALLS: All dirt and debris shall be removed from within the shuttering. Concrete shall be placed in

evenly spread layers of not more than 600mm deep. Vibration, by poker vibrator of diameter not less than 50mm should follow closely on placing. The poker shall be inserted at maximum 400mm centres. It shall be allowed sink under its own weight to the depth of the layer, plus 100mm into the layer beneath and when air bubbles cease to rise, be withdrawn slowly but evenly leaving no significant depression in the concrete. Care shall be taken to prevent the vibrator making contact with either the shutters or the reinforcement. Concrete shall not be poured under 4°C in a falling thermometer.

3.12 REMOVAL OF SHUTTERING: Shuttering shall not be removed from walls for at least 12 hours in warm weather, longer in cold weather. Shuttering under soffits of beams and slabs shall be left in position for at least 14 days.Fill all small blemishes caused by removal of bolts and tie bars with 1½:1 washed sharp sand-cement mortar. All large bolt or tie bar blemishes and honeycombing, if they occur, shall be repaired with a sand:cement mortar incorporating S.B.R. (Styrene Butadine Rubber) or a water resistant polymer bonding admixture in accordance with manufacturer's instructions.

NOTE: If good shuttering, properly erected, is used and concrete of proper workability has been well compacted, honeycombing will not occur.

3.13 BACK FILLING:Back filling shall not be carried out until walls are at least 28 days old. Suitable excavated clay may be used provided it contains no top soil or excess water. Back fill shall be placed in layers, and thoroughly compacted. To prevent the possible ingress of pollutants to ground water the top metre of backfill shall be of impervious material and sloped away from the tank. Back filling with very heavy plant or the use of heavy vibrating rollers should be avoided unless special precautions are taken. Particular care shall be taken in backfilling under central passageways and cubicle beds. [See also clauses 4.6 and 5.2]

SECTION 4: REINFORCEMENT

4.1 STEEL REINFORCEMENT: Shall consist of High Yield (H.Y.) steel with ribbed finish complying with the current edition of B.S.4449. All steel shall be free from mill scale and heavy deposits of rust. Steel bars shall not be straightened and rebent. Where the length of bar required exceeds the length supplied, a lapped joint shall be adopted: the overlap shall be at least 40 times the bar diameter.

4.2 CUTTING, BENDING, AND FIXING STEEL: Anchor steel in wall footing shall be cut and bent in a U-shape to suit wall height as shown in Fig 4. Wall footing steel shall be of the same diameter as main steel for walls (Clause 4.5), except that 12mm steel may be used where wall steel is 16mm. It shall extend into the floor a distance 'E' as shown, and shall extend into the toe of the wall a distance of 200mm beyond the outside face of the wall. Reinforcement for the wall shall be cut and bent in a U-shape to suit 225mm or 300mm wall and 250mm spine wall, as appropriate (Fig 5). Every second U-bar (long) shall extend to within 475mm of the top of the wall. Every other U-bar (short) shall extend up the wall at least one quarter the wall height (H) plus 300mm. (Fig.5)

Distribution (horizontal) steel shall be placed inside U-bars in wall and floor as shown. Junctions of bars shall be secured with standard tying wire to ensure that steel is kept firmly in position during concreting. Tack welding may be used instead of tying wire.

At each corner of the tank a series of two horizontal U-bars shall be fixed as per Figure 6. Each leg of the U shall be at least 900mm long and equal in diameter to the vertical steel. Also the long vertical wall bars within 900mm of the corners shall be extended up to within 50mm of the top of the wall to meet the top pair of horizontal U-bars. Each subsequent pair of horizontal U-bars shall be tied to each corresponding horizontal distribution steel bar in the height of the wall. A single leg vertical bar of the same diameter as the main vertical steel shall be fixed at the outside corner of the horizontal U-bars. The lower end of this vertical bar shall be bent diagonally into the floor for a distance of at least 500mm.

Where stanchions are to be bolted to the wall all vertical steel (each face) shall be extended up to within 50mm of the top of the wall for a distance of 300mm each side of the proposed stanchion. Extended vertical bars shall be securely tied to a horizontal bar placed on each face within 100mm of the top of the wall.

Where it is intended to insert fencing posts into external tank walls, the long bars shall be extended to within 50mm of the top of the wall for a distance of 300mm each side of the proposed post, and tied to a horizontal distribution bar on each face.

4.3 TANK WALLS: Where a tank is 1.2m or more deep, both inside and outside faces of each wall shall be reinforced. If a tank is divided into two or more non-interconnecting compartments the partition wall shall also be reinforced on both faces as per Tables I and II for Outer Tank Walls. When tanks are interconnected, the spine wall shall be reinforced as per table III. Floor steel in spine walls and in reinforced compartment walls shall be so placed that every second anchor U bar is placed either side of the wall. Distribution steel shall be placed, evenly spaced across full wall foundation.

4.4 STEEL MESH IN FLOOR: In tanks where the outer walls are more than 4m apart, and/or where tanks are subject to any groundwater pressure then the whole floor shall be reinforced with steel mesh (A.142 minimum). Individual sheets of mesh shall be overlapped by 200mm on each side. Mesh shall also be overlapped 200mm across footing steel. Mesh shall be laid close to the top of the slab with a min. 75mm concrete cover.

4.5 DETAILS OF STEEL REINFORCEMENT IN WALLS: Reinforcing steel shall be provided as shown in the following Tables and bent as shown in Fig 5.

TABLE I: OUTER TANK WALL AT LEAST 225mm WIDE
[H.Y. Steel to B.S. 4449]

Tank Depth: Not More than	Vertical Steel Both Faces	Horizontal Steel* Both Faces
1.5m	10mm @ 300mm centres	12mm @ 400mm centres
1.8m	10mm @ 225mm centres	12mm @ 400mm centres
2.1m	12mm @ 225mm centres	12mm @ 400mm centres
2.4m	12mm @ 150mm centres	12mm @ 400mm centres
2.7m	16mm @ 175mm centres	12mm @ 400mm centres
3.0m	16mm @ 135mm centres	12mm @ 400mm centres

TABLE II: OUTER TANK WALL AT LEAST 300 MM WIDE
[H.Y. Steel to B.S. 4449]

Tank Depth: Not More than	Vertical Steel Both Faces	Horizontal Steel Both Faces
1.5m	10mm @ 400mm centres	12mm @ 300mm centres
1.8m	10mm @ 300mm centres	12mm @ 300mm centres
2.1m	12mm @ 300mm centres	12mm @ 300mm centres
2.4m	12mm @ 200mm centres	12mm @ 300mm centres
2.7m	16mm @ 240mm centres	12mm @ 300mm centres
3.0m	16mm @ 190mm centres	12mm @ 300mm centres

TABLE III: SPINE WALL AT LEAST 250mm WIDE WITH OPES
[H.Y. Steel to B.S. 4449]

Tank Depth: Not More than	Vertical Steel Both Faces	Horizontal Steel* Both Faces
1.5m	10mm @ 450mm centres	12mm @ 400mm centres
1.8m	10mm @ 400mm centres	12mm @ 400mm centres
2.1m	10mm @ 250mm centres	12mm @ 400mm centres
2.4m	12mm @ 250mm centres	12mm @ 400mm centres
2.7m	12mm @ 200mm centres	12mm @ 400mm centres
3.0m	16mm @ 250mm centres	12mm @ 400mm centres

* Where vertical steel is 10mm, horizontal steel of 10mm @ 300mm centres is accepted in place of 12mm @ 400mm centres.

4.6 CENTRAL PASSAGE: This shall be solid or suspended as the design dictates. In the former case it shall consist of a 125mm concrete slab laid on 150mm compacted hardcore on solid foundation. In new buildings the recommended minimum width of a central passage is 4.0m.

4.7 SUSPENDED CENTRAL PASSAGE: Where tanks extend under the passage the slab and supports shall be designed to match the required loading for the particular design of house. With standard plans this is taken to be a 7.8 tonnes axle load imposed by a single-axle feeder - wagon and a further 1.5 tonnes transferred to the tractor.

Type A: Slab continuous over supports (Fig. 7A). Supports at a maximum of 3.2m.

Type A design is suitable where tanks are running across the house, and the central passage is at right angles to the tanks.

Slab thickness: 150mm minimum
Bottom Steel: 12 mm HY @ 200 mm centres.
Top Steel over supports: 12 mm HY @ 190 mm centres.
[Top steel shall extend at least 900 mm into each span, measured from centre of support].
Distribution Steel: 10mm HY @ 300mm centres.
[Fixed to both top and bottom steel with tying wire at each intersection].

TYPE B: Slab simply supported on wall (Fig. 7b.)
Maximum span of slab 4.9 m.
Type B design is suitable where slab is spanning the width of the central passage.
Slab thickness: 175mm minimum
Bottom Steel across width of passage: 16mm HY @ 150mm centres
Distribution Steel along length of passage: 10mm HY @ 375mm centres
[Bottom steel should be bent up into the slab with a right-angled bend at the end of each bar].

TYPE C: Slab spanning central passage with a central support wall running the length of the passage way. Maximum span between supports 3.2m [Fig.7C]

Slab thickness 150 mm minimum
Bottom Steel across the Central Passage 12mm HY @ 200mm centres
Top Steel over Central Support 12mm HY @ 190mm centres
[Top steel shall extend at least 900mm into each span measured from centre of central support].
Distribution Steel along length of Passage: 10mm HY @ 300 spacing.

NOTE: When stanchions are to be erected directly on a suspended central passage, the bottom reinforcement in the slab for 300mm each side of the proposed stanchion shall be doubled across the span of the slab [spacing halved]. Also 5 No. 12mm H.Y. top steel bars shall be placed across the full span of the slab at 150mm spacing and tied with standard tying wire to 12mm distribution steel placed at 300mm spacing.

Stanchions shall be welded to a 300 X 300 X 12mm base plate to be securely fixed to the concrete slab with 2 no. 20mm holding-down bolts prefixed into concrete slabs. Alternatively, patent anchor-bolts may be used provided they are sized, and installed, in strict accordance with the manufacturer's specification and instructions.

4.8 CONCRETE COVER TO STEEL: Steel reinforcement shall be protected by adequate concrete cover from the corrosion caused by slurry or silage effluent. Standard patent spacer blocks shall be used to provide the minimum cover shown in Table IV below, fixed to the reinforcement at regular intervals so that specified concrete cover is maintained throughout.

TABLE IV : MINIMUM CONCRETE COVER TO STEEL	
Walls (both faces):	50mm
Tank floor (bottom steel):	50mm
Tank floor (top steel):	75mm
Beams:	40mm
Slabs: (bottom/top steel):	30mm

4.9 ACCESS OPES WITHIN SLABS: Where openings are required in slabs they shall normally not be greater than 900mm square. All steel within a band 600mm wide on either side of such openings shall be doubled: i.e. spacing halved. A square reinforcing hoop of dimension equal to that of the opening + 100mm shall be used to trim all opes and a further square reinforcing hoop of dimension equal to the diagonal of the ope + 100mm shall be placed in the centre of the slab (Fig 8). All opes in slabs/slats shall be fitted with safety access covers. (See Clause 1.6).

4.10 BEAMS: Shallow doubly reinforced beam for supporting slats: Maximum width of opes 3.8m: 300mm deep beam.

TABLE V (See also Fig.9)

Beams simply supported	Bottom Steel	Top Steel	Stirrups*
225mm X 300mm deep or 250mmX300mm deep	4 No. 20mm HY bars	4 No. 20mm HY bars	10mm @ 200 centres along full length of beam
*Mild Steel (M.S) may be used only for stirrups			

NOTE: 250mm wide beams are recommended to achieve full bearing for slats.

4.11 PRECAST UNITS: Precast slabs may be used with the prior approval of the Department provided they are at least as strong as units specified herein and suitably marked to prevent wrong installation. A manufacturer's certificate guaranteeing the load-bearing capacity of the units shall be required. If stanchions are to be installed directly on the precast slabs, then the guarantee must cover this design.

SECTION 5: COMPONENTS

5.1. SLATS: Slats shall comply with I.S. 249: 1993 Cattle Slats. A manufacturer's certificate from a supplier approved by the Department shall be submitted. When laid, slats shall comply with the following requirements:-

(i) Be free from any cracks, honeycombing, and chipping of the top corner arrises.

(ii) Have a bearing of at least 100mm at points of support.

(iii) Finished slat floor shall be level and free from any rocking movement.

(iv) Be capable of being replaced with minimum disturbance.

5.2. CUBICLE BEDS:

Solid Ground: These shall consist of 100mm concrete on 150mm well compacted hardcore. The finish shall be uniform, non-slip, capable of easy cleansing with a fall of at least 50mm from head to heel kerb. The heel kerb shall be at least 100mm thick and the bed level at this point shall be 175mm over slat level.

Over Slats: Using polythene sheeting and edge shuttering, cubicle beds can be laid to the above standards. Concrete only, without hardcore, shall be used over slats.
[Cubicle beds on slats make slat-replacement extremely difficult: They are not recommended]

Suspended Cubicle Beds: Supported at a maximum of 3.2m centres, well-supported leak-proof shuttering shall be provided to the underside of the slab area. The walls under the slab shall be raised level with the top of the slats. Reinforcement shall be placed in position having clear bottom cover of 30mm. Where meshes overlap the cross wire on one shall overlap a cross wire on the other. Suitable meshes are shown in Table VI.

Note: Suitable precast Concrete units are also permitted.

TABLE VI

Mesh reference	Pitch of wires mm		Size of wires mm		Weight
	Main	Cross	Main	Cross	kg/m²
A.142	200	200	6	6	2.22
B.196	100	200	5	7	3.05

Alternatively 10mmH.Y. bars may be used at 150mm centres with similar bars at 300mm centres as transverse steel.

5.3. CUBICLE DIVISIONS: shall be of galvanised tubular steel, not less than 43mm O.D X 3.2 mm. They shall extend from the head wall to not more than 225 mm in from the kerb edge: if free-standing, they shall be installed close to the head wall. The top rail shall be at least 1.1.m from the floor. An adjustable head-rail is strongly recommended, and is mandatory for cantilever cubicles. Within the above limits, a range of cuticle designs is accepted.
NOTE: Sizes of cubicle beds will vary according to animal size, but for dairy cows, beds shall be at least 2.1 m long and the distance between divisions shall be at least 1.1m centre to centre.

5.4. PEN DIVIDERS: Divisions between pens shall be 1.5m high with 300mm clear spacing between bars and between bottom bar and floor. Steel shall be a min 50mm O.D. X 3.2mm, and up to 75mm O.D depending on the width of the pen or on the weights of stock housed. Vertical bracing pieces shall be secured between each pair of horizontals at 2m intervals and staggered. Dividers may either be securely fixed, or hinged to form gates.

5.5. FEED BARRIERS: A wide range of feeding barriers may be installed. Normally the rail shall consist of a 80mm X 4mm tubular steel rail fixed approximately 1.0-1.3m from the floor of the pen, with capacity for height adjustment. A barrier approximately 450-600mm high shall be positioned under the rail, of 100mm solid concrete or block work, or secured timber planks. [Blockwork is likely to fall unless a second rail is fixed directly above it]. Other feeding barriers, of equivalent strength, may be installed, as many proprietary barriers that include locking devices, forward hinging, or moveable sections.

5.6. ACCESS TO PENS: Where feeding is carried out along the central passage only, access to pens may be from the rear. The access shall be controlled by a door or a heavy-duty tubular gate 1.2m wide. Doors or sheeted gates wider than 1.2m shall be sliding. All access doors and gates shall be framed and hung to be strong enough to ensure safe stock management and protection of personnel.

NOTE: It is recommended that pen divisions, feed barriers, and access fittings (Clauses 5.4, 5.5, 5.6) should be galvanised.

SECTION 6: SUPERSTRUCTURE

6.1. VENTILATION OF STRUCTURE: Permanent open ventilation shall be provided, as specified below, as a strict condition of grant-aid, in order to protect animal health and the working life of the structure. Full ventilation shall also be provided in any conversion or extension of existing buildings.

Outlet Ventilation. Ridge outlets shall be provided along the full length of the house. A minimum outlet width of 300mm is required,

with a 450mm width for houses wider than 15m, and 600mm for houses wider than 24m. Where spaced sheeting with a gap of at least 20mm is used for the entire roof, then a central ridge outlet is not mandatory. [See also Clause 6.12]. Monopitch buildings, if fitted with a front canopy, shall have a min. 300mm wide outlet along the length of the roof, positioned near the highest point.

A cap over the ridge outlet is not recommended. Where it is provided there shall be a clear space of at least 175mm on both sides between the cap supports and the roof surface for a 300mm outlet; a 225mm clear space for a 450mm outlet; and 300mm for a 600mm outlet. [Curved or angled upstands placed on the roof on both sides of the ridge outlet improve the ventilation and prevent most rain access. They are a strongly recommended alternative to ridge capping. Under such upstands, the roof-sheet should extend 50mm on each side to prevent rain water dripping from the upstand] [See Fig. 10].

Inlet Ventilation shall be provided immediately under the eaves for the full length of each side of the house. The minimum gap on each side shall be that specified for the ridge outlet for the appropriate width of house. [Equivalent inlet ventilation shall be provided in single sided houses].

To reduce wind-speed, particularly in exposed areas, spaced boarding or fabric/plastic mesh may be used in the inlet gap. Wherever this is done in fully slatted sheds for cattle the minimum gap height shall be doubled. Boarding shall consist of treated timber laths secured at the top to a roof timber, and at the bottom to a 100mm x 50mm wall-plate or to a 150mm x 75mm cladding rail. Laths shall be 20mm thick and a max. 50mm wide: gaps shall be 25mm. Approved fabric or plastic mesh shall be well secured according to the manufacturer's instructions. Such materials shall be guaranteed for 10 years in normal working conditions: they shall not be used above eaves level on gable ends.

Prepainted steel sheets with ventilation slots over their entire surface shall be accepted for inlet ventilation, in houses not wider than 15m, provided they comply with the coating requirements for animal housing detailed in S102. They shall be positioned immediately below eaves level for the full length of the house and form as large a proportion of the wall as possible, with a min. depth of 1.5m. They are also accepted for gable cladding, and such use is recommended when they are also being used for side cladding.

6.2. HEIGHT AND ROOF SLOPE: New slatted livestock units shall have a minimum height at eaves of 3.0m. In order to generate satisfactory natural ventilation the slope of the roof shall be a minimum of 15°. [Equivalent to 270mm rise per 1m span]. Roofs with spaced sheeting, or roofs on monopitched buildings with open fronts, shall have a minimum slope of 12°. [Equivalent to a 215mm rise per 1m span].

6.3. STANCHIONS: Shall be placed up to 4.8m centres for timber purlins and up to 6.4m centres for special steel purlins. Stanchion sizes shall be as shown in Table VII.

TABLE VII Stanchion sizes

Span: up to	British Section (mm)	European Section (mm)
4.2m	U.B.178 X 102X19kg/m	I.P.E. 180@18.8kg/m
7.5m	U.B.203 X 102X23kg/m	I.P.E. 200@22.4kg/m
9.9m	U.B.203 X 133x25kg/m	I.P.E. 220@26.2kg/m

Stanchions may be carried on or built into a concrete pier 600mm x 600mm which is carried up from solid strata. The stanchion must be inserted in the piers to a minimum of 600mm, or secured to the piers in an approved manner using 300mm X 300mm X 12mm bearing plates and holding- down bolts. Corner stanchions shall be bolted down with 4 No. 20mm bolts. Intermediate stanchions shall be bolted down with 2 No 20mm bolts. See Fig 11. A similar arrangement of bearing plates and holding-down bolts shall be used for stanchions erected on 300mm tank walls.

NOTE: Patent anchor bolts may be allowed in place of cast-in bolts, provided they are sized, and installed, in strict accordance with the manufacturer's specifications and instructions.

6.4. TRUSSES OR RAFTERS: Where bay widths do not exceed 4.8m, trusses may be used to carry the roof provided they conform with S101. Otherwise steel beams shall be used as rafters and sized as in Table VIII.

TABLE VIII Rafter Size

Span up to	Bay Width	Rafter Size	
		British Section (mm)	European Section (mm)
4.2m	4.8m	U.B. 178 X 102 X19kg/m	I.P.E.180@18.8kg/m
	6.4m	ditto	ditto
7.5m	4.8m	U.B. 203X102X23kg/m	I.P.E. 200@22.4kg/m
	6.4m	U.B. 203X133X25kg/m	I.P.E. 220@26.2kg/m
9.9m	4.8m	U.B. 203X133X25kg/m	I.P.E. 220@26.2kg/m
	6.4m	U.B. 254X146x37kg/m	I.P.E. 270@36.1kg/m

Stanchion tops shall be bevelled at the chosen angle of roof slope and suitable cap plates welded to the stanchion tops. Rafters shall be securely fixed to the cap plates using two number 16mm bolts per junction.

Purlin cleats for timber purlins shall be at least 150mm wide and shall extend to a height of at least two thirds the purlin depth. They shall be placed downslope of the purlin and securely fixed to truss/rafter. For steel purlins, cleats shall be fitted as per manufacturers' instructions.

6.5. BRACING: For spans over 4.2m the rafter shall be braced from the high level stanchion, across the acute angle, by 60 x 60 x 6mm angle iron, at least 1.5m long and secured by one 16mm bolt at

either end. For spans in excess of 7.5m the brace shall consist of two such angles 1.5m long, back to back and spot welded at 500mm centres, and secured by two number 16mm bolts at each junction. [Fig.9A].

In units with spans in excess of 7.5m, cross bracing or X bracing to both end spans shall be provided in the plane of the roof. This shall consist of 50 x 50 x 6mm angles secured to the rafters by 16mm bolts and similarly fastened to each other at the cross-over point.

End cladding above eaves level shall be provided with wind stays or secured to wall plate on gable walls. Where wind stays are provided they shall consist of 50 x 50 x 6mm angle secured to the horizontal cladding rail at or near eaves level and extending at 45° approx. to a matching purlin. For spans in excess of 4.2m two such stays, located symmetrically about the mid-span, shall be used.

6.6 PORTAL FRAMES: Clear-span structures of this type shall be accepted provided they are constructed according to the current edition of S101 (Supplementary).

6.7. TIMBER PURLINS: Timber purlins shall comply with I.S. recommendation SR11: 1988 and shall be stress graded and marked S.C.A. (strength class A) and fully treated with an approved preservative. All prepainted metal sheets shall be separated from timber by a D.P.C. strip the width of the purlin and fixed to the purlin with flat head galvanised nails. Purlins shall be 150mm x 75mm at 1.8m centres in the case of steel cladding, and 175mm x 75mm at 1.4m centres in the case of asbestos - cement.

6.8 STEEL PURLINS: Steel purlins shall be galvanised, selected and installed as per the manufacturer's instructions. Purlins (minimum galvanised weight 275 g/m2) shall be prepainted in the factory to the same standard as prepainted cladding material (S.102). Alternatively galvanised purlins shall be acid-cleaned, primed and painted before erection as for structural steel. Care shall be exercised to ensure that weepholes are not blocked.

6.9 LAMINATED TIMBER PURLINS: For spans greater than 4.8mm laminated timer purlins may be used instead of steel purlins provided a performance guarantee is given by the manufacturer that they are suitable for damp acid environments. They shall be sized and installed according to manufacturer's instructions for asbestos and steel sheeted roofs as appropriate.

6.10 CLADDING MATERIALS FOR ROOFS AND SIDE-CLADDING: shall conform to the current edition of F.D.S. S.102.

6.11 ROOF AND SIDE CLADDING: ERECTION Roof and side cladding sheets shall be handled, stored, laid, cut, and fixed in strict accordance with manufacturers instructions. Sheets shall be laid with overlaps away from the prevailing winds. Where endlaps are required they shall be a minimum of 150mm.

All fixings shall be suitable for the type of purlin or rail used and shall be as recommended by the manufacturers [or as recognised

in the trade]. Sheets shall be fixed in the recommended manner in at least three places per sheet per purlin/rail: suitable washers shall be used with each fixing. All fixings shall be corrosion resistant as recommended by manufacturers.

6.12 SPACED SHEETING: This type of roof is very strongly recommended. Cladding materials will normally require to be specially ordered for a spaced roof. The cladding material must have an equal upstand on each side of the sheet. The gap shall not be less than 12mm or more than 25mm. The first two sheets at gable ends shall be overlapped, but all other sheets shall have a space between them. Sheets shall have one fixing per purlin through each of the corrugations forming the edge of the sheet, and no more than two corrugations shall be free of a fixing. Asbestos fixings may be staggered to suit this requirement. In all circumstances X-bracing in the plane of the roof shall be used to ensure rigidity. This shall be 50 x 50 x 6mm angle iron in each slope of each end bay.

NOTE: Spaced sheeting is mandatory for any new roof in extension or conversion work where a full ventilation outlet is not available. Note also that spaced sheeting is not permitted for inlet ventilation.

6.13 GUTTERS AND DOWN PIPES: Roofs shall be fitted with gutters and down pipes complete with necessary brackets and securely fixed. Table IX shows the number of bays drained by a standard 150mm half-round gutter.

TABLE IX

ROOF DRAINAGE

Up-slope length of roof not exceeding	6.0m	8.5m	10m	12m
No. of 4.8m bays drained by gutter with a min. slope of 10mm/bay.	8	6	5	4

A 75mm down-pipe is adequate for any of the above combinations, if situated at one end of the gutter run, otherwise a 100mm down pipe is required. Down pipes shall be protected against damage, and discharge at ground level over a gulley trap. All drainage shall comply with specification S.129 Farmyard Drainage.

6.14 PROTECTION OF STRUCTURAL STEEL AND TRUSSES:

System 1

Hot dip galvanised coating shall be applied after fabrication in accordance with B.S. 729:1971 to a minimum average coating weight for any individual test area of 610/gr./m2.

Small areas of galvanised coating damaged by any subsequent welding, cutting, or by excessively rough treatment during transit and erection may be renovated by the use of at least 2 coats of zinc-rich paint complying with BS 4652: 1971 (Appendix D, BS 729: 1971)

System II

Preparation
Any oil or grease shall be removed by thorough cleaning with detergents. Mill scale and rust shall be removed by shot blasting to Sa 2½ or ISP 8501:1980.

Primers
Epoxy zinc-rich primer complying with BS 4652: 1971 shall be applied to a total dried thickness of 75 microns. A holding primer of 25 microns shall be applied within 12 hours of shot-blasting. After fabrication all welds shall be wire brushed and re-primed. The remaining 50 micron dried film thickness must be achieved with the remaining coat(s).

Finishing Coat
Apply an epoxy micaceous iron oxide paint-coat, minimum 50 micron dried film thickness.

System III
Surface Preparation
Mill scale and rust shall be removed, by hand or power driven hammer, chisels, wire brushes, scrapers, grinding machines with or without the aid of an oxy-acetylene flame. Any oil or grease shall also be removed by thorough cleaning with detergents.

Primers
Zinc phosphate 'high build' primer shall be applied to a total dried film thickness of 150 microns. A holding primer of 25 microns shall be applied to prepared steel within 12 hours of preparation. After fabrication all welds shall be wire brushed and reprimed. The remaining 125 microns, dried film thickness, must be achieved with the remaining coat(s).

Finishing Coat
Apply a phenolic or alkyd micaceous iron oxide paint - coat 75 microns dried film thickness.

Damage to paint surfaces
Any damage to paint surfaces during transport or site erection shall be made good by brush treatment on site using specified primer and furnishing coats.

NOTE: Certification may be sought from steel fabricators or contractors that painting has been carried out to the above standards.

6.15 NON LOAD BEARING SUPERSTRUCTURE WALLS: External tank walls shall be wide enough to carry full width of superstructure wall and provide a slat bearing of 100mm. Precast centre passage slabs may require 150mm bearing.

Where infill walls between stanchions are built on backfill material the concrete foundation shall be a minimum of 600mm wide and 300mm deep. Backfill materials shall be thoroughly compacted before foundations are laid.

Where stanchions are at 4.8m or less the infill wall shall be a minimum of 150mm thick. Where stanchions are greater than 4.8m spacing the wall thickness shall be at least 200mm. Internal headwalls between cubicles and feed passage shall be at least 100mm, and be secured to every second cubicle.

Walls shall be of concrete block construction or mass concrete with nominal mesh reinforcement. [Minimum mesh A98: 5mm at 200 X 200mm; 1.54 kg/M²,] Mesh shall be placed on outside face of wall with 40mm concrete cover. It is strongly recommended that gable walls, particularly gable walls built on slats, should be in mass concrete with nominal mesh reinforcement.

Walls shall be built into the web of steel stanchions. Where they abutt the flange of the stanchion, they shall be secured to the stanchion flange with 6mm steel dowels at a maximum vertical spacing of 450mm. Alternatively an angle section can be welded to both edges of the flange to form a recess for the wall. This recess shall extend from 450mm above wall foundation for eighty per cent of wall height. To minimise corrosion continuous weld shall be used.

In gables, stanchions to support the gable walls shall be erected from the foundation and be secured to the steel rafter or to a steel cross beam at approximately wall height. For 150mm walls, spacing of these stanchions shall be 5m maximum, and for 200 mm walls the maximum spacing shall be 7m. Stanchions shall also be positioned at openings for central passage doors.

All block walls shall be rendered internally with two coats, 12mm and 6mm respectively, with 3:1 sand cement rendering with plasticiser or ¼ part lime, to a smooth steel trowel finish.

Block walls shall be rendered externally one coat 12mm thick to a nap or smooth finish. Any blemishes, tie-bar holes, or honeycombing in mass concrete walls shall be filled/repaired with 3:1 cement mortar.

6.16 SLIDING DOORS: Doors to central passages (Clause 1.7) shall be sliding. The sliding gear shall be fitted and erected as per manufacturers instructions for the size and weight of door fitted. A sliding door shall preferably incorporate a hinged type outward-opening single personnel door with a minimum head-room of 2.2 metres above ground level. Cladding materials for doors shall conform (at least) to the standards specified in S.102 for animal houses.

SECTION 7: SERVICES

7.1. LIGHTING: Day lighting should be relied on to the maximum by fitting translucent sheets on each roof slope as follows:

Shed span	No.of standard 2.6m translucent sheets per 4.8m run of shed.
Up to 4.2m	1
Up to 7.5m	2
Up to 9.9m	3

Sheets shall be corrugated resin-bonded glass-fibre reinforced, resistant to ultra violet degradation and mould growth. Translucent sheets may be omitted where spaced sheeting is used for the entire roof.

Artificial light shall be provided to a minimum of 20 lux. [Approx 2 watts/m² using fluorescent fittings]

7.2. ELECTRICAL INSTALLATION: Wiring and fittings shall be installed, and be carried out in accordance with the Second Edition of the National Rules for Electrical Installations, ET 101/1991 and specifically Section 705 - electrical installations for Agricultural and Horticultural premises. A completion certificate shall be required signed by the Electrical Contractor(s) or a person duly authorised to act on his/her behalf to certify that the electrical installation has been constructed and/or has been tested according to the National Rules of Electrical Installations and has been found to be satisfactory. An associate certificate, specifically for agricultural work, shall also be signed by the Electrical Contractors or authorised persons. The signed printed "Supplementary Agricultural Certification Form" shall be given to the Farm Development Service before grant-aid is finally certified.

7.3. DRINKING ARRANGEMENTS: Houses shall have at least one trough between every two pens, mounted at a suitable height and protected by double 50mm rump rails at least 75mm and 150mm clear of the trough. Water supply shall be via a 19mm min. flexible pipe located and securely fixed so that it cannot be easily damaged.

In all houses drinking bowls, or troughs mounted on concrete blocks, suitably located and protected may be used. Troughs may be external to the house with access through a 600mm deep opening in the wall, provided they are suitably protected against frost. Whichever system is adopted it should be capable of providing the large quantities of water required by housed animals, particularly cows in milk.

SECTION 8: SAFETY

8.1. RESPONSIBILITY FOR SAFETY: Applicants are reminded that they have a duty under the Safety, Health, and Welfare at Work Act 1989 to provide a safe working environment on the farm, including farm buildings, for all people who may work on that farm. There is a further duty to ensure that any contractor, or person hired to do building ÷ work, provides and/or works in a safe environment during construction.

8.2. TOXIC GASES AND AGITATION: Harmful gases are generated in slurry stores and these have been responsible for both human and animal deaths. Good ventilation in slatted buildings is always important, and is vital during agitation or emptying of the tanks. Where silage effluent has been added to the slurry there can be a danger of more concentrated gases. Therefore:

(a) Always agitate and/or empty the tanks from the external agitation points, and never from openings within the house.

(b) All doors, and any feed-flaps, shall be fully opened before agitation/emptying begins. Agitation should take place on windy days, if possible.

(c) No person shall enter the house during agitation or emptying. It is strongly recommended that animals be removed from the house before agitation. It is also recommended that animal holding pens are installed close to the house to facilitate this removal.

(d) Some poisonous slurry gases are heavier than air. Never climb down into an emptied or part-emptied tank without breathing apparatus. Such apparatus requires full training before it can be used.

8.3. SAFETY TANK FENCING: A long lasting stock proof and child proof fence, 1.8m high, shall be provided around all external tanks without safety covers.

Posts shall be 2.3m long minimum of either:-

(a) Reinforced concrete 125mm X 125mm at butt end (to IS. 177: 1980)

(b) Galvanised angle iron 60mm X 60mm X 6mm thick

(c) Galvanised tubular steel, 75mm outside diameter X 3.2mm thick

Uprights and strainers shall be embedded 400mm into the tank wall or in 0.5m square concrete base, not more than 3.0m apart. Four strands of of 3.2 mm plain wire shall be pulled tight and stapled or tied to the uprights with tying wire. Chain link fencing 2.5mm (to I.S. 130: 1980) shall be secured to the outside of the line wires over the entire fence. One strand of 2.5mm barbed wire shall be placed along the top.
A 3.5m wide gate, 1.8m. high, of galvanised steel, or preservative treated timber, with closing bolts and locks shall be fitted at each agitation or emptying point. Chain-link fencing shall be fitted to the outside of the gate. A safety concrete kerb, minimum

300mm X 600mm wide, shall be installed near the edge of the tank, across the width of the gate.

Other fence systems will be acceptable if the above criteria are met.

8.4 SAFETY DURING CONSTRUCTION: Please note that neither the Minister or any official of the Farm Development Service may be in any way liable for material damage or injury to persons, animals or property in the event of any occurrence related to development.

Certain dangers may be encountered during building or conversion work. Therefore if, carrying out any or all of the work yourself you should seek competent advice and undertake all temporary work required to ensure the stability of excavations, superstructure, stanchion foundations and wall foundations: also to divert any drains, springs or surface water away from the works and to guard against possible wind damage. You should check that you are fully insured for reconstruction work, or alternatively, arrange for such insurance.

If the work is being undertaken by a contractor ensure that he follows the above instructions, and that he has full insurance cover.
Never erect farm buildings or construct a silo under or near an overhead power supply. If advice is required, or if power lines need to be diverted, written notice should be given to the local ESB supervisor before construction commences.

Never let children play or spend time in the vicinity of any sort of building work.

8.5 SAFETY NOTICES: It is recommended that at least one safety notice should be put on the side of a building next to which a slurry agitation point is situated. The notice should be as close to the agitation point as possible. [Notices are available from Teagasc].

8.6 MAINTENANCE: All farm buildings require maintenance to ensure the health and safety of personnel and animals. After each winter-season buildings should be thoroughly washed and cleaned out. Fittings such as slats, electrical fittings, drinking arrangements, etc., should be periodically checked, and all defective items replaced.

9. CERTIFICATES:

The following certificates must be collected, and given to the F.D.S. before grant-aid can be paid

(1) "Concrete" Certificate (Clause 3.4)
(2) "Electrical" Certificate (Clause 7.2)
(3) "Slat" Certificate (Clause 5.1)
(4) Precast Unit (where appropriate) Clause (4.11)
(5) A paint certificate for structural steel may be required (Clause 6.14)

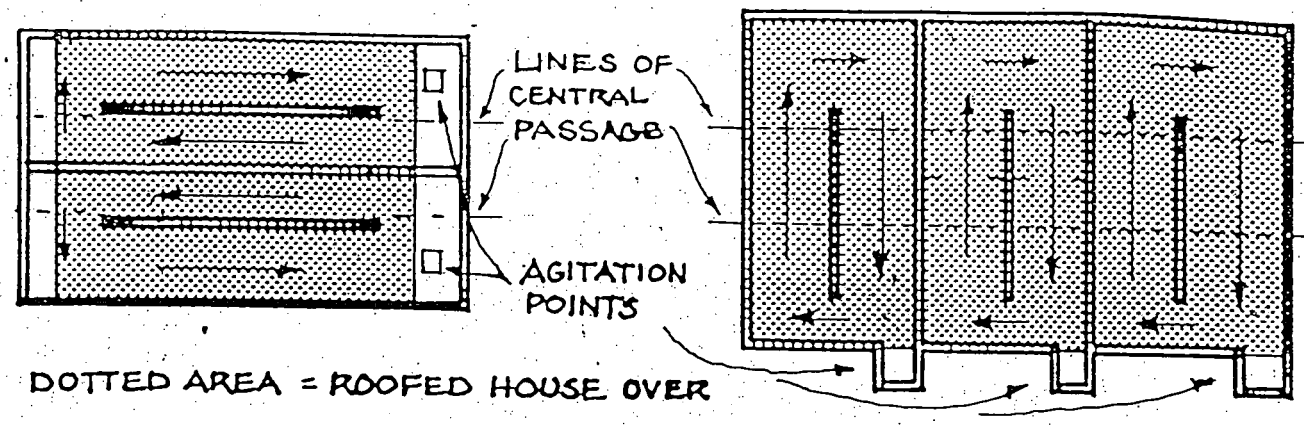


FIG. 1 : SLURRY CIRCULATION IN TANKS [EXAMPLES]

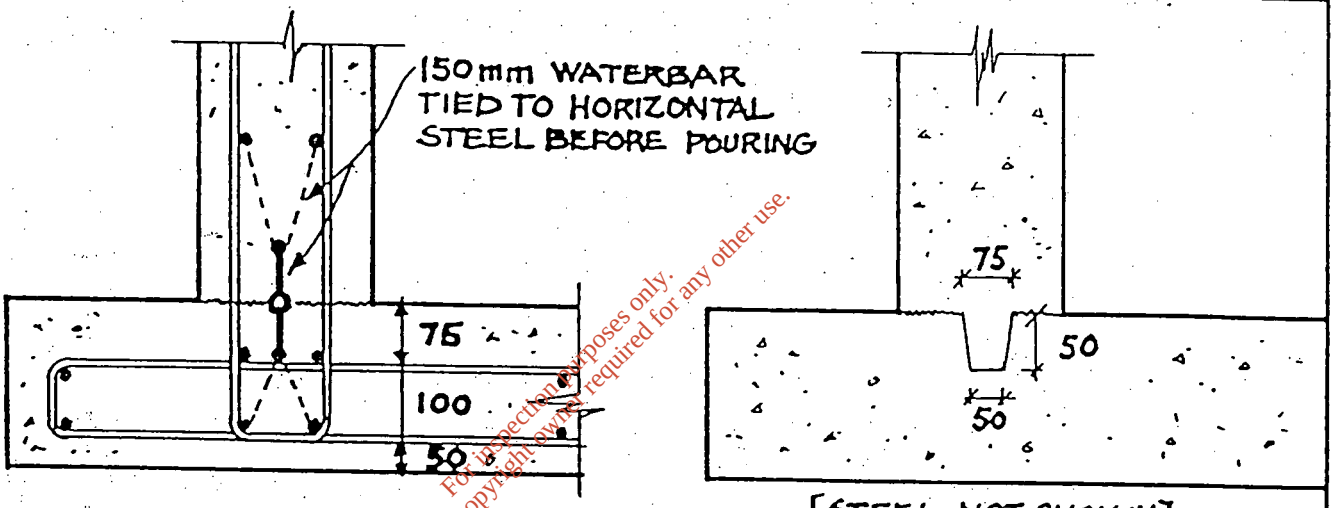


FIG. 2 : WALL-FLOOR JOINTS

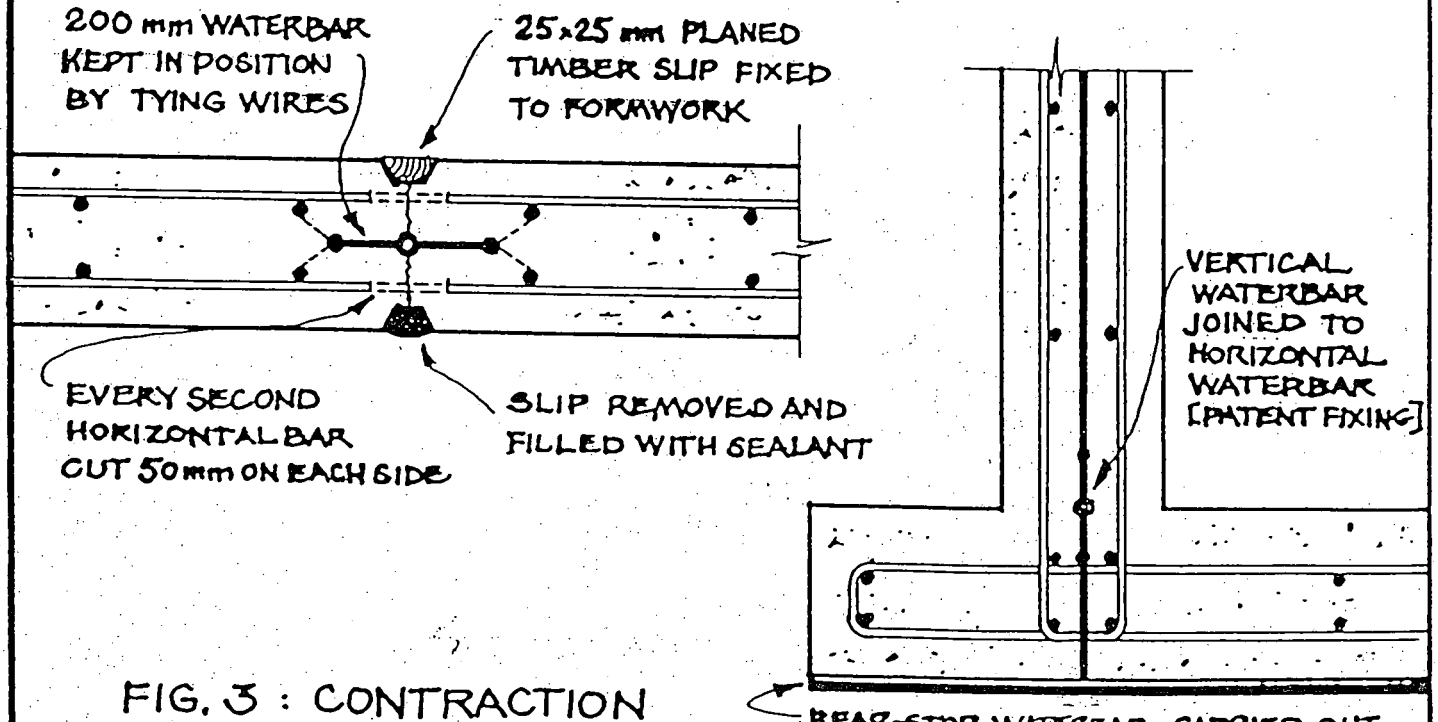
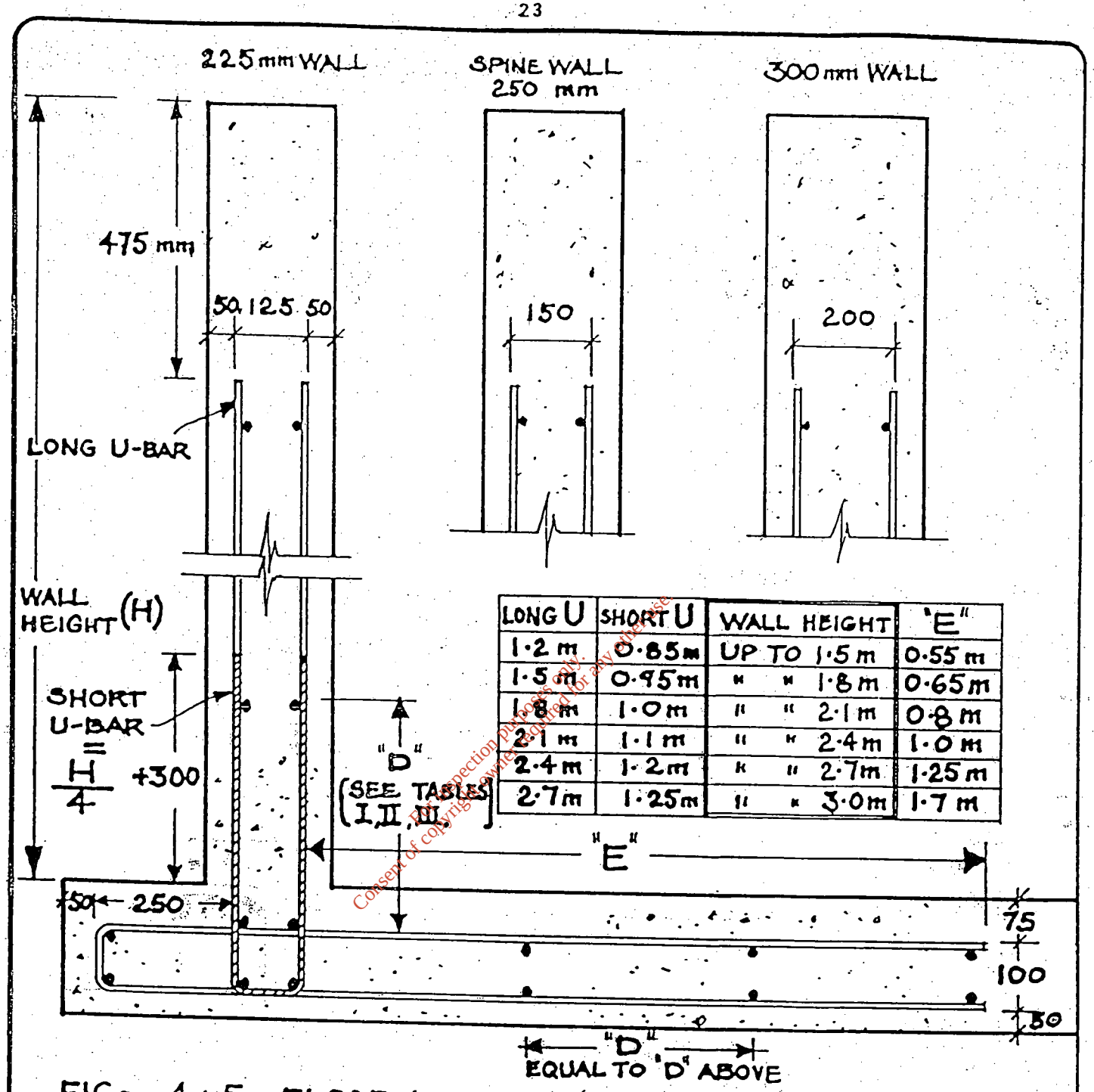


FIG. 3 : CONTRACTION JOINTS IN TANK WALLS



LONG U	SHORT U	WALL HEIGHT	"E"
1·2 m	0·85m	UP TO 1·5 m	0·55 m
1·5 m	0·95m	" " 1·8 m	0·65m
1·8 m	1·0 m	" " 2·1 m	0·8 m
2·1 m	1·1 m	" " 2·4m	1·0 m
2·4 m	1·2m	" " 2·7m	1·25 m
2·7m	1·25m	" " 3·0m	1·7 m

FIGs. 4+5 : FLOOR AND WALL REINFORCEMENT

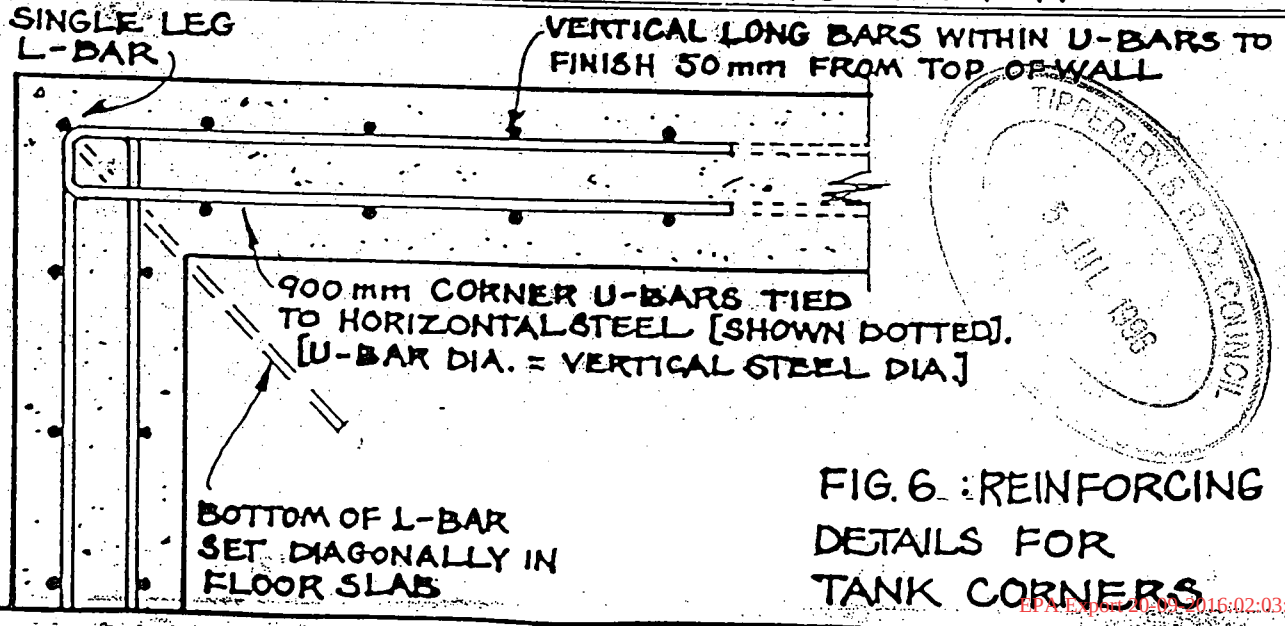


FIG. 6 : REINFORCING DETAILS FOR TANK CORNERS

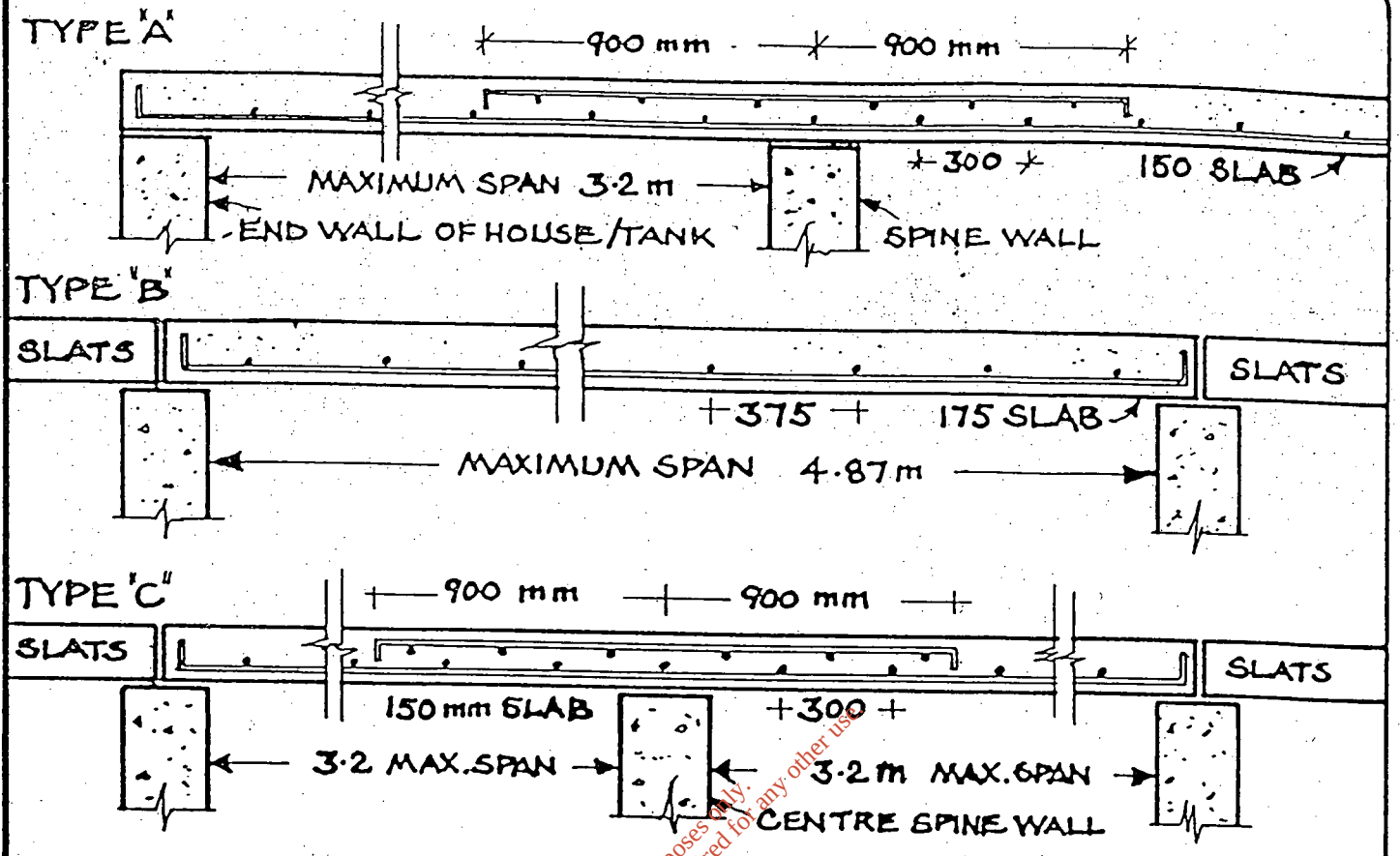


FIG. 7 : SUSPENDED SLABS : STEEL DETAILS

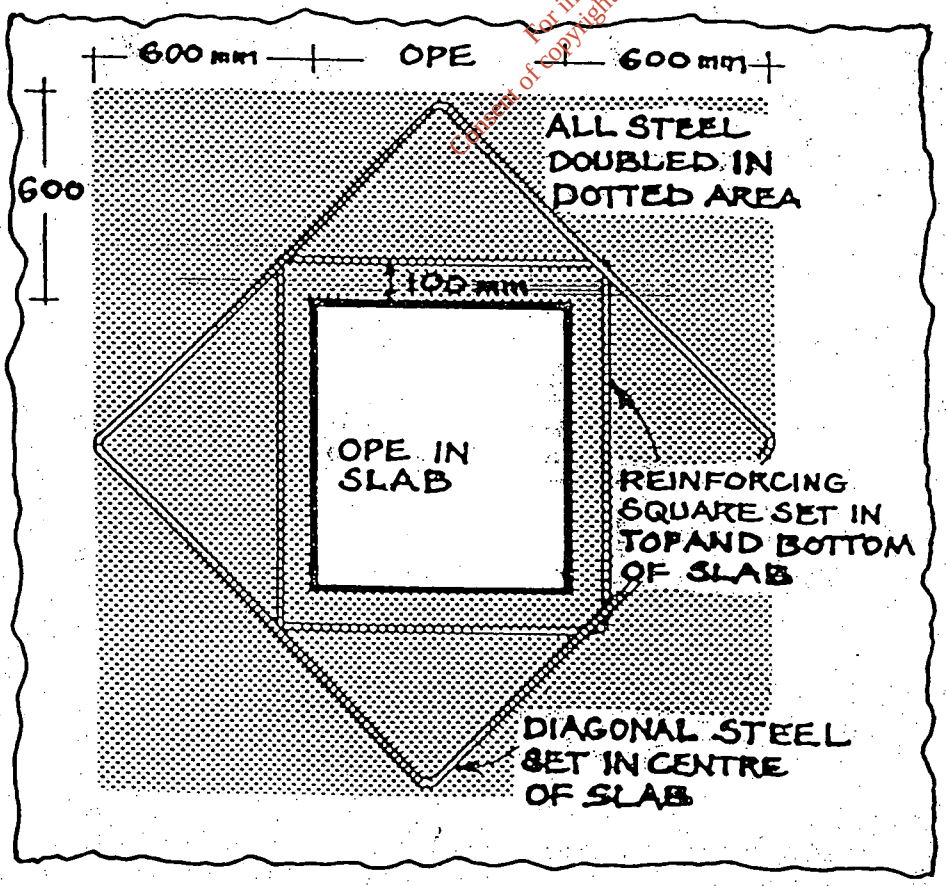


FIG. 8 : OPE IN SLAB

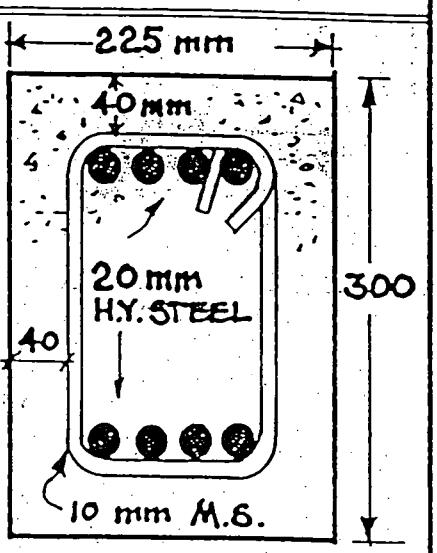


FIG. 9 : BEAM

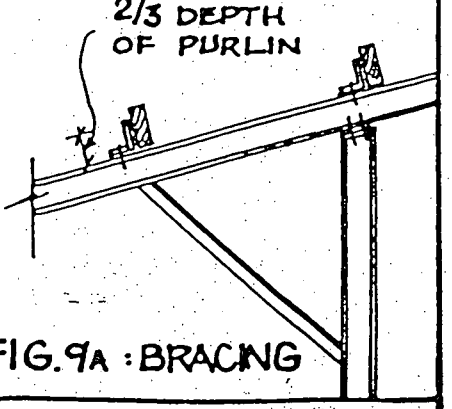
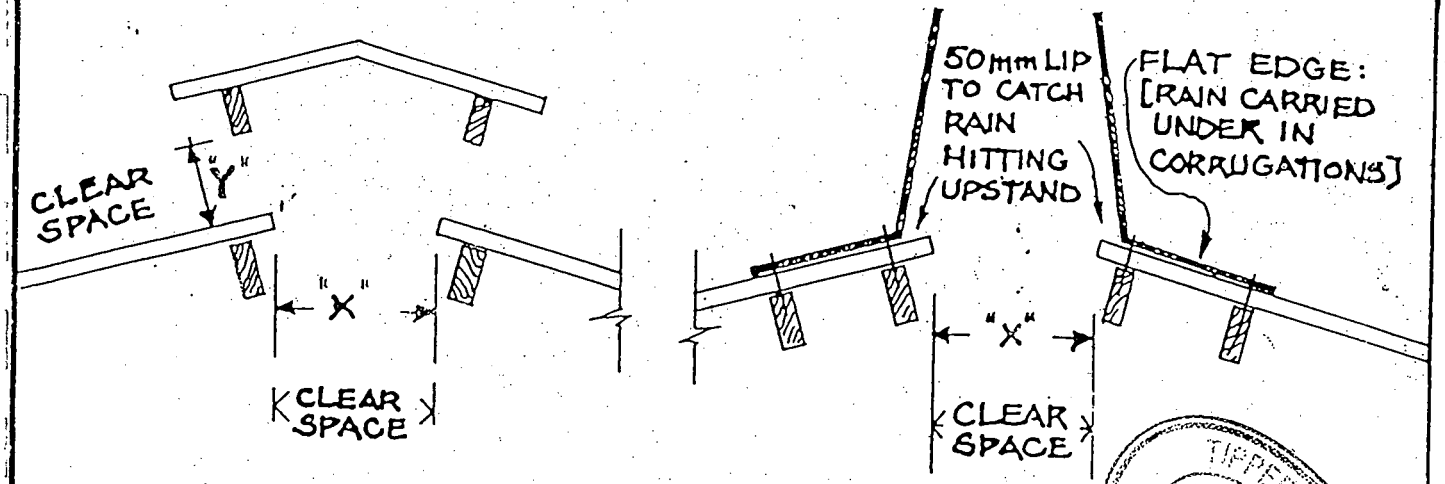
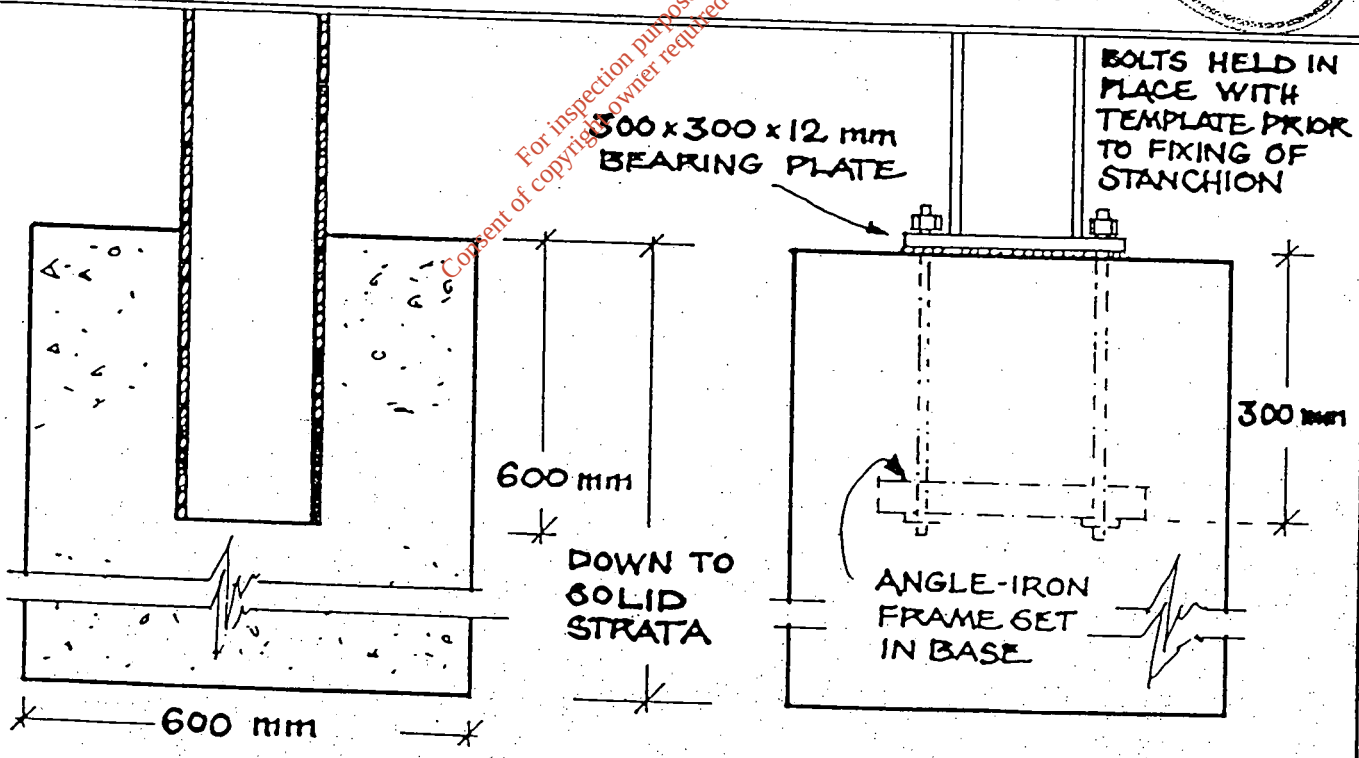


FIG. 9A : BRACING



"X" mm	"Y" mm	WIDTH OF HOUSE
300	175	UP TO 15 m.
450	225	15 m. – 24 m.
600	300	OVER 24 m.

FIG. 10 : OUTLET VENTILATION DETAILS



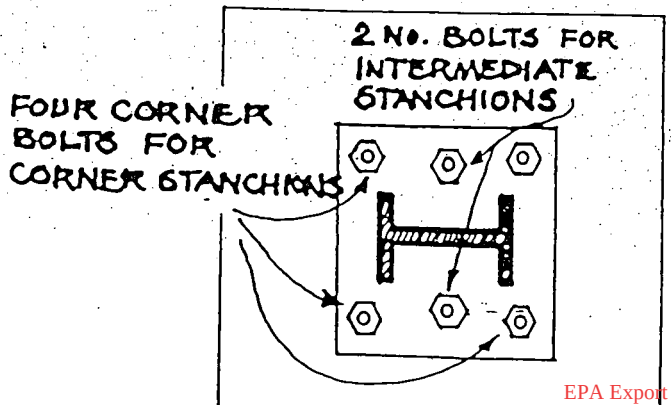
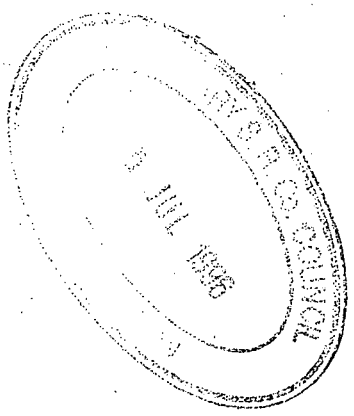


FIG. 11 : FIXING OF STANCHIONS

APPENDIX 9

SITE PLAN, PLAN, SECTION AND ELEVATION OF THE BUILDINGS



APPENDIX 4

DETAILS OF OWNERSHIP OF SPREADGROUNDS

No.	Name	Townland	Area (ha)	Tipperary Sheet No.
1	Bergin, D.	Kilbragh/Railstown	154	69/61
2	Carroll, W.	Rathronan	81	77
3	Delahunty, K.	Orchardstown East	57	77
4	Flaherty, M.	Rathronan	25.5	77
5	Hennessy, J.	Knockeevan	61	77
6	Phelan, E.	Horsepasture	19	77
7	Power, E.	Horsepasture	52	77
8	Purcell, E. J.	Caherclogh	65	77
9a	Purcell, G.	Carrigeensharragh	16	77
9b	Purcell, G.	Tooreen	65	77
10	Purcell, J.	Caherclogh	105	77
11	Purcell, T.	Jossestown	32	70
12	Quirke, Pat	Caherclogh	17	77
13	Quirke, P. F.	Caherclogh	18	77
14	Sheehan, M.	Carrigeensharragh	25.5	77
15	Slattery, D.	Knockeevan	81	77
	Total		874 ha (2159 ac)	