

AN ROINN TALMHAÍOCHTA, BIA AGUS MARA
DEPARTMENT OF AGRICULTURE, FOOD AND THE MARINE

**MINIMUM SPECIFICATION FOR FARMYARD DRAINAGE, CONCRETE YARDS
AND ROADS**

The receiving of this specification does not imply approval of a grant application. However, if written approval is issued, then this specification becomes part of the contract between the applicant and the Department of Agriculture, Food and the Marine.

This is a minimum specification. Where the word “SHALL” is used, then that standard (at least) **must** be followed in grant-aided buildings. Where a procedure is “RECOMMENDED”, this is advice only on good practice.

Note that all references to other Department Specifications are to the current edition of that specification [available on the Department of Agriculture, Food and the Marine’s website (www.agriculture.gov.ie) under Farm buildings]. Similarly, references to Standards are to the current edition of the Irish, British or European Standard, as appropriate.

1. Safety

1.1 Responsibility for Safety

Applicants are reminded that they have a duty under the Safety, Health, and Welfare at Work Act 2005 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.

1.2 Safety during Construction

Farmer/Applicant Responsibility: Please note that neither the Minister nor any official of the Department shall be in any way liable for any damage, loss or injury to persons, animals or property in the event of any occurrence related to the development and the applicant shall fully indemnify the Minister or any official of the Minister in relation to any such damage, loss or injury howsoever occurring during the development works. It is the applicant’s responsibility to provide a construction stage project supervisor.

Dangers: Where the applicant/farmer is undertaking any part of the above work, it is his/her responsibility to seek competent advice and to undertake all temporary work required to ensure the stability of excavations, superstructure, stanchion foundations, wall foundations, to guard against possible wind damage and to avoid any other foreseeable risk. It is also his/her responsibility to ensure that any drains, springs or surface water are diverted away from the works.

Power lines: Due to the complex criteria involved, where buildings are proposed within 35 metres of the centre of any overhead power line, the landowner shall contact ESB Networks in advance to ascertain the specific minimum building clearance requirement. It is a requirement on landowners under The Electricity Supply Acts to notify ESB Networks, at

least, two months before commencement of any construction works near overhead lines. As a guide, table 1 below sets out the usual minimum clearance distances required, however, ESB Networks shall be contacted and their advice followed for any structure within 35m of the centre line of an overhead power line. ESB will provide landowners with written confirmation of the required clearances. Landowners can contact ESB through phone numbers provided on their electricity bills.

Where building work is undertaken near power lines there is also a safety issue regarding Machinery, Tipper Trucks and Elevators operating without proper safety measures in place. When landowners contact ESB they will be provided with relevant safety literature.

Table 1: In general the following clearances apply to various voltage levels.

Voltage	Clearance
Low Voltage	0.5 to 3 Metres
Medium Voltage	3 to 6 Metres
38KV Lines	10 to 17 Metres
110kv Lines	23 Metres
220KV Lines	30 Metres
400KV Lines	35 Metres

Note:

- ESB overhead lines consist of lines at various voltage levels and require specific safety clearances from buildings depending on voltage level and construction type.
- Clearances are specific to the line voltage, building height, location in line span and ground levels.

Danger to children: It is the applicant’s responsibility to prevent children from playing or spending time in the vicinity of any construction work.

1.3 MAINTENANCE

All farm buildings require regular 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.

2. GENERAL

Separate drainage systems are required to deal with the three types of liquid to be drained away from farmyards. These are as follows:

2.1 Clean Water System

- a) To divert all existing land drains around the farmyard site.
- b) To trap and drain clean rainwater which may flow on to the site from higher ground when the soil is saturated.
- c) To dispose of rainwater from roofs and clean surface areas by discharging directly to a ditch, stream or river.

2.2 Soiled Water System

To convey to storage soiled water in accordance with S.I. 31 of 2014 Regulations European Communities (Good Agricultural Practice for Protection of Waters) and any subsequent amendments to the regulations. Storage facilities shall be in accordance with S122, S123, S126 or S131.

Under S.I. 31 of 2014 Regulations, an occupier of a holding shall take all such reasonable steps as are necessary for the purposes of minimising the amount of soiled water produced on the holding.

2.3 Silage Effluent System

To collect silage effluent, via channels (as specified in S120 and S128) and to pipe it directly to an appropriate storage facility. Storage facilities shall be in accordance with S122, S123, S126 or S131.

3. CLEAN WATER DRAINAGE

3.1 Collection

Rainwater 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 the rainwater down pipe is at end of the run. Where the rainwater pipe is at the centre of the run, the area drained is approximately 25% extra. R.W. pipes shall be minimum 75mm diameter. Gutters and R.W. pipes shall be supported at not more than 2m centres and at all outlets and angles. Galvanised pressed steel gutters, aluminium gutters and other metal gutters shall be to EN 612:2005 and U-PVC gutters shall be to EN 607:2004. It is strongly recommended that all gutters are either aluminium or uPVC, particularly in valleys to ensure a long life.

Rainwater falling on all concrete yards, not soiled by manure or silage, shall be collected through trapped yard gullies placed 12 to 15 metres apart. Alternatively, collection may be through proprietary gridded channels where grids can be removed to facilitate the removal of silt and debris. Such yards shall be laid to suitable falls; 1:60 to 1:100 is recommended.

On sites built into sloping ground where the soil is of an impervious nature and where there is a danger of run-off on to soiled paved areas, catch drains shall be provided along the edge of the site, discharging, where possible, to the clean-water outfall drain. Drains shall be of minimum 75mm corrugated plastic land drainage pipe overlain with a granular material to ground level, see Fig 6.

Field drains under a farmyard site shall be stopped at least 10m from the site on the upstream side and diverted around it to reconnect with the drainage system at least 10m on the downstream side of the site.

3.2 Capacity of Drains

The capacity of drains shall be capable of carrying the run-off from a storm of at least 25mm per hour rainfall intensity. The following table gives the areas that can be drained by various pipe sizes for defined slopes.

Drain Diameter (mm)	Fall	Area Drained (m ²)
100	1 in 60	1,500
100	1 in 100	1,100
150	1 in 100	3,000
150	1 in 150	2,500
225	1 in 150	6,500
225	1 in 200	5,800

3.3 Lay-Out of Drains

All drains shall be laid in straight lines from point to point with inspection chambers (manholes or armstrong junctions) at all changes in direction. Drains at the point of exit from the yard, whether gathered to exit in a single out-fall or multiple outfalls, shall pass through a sump manhole as specified in clause 4.4. The maximum distance between manholes in straight lines shall be 90m. A single branch pipe may enter a main without an inspection chamber provided the branch enters in the direction of flow. A rodding eye formed with a 45° branch shall be fitted to the branch pipe to facilitate rodding.

3.4 Laying Drains

The available gradient of drains shall be ascertained by measuring the distance along the proposed line of the drain from the lowest point in the farmyard to the outfall and obtaining the difference in level between the pipe inverts at these points. As far as possible all drains shall have a regular fall to the outlet.

The maximum fall in clean water drains shall be 1 in 25. The recommended minimum falls are as follows:

Drain Diameter (mm)	Minimum Fall
100	1 in 100
150	1 in 150
225	1 in 200

Where a pipeline is laid in steep sloping ground it will be necessary to provide a back drop manhole as specified in clause 4.3.

Pipe laying 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 side fill 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 conform to EN 1916:2002 and uPVC pipes to EN 13476:2007 or EN 1401:2009.

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

3.6 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.

4. MANHOLES OR INSPECTION CHAMBERS

4.1 Manholes

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.

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

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.

4.2 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 length of the manhole. Side connections shall discharge over the edge of the main channel in the direction of flow as shown in Figure 2.

4.3 Backdrop Manhole

Where a backdrop manhole is required, the manhole shall be constructed as specified in clause 4.1. The backdrop shall be formed on the upstream side of the manhole as shown in Figure 4.

4.4 Sump Manhole

The drainage system for the collection and disposal of clean water shall have a sump manhole as shown in Figure 3 at the point where it leaves the yard to allow the drainage water to be monitored for contamination. Such manholes shall be constructed with a facility to close-off the outlet if required and a sump at least 300mm deep to allow the insertion of a submersible

pump to facilitate evacuation should accidental spillage of oil, toxic sprays etc. gain access to the clean water yard drainage system.

5. SOILED WATER DRAINAGE

5.1 Drains

Soiled water drains shall be laid in a similar manner to clean water drains but only uPVC pipes shall be used. Care shall be exercised to ensure that all joints are leak- proof. These drains will normally be of 100mm diameter, laid to a fall of not less than 1 in 60 to avoid settlement of solids or semi-solid material. Where 150mm diameter drains are laid the fall shall not be less than 1 in 100.

5.2 Diversion Manhole for Clean Yards in Summer

A drain diversion arrangement through a sump manhole may be accepted to divert run-off from yards soiled during the winter housing season but not used for the remainder of the year as shown on Figure 5. A sump manhole shall never be used to divert clean water run-off from a silage base.

6. SILAGE EFFLUENT DRAINAGE

6.1 Silage Drains

Under no circumstances shall silage effluent be directed through a yard drainage system. It shall always be piped directly to a storage tank. Silo channels for the collection of effluent shall be constructed strictly in accordance with S120 (Walled Silos) and S128 (Silage Bases).

6.2 Channels to Precast Retainers for Silage

Retainers shall be set on structurally sound concrete slab, which incorporates a perimeter outside drain as shown on Figure 7.

6.3 Silage Effluent Transfer Drains

The drains between the silo collection channels and the effluent holding tank shall be laid in a similar manner to clean water drains but only uPVC pipes shall be used. Care shall be exercised to ensure that all joints are leak proof and that drain discharges to storage tank at least 150mm from inside wall surface. These drains will normally be of 100mm diameter laid to falls of not less than 1 in 100.

6.4 Diversion Trap

A surface diversion trap may be constructed for clean water run-off from uncovered silage bases as specified in S120 and S128.

7. YARD GULLY

Yard gully shall have a minimum 300 x 300mm 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.

8. 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.

9. 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 and be accessible for rodding.

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

10. CONCRETE SPECIFICATION

10.1 Certificates

Concrete shall be produced in a plant audited to I.S. EN 206-1: 2002 by a certified body accepted by The Department of Agriculture, Food and the Marine (e.g. N.S.A.I., B.S.I., Q.S.R.M.C). It shall not be produced on site.

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 and retained by the local AES Office of the Department of Agriculture for inspection upon completion of the works.

10.2 Curing of Concrete

Concrete produced and supplied is fit for purpose ONLY IF proper curing procedures are adhered to and the structure is not put into service until an adequate curing time (usually a minimum of 28 days) has elapsed. The curing regime shall take account of best practice appropriate to the concrete binder composition and prevailing climatic conditions at time of placing.

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 a danger, 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.

For further information on curing, see the website of the Irish Concrete Society.

10.3 Concrete for Silage Effluent

For **purpose-built** silage effluent tanks and channels, concrete shall be purchased on the basis of a characteristic 28 day cube crushing strength of 45N/mm^2 (strength class C35/45). Minimum cement content shall be 360 kg/m^3 . The maximum water to cement ratio will be 0.5. The specified slump class shall be S2 or S3. Maximum aggregate size shall be 20mm.

The concrete shall be ordered using the appended form for ‘S.100 Mix A’ or by requesting ‘45N concrete with 360kg cement minimum, 0.50 water cement ratio maximum, and slump class S2 or S3, certified to IS EN 206, for use to Specification S.100’.

If the Concrete Supplier requires further information the following shall be quoted to them:

- The concrete is to be to I.S. EN 206-1:2002: Strength Class: C33/45, 360 kg cement, maximum water cement ratio of 0.50, Exposure classes: XA3, XC4 (25 year life), Slump class: S2 or S3, maximum aggregate size 20mm.

10.4 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 cube crushing strength of 37N/mm² (strength class C30/37). Minimum cement content shall be 310 kg/m³. The maximum water to cement ratio will be 0.55. The specified slump class shall be S2 or S3. The maximum aggregate size shall be 20mm.

The concrete shall be ordered using the appended form for ‘S.100 Mix B’ or by requesting ‘37N concrete with 310kg cement minimum, 0.55 water cement ratio maximum, and slump class S2 or S3, certified to IS EN 206, for use to Specification S.100’.

In the case of exposed yard slabs where freeze/thaw action is a concern, ‘S.100 Mix B’ shall be used with 3.5% minimum air entrainment. Alternatively ‘S.100 Mix A’ may be used.

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.

10.5 Compaction of Concrete

All concrete shall be compacted by either vibrating screed or poker vibrator depending upon the position of the concrete. Poor compaction leads to entrapped air, which will weaken the concrete and may cause premature failure. All concrete can be easily placed and compacted when using a vibrating screed or poker vibrator which helps ensure the concrete achieves its full strength.

10.6 Fibres

Polypropylene fibres may be incorporated into the concrete mix to improve the properties of concrete. Only fibres which have been tested and approved by National or European approval authorities may be used. The use of fibres helps to reduce plastic cracking and improve surface durability but they are not a substitute for structural reinforcement. Fibres shall be used in strict compliance with manufacturer’s instructions and shall only be added at the concrete manufacturing plant. The concrete certificate (Clause 10.1) shall clearly show the amount and type of fibre added. The mix design, compacting, and curing of fibre concrete is the same as concrete without fibre.

10.7 Self-Compacting Concrete

Self-compacting concrete (SCC) may be used in vertical elements only. SCC must comply with all requirements of this specification, except for the slump class which must meet slump flow class SF2. SCC shall be produced by a manufacturer with experience in producing SCC and should be placed by a contractor with experience using SCC.

If it is proposed to use SCC, additional guidance shall be sought by the contractor undertaking the works. Particular care must be taken in the use of fully sealed formwork, designed to withstand the higher hydrostatic pressure exerted by SCC. Guidance can be obtained from the Irish Concrete Society website (www.concrete.ie).

10.8 Materials

Cement and other materials used in the production of concrete shall be in accordance with Department of Agriculture, Food and the Marine specification S.100.

Plasticisers and other admixtures shall be to EN 934. All admixtures shall be used in strict accordance with manufacturer's instructions, and shall be added only by the concrete-mix manufacturer.

10.9 Tests

The Department reserves the right to require that concrete should be tested in accordance with EN 12390 and EN 12504.

11. CONCRETE TO YARDS AND ROADS

11.1 Preparation of Site

Remove all topsoil and soft material to a minimum depth of 150mm or down to a solid stratum and dispose off site. Lay hardcore and compact in 150mm layers using a suitable vibrating or heavy roller. Consolidation with wheeled or tracked plant is not adequate. The area shall be blinded over with sand or lean mix concrete. Gradients shall correspond to these required in the finished paving. It is recommended that light gauge polythene sheet is placed under the concrete slab.

In cases where fill is purchased for use under concrete, it shall be certified to EN 13242:2013 and meet the requirements of Annex E of S.R. 21: 2015. This material shall also be used as the top 300mm of any backfill around stanchion foundations.

11.2 Thickness of Concrete

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

Where concrete paved areas are subject to heavy mechanised traffic, reinforced paving should be provided. The design should meet the requirements of specific loading. In the absence of specific design data A393 mesh to BS 4483 [10mm @ 200mm centres: 6.16kg/m²] shall be placed 40mm below the finished paved surface.

11.3 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 wide and 6.0m long where there is no fibre additive and not more than 8m long where there is fibre additive. In the case of mesh reinforced paving joint spacing can be extended to 12m by 8m. 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 100mm 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. Concrete shall not be poured under 4°C in a falling thermometer.

12. STORAGE TANKS

12.1 Single Compartment Storage Tank

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 S.123.

12.2 Three Compartment Storage Tank

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 S.123.

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. Pump house may be located either over or close to the pumping chamber.

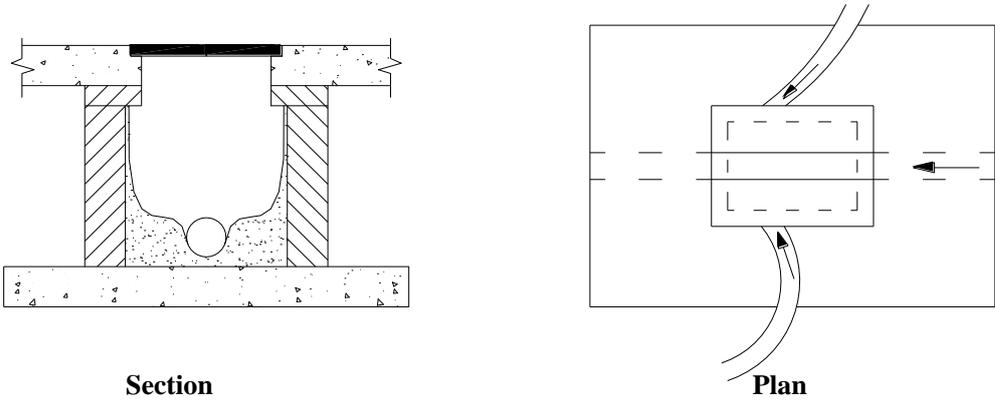


Figure 1 - Interception Chambers -

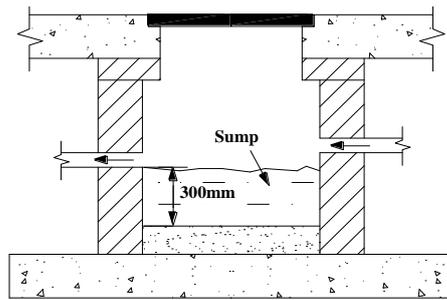


Figure 2 Interception Chambers with Silt Trap

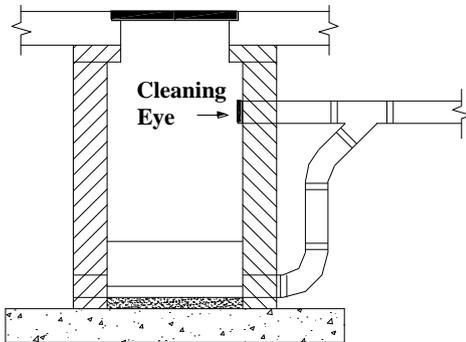


Figure 3 Backdrop Manhole

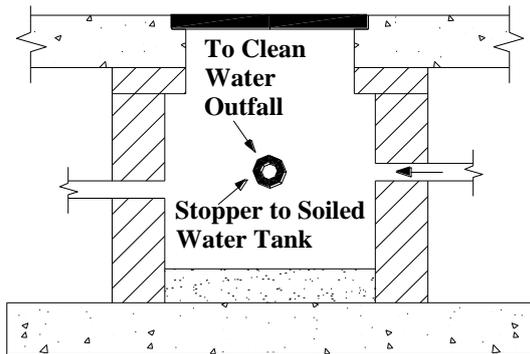


Figure 4 **Diversion Chamber**

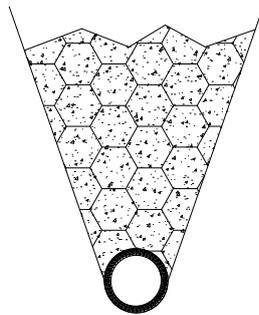


Figure 5 **Surface Water Trap Drain**

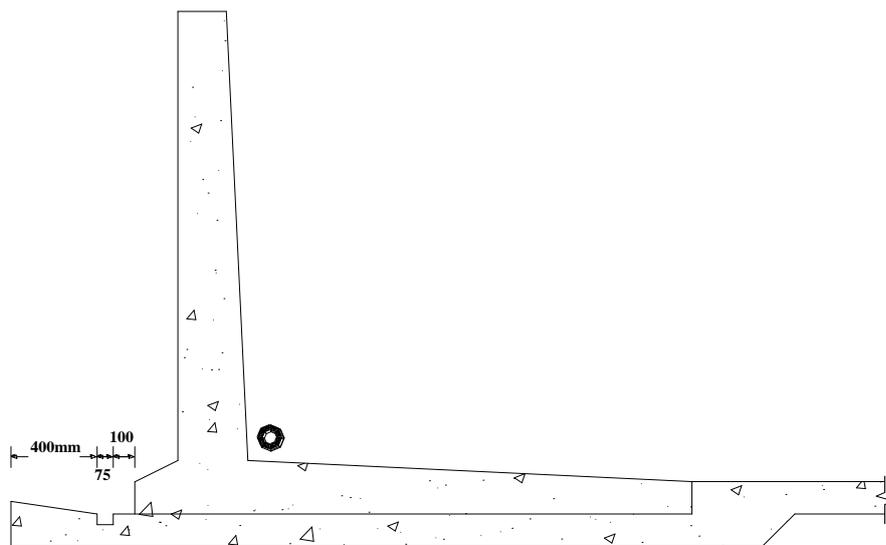


Figure 6 **Effluent drainage arrangement for walled silo where precast concrete retainers are used**

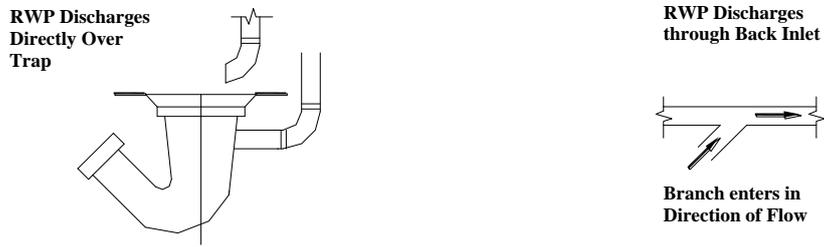


Figure 7 RWP Discharge

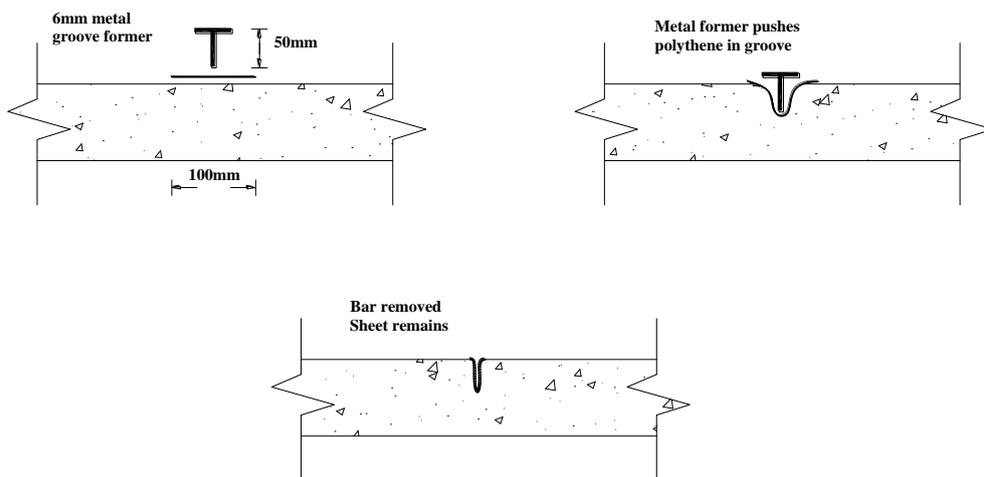


Figure 8

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

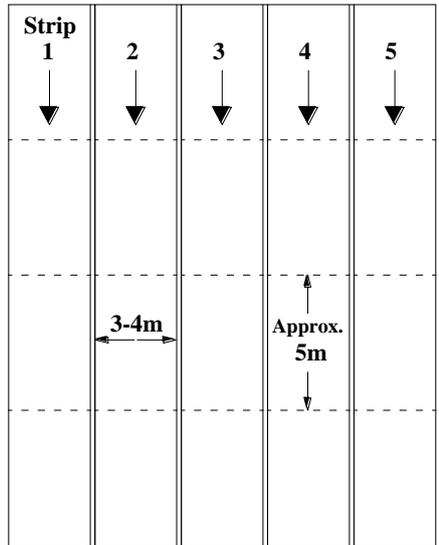


Figure 9 Alternative method of forming contraction joint in concrete paved yards - not suitable for silage bases

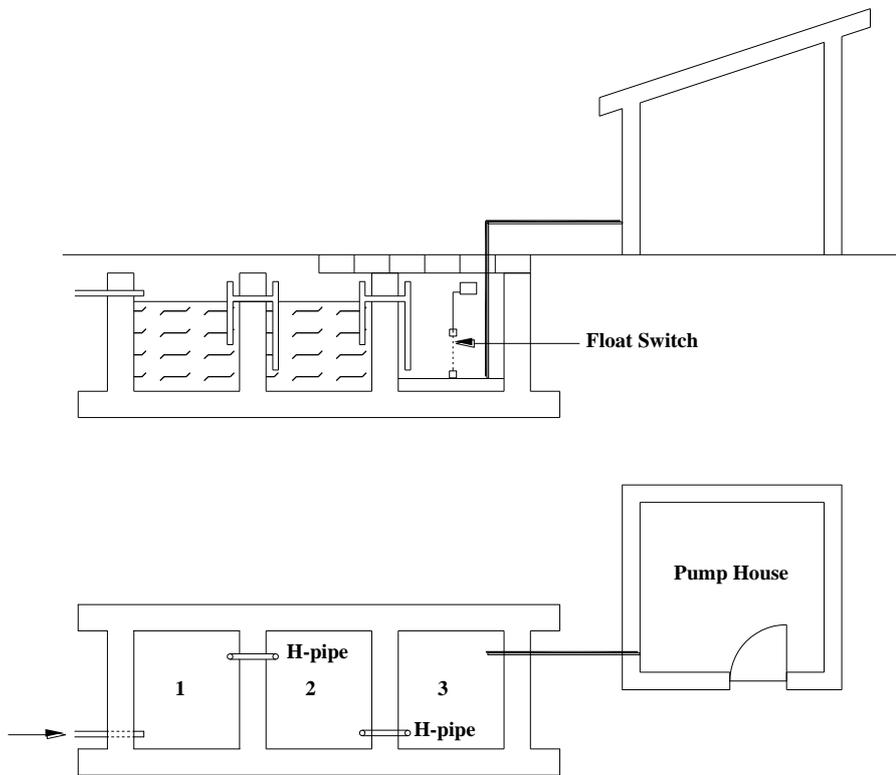


Figure 10 Soiled water settlement tank features