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DEPARTMENT OF AGRICULTURE & FOOD

S129
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MINIMUM SPECIFICATION FOR FARMYARD DRAINAGE, CONCRETE YARDS AND ROADS

1. GENERAL

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

1.1 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.

1.2 Soiled Water System

To convey to storage soiled water in accordance with S.I. 378 of 2006 Regulations European Communities (Good Agricultural Practice for Protection of Waters). Storage facilities shall be in accordance with S122, S123, S126 or S131.

Under S.I. 378 of 2006 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.

1.3 Silage Effluent System

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

2. CLEAN WATER DRAINAGE

2.1 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 220m^2, 150m^2 and 90m^2 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 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 shall be to IS 59 1953, PVC to BS 4576 and aluminium to BS 2997.

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.

2.2 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

2.3 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 3.6. 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^o branch shall be fitted to the branch pipe to facilitate rodding.

2.4 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 3.5.

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 be to IS 6: 1974 and uPVC pipes to IS 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 under roads, with less than 0.9m cover, 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

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.

3.2 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.

3.3 Backdrop Manhole

Where a backdrop manhole is required, the manhole shall be constructed as specified in clause 3.1. The backdrop shall be formed on the upstream side of the manhole as shown in Figure 4.

3.4 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.

4. SOILED WATER DRAINAGE

4.1 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.

4.2 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.

5. SILAGE EFFLUENT DRAINAGE

5.1 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).

5.2 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.

5.3 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.

5.4 Diversion Trap

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

6. 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.

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 and be accessible for rodding.

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

9. CONCRETE SPECIFICATION

9.1 Certificates

Concrete shall be produced in an audited plant only: 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 the Agriculture, Environment and Structures (AES) Division of the Department of Agriculture for inspection upon completion of the works.

9.2 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/mm^2. Minimum cement content shall be 350 kg/m^3. The slump of unplasticised concrete shall not exceed 90mm. Maximum aggregate size shall be 20mm.
The concrete shall be ordered by requesting '40N concrete to be certified to the grant-aid standard of the Department of Agriculture and Food'.

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: C32/40, 350 kg cement, maximum water cement ratio of 0.50, Exposure classes: XA3, XC4 (20 year life), Slump class: S2 (unplasticised), maximum aggregate size 20mm.

If plasticised concrete is desired, the slump class shall not exceed S3.

9.3 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 35N/mm^2. Minimum cement content shall be 300 kg/m^3. Slump of unplasticised concrete shall not exceed 90mm, and maximum aggregate size shall be 20mm.

The concrete shall be ordered by requesting '35N concrete to be certified to the grant-aid standard of the Department of Agriculture and Food'.

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: C28/35, 300 kg cement, maximum water cement ratio of 0.60, Exposure classes: XC4, XF3, XA1 (20 year life), Slump class: S2 (unplasticised), maximum aggregate size 20mm.

If plasticised concrete is desired, the slump class shall not exceed S3.

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 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.

9.4 Materials

Cement used in concrete and concrete products shall be certified to IS EN 197-1, and shall bear the Irish Standard Mark, or shall be certified by NSAI to be equivalent to IS EN 197-1. All aggregates shall be to IS 5 1990. 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.

9.5 Tests

The Department reserves the right to require that concrete should be tested in accordance with BS 1881.

9.6 Curing of Concrete

All concrete shall be cured by keeping it thoroughly moist for at least seven days. Wetted floor slabs and 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.

10. CONCRETE TO YARDS AND ROADS

10.1 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.

10.2 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 4482 / BS 4483 [10mm @ 200mm centres: 6.16kg/m^2] shall be placed 40mm below the finished paved surface.

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 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.

11. STORAGE TANKS

11.1 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.

11.2 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.

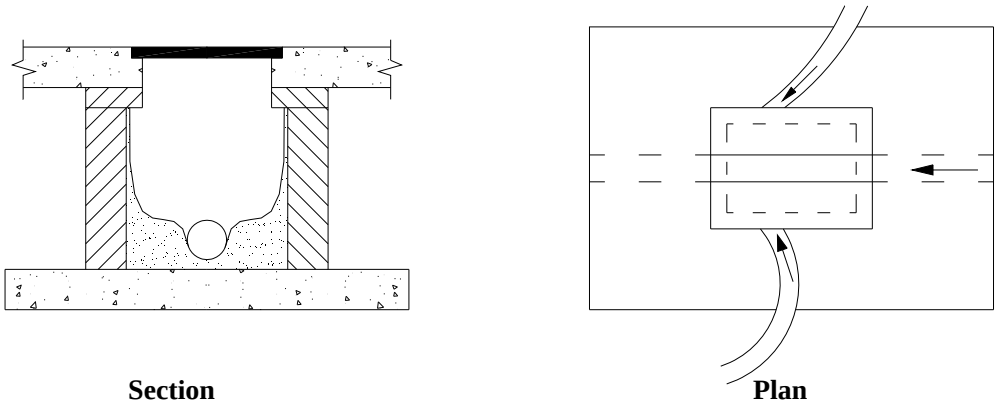

Figure 1 - Interception Chambers -

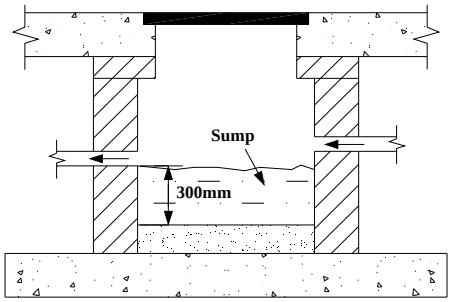

Figure 2 Interception Chambers with Silt Trap

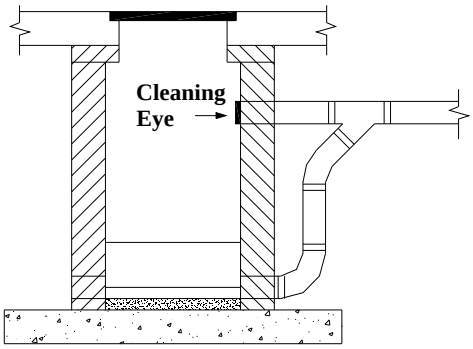

Figure 3 Backdrop Manhole

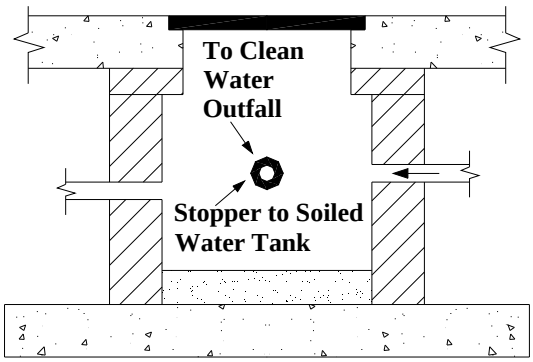

Figure 4 Diversion Chamber

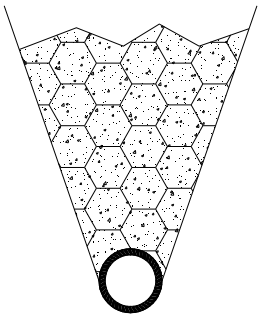

Figure 5 Surface Water Trap Drain

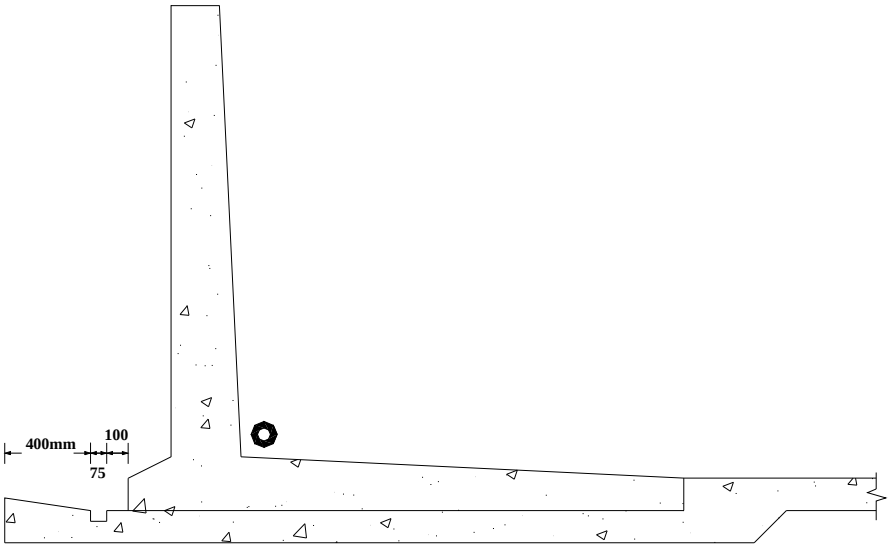

Figure 6 Effluent drainage arrangement for walled silo where precast concrete retainers are used

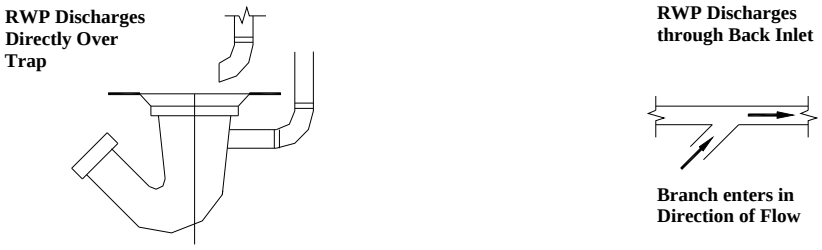

Figure 7 RWP Discharge

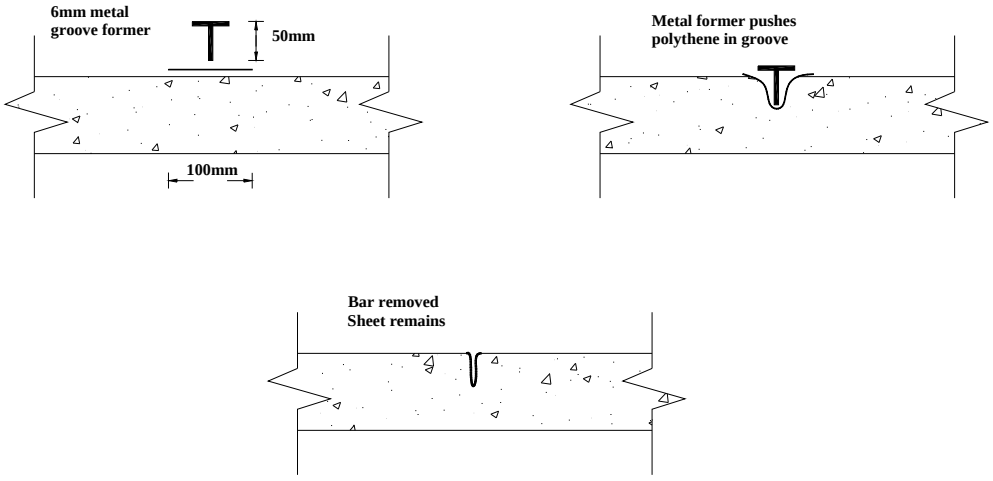

Figure 8

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

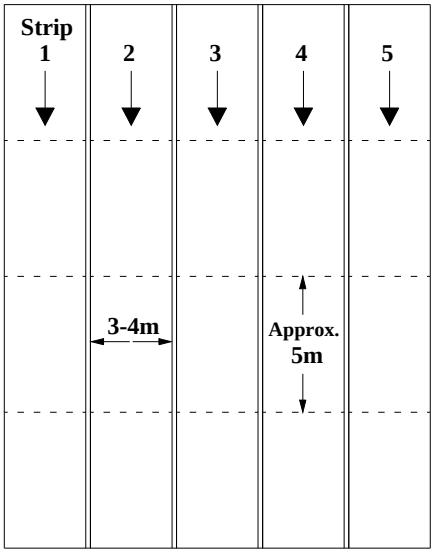

Figure 9 Alternative method of forming contraction joint in concrete paved yards - not suitable for silage bases

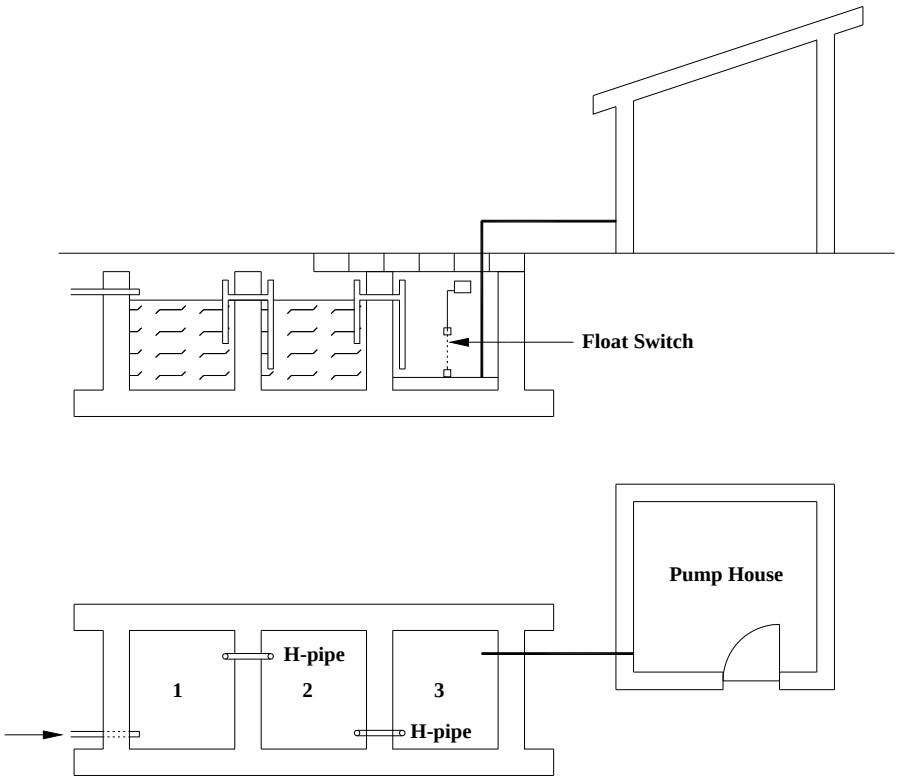

Figure 10 Soiled water settlement tank features