

## Laois County Council



## Water Services Section

# Standard Specification for Domestic Raw Sewage Pumping Stations & Associated Infrastructure Serving Housing Developments of up to 60 Houses

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## 1 Scope

The following specification details the requirements of Water Services Section of Laois County Council for raw domestic sewage pumping stations. This specification will apply to developments of greater than 60 houses. Where the number of houses in the development is less than 60, a reduced specification will apply.

It should be noted that compliance with this specification alone does not guarantee approval of a proposed pumping station.

## 2 General Design Criteria

The design capacity for the pump station will be based the following assumptions:

- The load from each domestic dwelling is assumed to be equivalent to 3 PE
- The hydraulic load per PE is 180 litres/day.

When calculating loads generated by schools, crèches, industrial or commercial undertakings etc., the EPA guidelines, taken from “Treatment Systems for Small Communities, Business, Leisure Centres and Hotels” are to be used.

## 3 Documentation Requirements

All proposals for pumping stations are to be accompanied by the following:

### 3.1 General arrangement drawings

1. Pump station
2. Emergency overflow chamber
3. Valve chamber

Note: Drawings should clearly show the invert levels of all pipes connecting to chambers, over flows, cut in/cut out levels etc. In addition to hard copies, drawings should be submitted in DXF or DWG format on CD.

### 3.2 Site layout drawing

1. The levels of all site manholes in relation to the levels of pipes feeding the pump station
2. The levels of overflows from the pump station. Alternatively this may be provided in the form of a hydraulic flow diagram

### 3.3 Equipment Documentation

1. Pump details including performance curve and power rating
2. The manufacturers data sheet for a proposed flow meter
3. A hard copy of all operation & maintenance manuals relating to all installed equipment is to be submitted to Laois County Council Water Services Section when the pump station is to be taken in charge. This is to include electrical data sheets for pumps, level control etc.
4. The manufacturers standard annual maintenance contract
5. A list of the manufacturers recommended spare parts for 20 years operation, including the current cost for each item

## 4 Enclosed Compound

1. The pumping station, emergency over flow chamber, valve chamber and control building shall be completely enclosed with palisade fencing. This shall include a lockable gate or double gates.
2. A prominent warning sign shall be mounted on the gate. This shall be black text on yellow background indicating the following “Danger Keep Out –Electrical Equipment & Deep Tanks”.
3. The enclosed pumping facility shall be suitably landscaped.
4. The pumping station shall be accessible from the road which should be suitable for an agricultural type vacuum tank or a truck mounted vacuum tank.

## 5 Pumping Station

### 5.1 General Configuration

1. The pumping station should be located away from houses and buildings in order to minimise the risk of odour nuisance.
2. The pumping station should preferably be of circular pre-cast concrete sections surrounded with a minimum thickness of 200mm C20 concrete. The use of GRP/FRP pump stations is also acceptable and will be subject to a 30-year design life. The manufacturer's data sheet and installation instructions shall be submitted.
3. A minimum distance of 200mm shall be provided between the invert of the lowest inlet sewer pipe to the chamber and the top water level of the pump chamber.
4. The pump station is to be provided with a separate ductile iron pipe (min 100mm dia) commencing at between 125 – 150mm from the pump station floor and terminating with a female Bauer coupling in the valve chamber. There should be sufficient space around the Bauer coupling for the connection of a vacuum tanker hose.
5. The pump delivery pipe work within the pump chamber shall be opposite the inlet sewer to avoid the formation of vortices.
6. Aluminium or galvanised mild steel access covers are to be provided on all chambers and these shall be hinged and spring assisted. Minimum allowable size of personnel access covers is 600 mm square or diameter. All covers must be lockable. Note covers shall be suitable for vehicular and/or pedestrian load as required.
7. The pump chamber should be fitted with an access ladder complete with safety hoops where required.
8. All pumping stations are to include a cast-in socket, lifting davit and lifting tackle suitable for the lifting of pumps from the pump station. Davits and sockets shall be galvanised and davits shall not weigh more than 35 kg.
9. Where the lifting height requires it the lifting chains shall be provided to BS 4942 incorporating a large link at not more than one metre intervals. It is a requirement that the equipment be stored in the pump control house and should be suitable for this purpose. The manufacturers name and SWL of any lifting equipment should be stamped on a stainless steel plate attached to the equipment.
10. All metal equipment on the pump station site e.g. pump guide rails, covers, ladders, rising main etc shall be bonded to earth. Earth rods shall be installed in inspection pits with removable covers. All electrical work to be carried out to IEE regulations.
11. All electrical ducts are to be installed with long radius bends.
12. A ½" water stopcock shall be provided in the vicinity of the pump station, preferably attached to the control building. This is for washing down purposes and shall be fitted with a double check valve and connected to the site water supply. It should be suitably insulated above ground level. Its location should be indicated on the submitted site layout drawing.

### 5.2 Controls

1. A sluice valve shall be provided on the inlet sewer pipe to the pump chamber to facilitate maintenance.
2. Regardless of pump manufacturers' recommended cut-out levels it is a requirement that min cut out level should not be set below the top of the pump motors, i.e. at all times the motor housing is submerged.
3. Level control is to be multitrode/conductivity type.

## 6 Emergency Overflow Chamber

All pumping station installations are required to have an emergency overflow chamber for overflows which may occur due to pumps being out of operation for long periods due to power failure or mechanical/electrical failure of the installation. The emergency overflow chamber will meet the following requirements:

1. 8 hours retention capacity at dry weather flow.
2. Overflow pipe shall be 200mm diameter minimum.
3. Return pipe feeding back into the pump chamber. This shall be fitted with a flap valve on the pump chamber side and shall be 200mm diameter minimum.
4. Designed and constructed with benching so as to be self-draining to the pump chamber.

5. Fitted with covers suitably large to allow hosing down of the chamber. Covers shall be GMS and hinged, spring assisted. The covers shall be suitable for pedestrian and/or vehicular load as required and lockable.
6. Shall be fitted with two vent stacks capped with anti bird cowls.

## 7 Control House

### 7.1 General Configuration

1. The control kiosk shall be galvanised mild steel, painted green or may be manufactured from GRP and coloured green with lockable doors. Its dimensions should be sufficient to allow access for maintenance and replacement of all mechanical and electrical items within the kiosk.
2. Alternatively a control house of block wall construction may be used. It shall be of minimum internal dimensions 10ft x 8ft. See section 7.2 for details.
3. The control house should be positioned as far away as possible (minimum 2m) from the pump chamber, and the valve chamber (where it has been fitted with a drain to the pump chamber). This is for safety purposes and to allow adequate working space for pump removal and maintenance activities.
4. The door/s of the control house should not open towards the pump chamber.
5. Control house to be surrounded with a continuous concrete footpath of minimum width 600mm.
6. All ducting from the pump chamber to be sealed airtight. This is to prevent ingress of gas from the pump chamber to the control house where conditions result in the production of biogas in the pump chamber.
7. The control house wall is to include two permanent air vents one high and one low vermin proof on opposite walls.

### 7.2 Construction Requirements

1. 100mm solid block, cavity wall construction
  - o Minimum 105mm cavity
  - o 65mm thermal insulation (k value not greater than 0.04 w/mk)
  - o 19mm external render
2. Pitched roof constructed from roof trusses designed to ISS 193
  - o Finished with tiles or slates on sarking felt
3. 150mm insulation to be placed between joists (k value not greater than 0.04 w/mk)
4. Eaves to be finished with uPVC fascia and soffit
5. Floor construction to consist of:
  - o 300mm thick hardcore compacted and blinded
  - o 1000 gauge DPM
  - o 40mm insulation
  - o 100 mm concrete slab
6. DPC to be used around door lintel

### 7.3 Electrical Requirements

1. The control house will have an independent metered supply with meter cabinet located on external wall as per ESB requirements.
2. The control panel shall have provision for generator connection.
3. The control panel shall have hand/off/ auto selector for each pump, run light for each pump, trip light for over temperature on each pump, trip light for seal failure on each pump, main isolator, duty select switch and reset buttons.
4. Automatic dial out of a common alarm shall be installed. This will include an auto dialler, which can be programmed with a minimum of 3-phone numbers, modem and phone line connected and operational. Any one of, or a combination of the following shall constitute a common alarm:

Condition 1	No.1 Pump over temperature
Condition 2	No.1 Pump seal failure
Condition 3	No.1 Pump failure to run
Condition 4	No.2 Pump over temperature
Condition 5	No.2 Pump seal failure
Condition 6	No.2 Pump failure to run

5. Either the control panel/panels or the control house is to include an electrical heater to prevent the build-up of moisture in electrical components.

## **8 Pumps**

### **8.1 General Configuration**

1. Pumps shall be provided in duty/standby and shall be submersible and specifically designed for the pumping of raw, unscreened domestic sewage. Where duty/standby/assist is proposed the pump station drawings should indicate the cut-in level for the assist pump.
2. There shall be a plate near to the top of the pump chamber indicating pump No.1 and pump No.2.
3. Each pump shall be installed with galvanised mild steel or stainless steel (316 grade) guide rail and lifting chains.
4. The pump shall be mounted on a cast iron coupling/duck-foot pedestal.
5. All anchor bolts shall be stainless steel or galvanised steel. Note that under no circumstances should stainless steel and galvanised steel surfaces come in contact with each other anywhere in the installation.
6. All pipe work and valves shall be ductile iron NP16 for sewage as per BS/EN 598.
7. Manhole rungs manufactured from stainless steel or GMS are to be installed in the pump chamber.

### **8.2 Pump Chamber**

1. The chamber floor is to be benched to a minimum of 15° towards the pumps to reduce the build up of solids in the chamber.
2. The pump chamber shall be fitted with a vent stack capped with an anti bird cowl.
3. A separate valve chamber shall be provided. Where this chamber is to contain electrical equipment e.g. flow meter and the pump station has been zoned hazardous, the valve chamber shall be fully sealed from the pump chamber. Otherwise the valve chamber shall drain to the pump chamber.
4. The valve chamber shall contain each pump rising main entering through one side of the chamber followed by a non-return valve followed by a sluice valve. Downstream of the sluice valves both rising mains may then combine into a single main. Within the valve chamber the single main shall then be fitted with a tee. The vertical leg of this tee shall be fitted with a 100mm sluice valve followed by a 100mm female Bauer coupling. This facility combined with that described in part 10 Pumping Station, will enable pumping down of the pump station by vacuum tanker in the event of the pumps being out of service.
5. The rising main non-return valves shall be mounted horizontally and have removable top covers. They shall have a ductile iron body and disc, resilient seated disc and stainless steel hinge pin. Each valve shall be complete with lever and weight.
6. The rising main shall be fitted with an electromagnetic flow meter where the discharge is to a public sewage treatment works, public sewer, or another pump station, which is public infrastructure. This is to be located in the valve chamber or a separate chamber if preferred. The flowmeter shall have a remote interface located in the control house. The flow meter shall be IP67; it shall have a polyurethane liner and be capable of 0.5% accuracy. Segregation of power and communications cables into separate ducts shall be observed.
7. A sluice valve should be installed on the rising main up stream of the flow meter to prevent draining back of the rising main where the flow meter needs to be removed for replacement or repair.
8. All valve and or flow meter chambers are to be constructed as per Laois County Council Water Services –Standard Specification for the construction of valve and flow meter chambers.

### **8.3 Pump Technical Requirements**

1. Pump cable shall conform to BS 6500 where the pump chamber is classified zone 2 and to BS 5345 where the classification is zone 1. Pump cables shall be suitably supported inside the pump chamber to prevent stretching/stressing of the cables and this should allow removal of the pumps from the pump chamber without fouling of the cables.

2. Each pump shall have a panel mounted hour run meter and automatic cycling of each pump to duty shall be provided.
3. Pumps shall have a minimum solids passage of 100mm and shall be vortex impeller type up to flows of approximately 15 l/s. Above this flow rate the manufacturers recommendation should be observed.
4. Minimum pump discharge size shall be 3".
5. Three phase installations shall have single phasing protection fitted to the motor starter to prevent motor burnout due to loss of phase.
6. Pumps shall be capable of a minimum of 12 starts per hour without motor overheating.
7. Pumps shall be sized for 3 times dry weather flow.
8. Pump casing shall be manufactured from cast iron with impeller and shaft manufactured from duplex stainless steel (typically grade 2304 or 2205).
9. Pump shaft shall have a mechanical seal provided by tungsten or silicon carbide mechanical seals.
10. The pump shaft seal or primary seal shall be housed in an oil filled chamber containing electronic seal monitoring.
11. The secondary seal between the seal chamber and the motor shall be a mechanical seal. This shall be similar to the primary seal or shall have tool steel seal faces.
12. Bearings shall have a B-10 life rating.
13. Motors shall be High Efficiency with class F insulation.
14. Motor and motor housing shall be bolted to the pump housing. Shrink or press fit assemblies will not be accepted.
15. Motors must include stator over-temperature protection in the form of thermistors embedded in each phase of the windings. Over-temperature protection should automatically re-set when temperature returns to normal.
16. The motors should be capable of running for short periods out of the pumped liquid.
17. Motors and pumps should include a stainless steel stamped nameplate secured to the housing. A duplicate stainless steel nameplate is to be mounted in the control cabinet. The nameplate should include as a minimum the phase, voltage, kW, pump weight, confirmation of high efficiency motor, manufacturer name, serial number and date of manufacture.
18. Where a frequency inverter is proposed the motor should be suitable for use with an inverter and derating of a standard motor will not be accepted. The motor should be specifically labelled for inverter duty.

## **9 EX Rating/Hazardous Area Classification**

It is the responsibility of the Project Supervisor for Design to ensure that Area Classification is applied to the design of the pump station to identify the potential for flammable or explosive atmospheres to develop in and around the pump station. While it is unusual for the conditions necessary to support biogas production to occur in pump stations of the size typical to housing developments, due diligence shall be applied and ATEX directives 1999/92/EC and 1994/9/EC are to be consulted. BS/EN60079 should also be consulted in regard to area classification. The drawings submitted and the specification for the selected pump should indicate the zone classification being applied or otherwise the absence of zoning.

## **10 Commissioning**

On completion of construction Laois County Council Water Services Section should be notified so that the complete finished installation can be inspected. Written approval to commence operation of the installation will only be granted by Laois County Council where the installation has been completed to the above requirements and all necessary documentation has been provided.

It will be a requirement that the operation of all pumps, pump protection devices, auto dialler etc are demonstrated prior to approval.

## **11 Taking in Charge**

Prior to taking in charge of the pump station by Laois County Council, the capitalised sum over 20 years for the operation and maintenance of the pumping station and associated works shall be paid to Laois County Council.