

## 5 FOUL DRAINAGE DESIGN

This section is to define the policy for the design of foul sewerage servicing new development within the Council areas.

Ideally the design approach and parameters should be uniform between Councils. Where common details cannot be agreed, then each Council's specific requirements should be stated in the policy document.

### 5.1 Current Arrangements

Requirements for the design and construction of foul systems are contained in "Recommendations for Site Development Works for Housing Areas" DoEHLG, 1998, "Code of Practice for Development Works – Drainage", Dublin City Council, 2002, and the Building Regulations for Drainage and WasteWater Disposal.

The documents generally comply with each other and provide very useful information on flows, sizes and gradients. They are very practical documents, and include systems within buildings, house connections and combined and private drains. They concentrate on systems serving smaller residential-type developments, for example providing flow rates from up to 30 dwellings.

There do not appear to be any design guides for larger and mixed-use developments, and Councils require developers to produce specific designs for such sites.

### 5.2 Proposed Arrangements

#### 5.2.1 Small Residential Developments (up to 30 Dwellings)

It is proposed that the "Recommendations for Site Development Works for Housing Areas" and the Building Regulations for Drainage and Waste Water Disposal remain in place. They are readily understandable and practical documents, and the policy should be to ensure that design and construction comply with their requirements.

"Recommendations for Site Development Works for Housing Areas" requires that foul sewers be designed for six times an average daily flow of 1000 litres per dwelling per day. Assuming a generous discharge figure of 200 litres per person per day, this corresponds to an average occupancy of five persons. The current highest average occupancy rates in the Region are around 3 to 3.5 persons per house, and the planning predictions are that this figure will reduce towards typical European occupancy rates of 2 to 2.5 persons per dwelling.

It is therefore proposed that the average daily flow be reduced to 650 litres per dwelling per day, resulting in design flows of 3900 litres per dwelling per day. This figure corresponds with the recommended design flow of 4000 litres per dwelling per 24 hours contained in Sewers for Adoption, 5<sup>th</sup> Edition. No further allowance for infiltration should be made.

Pipeline design will be subject to the overall requirement that no gravity pipes below 225mm diameter are to be taken in charge.

#### 5.2.2 Large Residential Developments

Design of main sewers in large developments should take account of the attenuation in peak flows resulting from large connected populations. Each situation will be different and the developer should provide particular designs, prepared by suitably experienced drainage engineers. Design sources include:

- IS EN 752: Drain and sewer systems outside buildings;
- Drainage Area Plans for the catchment;
- Proprietary drainage software.

In practice the design would be derived from a combination of such sources.

### 5.2.3 Commercial, Industrial and Institutional Developments

As with large residential developments, each project will be different and the developer should provide particular designs. The Developer should also provide design parameters to the Council's Drainage Department for such developments, with suitable justification for the values being used.

Table 3 entitled "Recommended Wastewater Loading: Rates from Commercial Premises" from EPA publication "Wastewater Treatment Manuals: Treatment Systems for Small Communities, Business, Leisure Centres and Hotels" contains useful guidance on flow and load parameters.

### 5.2.4 Pumping Mains

The diameter of the pumping main should be such that the velocity of the discharge is in the range of 0.75 to 1.8 m/s. The maximum velocity should not exceed 3 m/s.

Pumping main diameters below 100mm will not be accepted.

The roughness value used for the design of the pumping main should be shown in calculations, and should be in accordance with the latest edition of "Tables for the Hydraulic Design of Pipes, Sewers and Channels" published by HR Wallingford. Roughness values should generally comply with Table 5.1.

Flow Conditions	Roughness Value (ks)
For mean velocities up to 1.1 m/s inclusive	0.3mm
For mean velocities between 1.1 and 1.8 m/s	0.15mm

**Table 5.1** *Roughness Values for Pumping Mains*

Table 5.1 provides the average roughness for rising mains, but these values can increase by an order of magnitude (i.e. up to 3.0mm and 1.5mm) for mains in poor condition. It is advised that where the velocity head is significant compared with the static head (say 25%), a precautionary position is taken with regard to the roughness value. The suggested roughness value should increase to 2.0mm and 1.0mm respectively. This situation is often found for long rising mains.

The design of pumping mains longer than 500m, and/or with undulating longitudinal profiles, needs to consider:

- ◆ Retention time and septicity. (It may be necessary to use chemical dosing or reduce retention times by using a smaller diameter main or a smaller pump);
- ◆ Effect of hydraulic surge and cyclic loading on the fatigue life of the pipe material;
- ◆ The effect of air coming out of solution at high points in the system (It may be necessary to install a separate air release valve);

- ◆ The drawing in of air after running pumps ('on snore' where it may be necessary to install a special air release valve);
- ◆ Access provisions for general cleansing and for operational maintenance of valves, washouts, etc;
- ◆ Washout facilities at low points, to drain the pipeline by gravity;
- ◆ Roughness values.

Gate valves should generally not be required to isolate lengths of pumping main for draining.

Pumping mains should discharge into the sewerage system at manholes or other purpose built chambers. Details of the entry arrangements should ensure that sewer maintenance operations could be undertaken without difficulty. Discharge arrangements should avoid disturbance, which could lead to gas formation and smell nuisance, and not cause surcharge or flooding.

### 5.3 Monitoring of Discharges from Developments

There is little or no monitoring of actual flows discharged from developments, especially for the detection of the presence of inflow and infiltration which compromises capacity in the downstream conveyance and treatment systems.

Monitoring facilities should be included in the design of the drainage system for significant developments, being those exceeding 1 hectare in area. These facilities should include:

- Manhole or chamber at the discharge point from the development, with access for man-entry and permanent access;
- Discharge pipeline into the manhole or chamber of at least 10 pipeline diameters straight upstream of the discharge point to ensure hydraulic conditions suitable for flow measurement;
- Manhole or chamber design to be suitable for installation of in-sewer flow measurement equipment;
- Manhole or chamber design to be suitable for the taking of samples of the discharge effluent.

Flow survey results, using in-sewer monitoring equipment capable of producing continuous flow and depth measurements, shall be supplied to the Sanitary Authority before the development is taken in charge. The measurement period shall be continuous and include a dry weather period and three significant rainfall events.

Requirements for licensing of discharges are contained in Chapter 8 of the Regional Drainage Policies – Volume 3 - Environmental Management Technical Document.

**Design Requirements**

**Existing Guidelines for small residential developments should be retained**

**Current allowances for domestic discharge rates per dwelling should be reduced in recognition of trends in occupancy**

**Developers should continue to provide particular design details and parameters for large residential, commercial, industrial and institutional developments**

**Design for pumping mains should be adopted**

**Monitoring facilities for discharges from developments over 1 hectare in area to be provided**