UISCE ÉIREANN : IRISH WATER

Code of Practice for Wastewater Infrastructure

Connections and Developer Services

Design & Construction Requirements for Self-Lay Developments
December 2017 (Revision 1)

Document IW-CDS-5030-03

IW-CDS-5030-03

Part of ervia group

SCOPE

This Code of Practice outlines acceptable typical design and construction details that are required by Irish Water for the provision of Wastewater pipes and related infrastructure in Self-lay Developments which are to be connected to the Irish Water Network. It shall be used in conjunction with the associated Design Risk Assessments that have been developed which identify the risks that designers shall take into account in the detailed design of the Wastewater pipes and related infrastructure to be connected to the Irish Water Network. The pipes and related infrastructure to be put in place within developments shall comply fully with this Code of Practice. Ultimate responsibility (including, but not limited to any losses, costs, demands, damages, actions, expenses, negligence and claims) for the detailed design, construction and provision of such pipes and related infrastructure shall rest entirely with the Customer, his/her designer(s), contractor(s), or other related party. Irish Water assumes no responsibility for and gives no guarantees, undertakings or warranties in relation to the pipes and related infrastructure to be provided in accordance with this Code of Practice.

This Code of Practice shall be used in conjunction with current Connection and Developer Services Standard Details. Standard Details can be found on the Irish Water website at www.water.ie.

Revision Log

Date	Details of Revision	Revision	Author	Approver
December 2016	Initial Issue	0	TO'C	MO'D
December 2017	General Revision (See Appendix E)	1	T'OC	M'OD

Background

Technical Documentation was developed by Irish Water's Connection and Developer Services which outlines the requirements for wastewater services infrastructure within developments.

The Technical Documentation comprises Codes of Practice and Standard Details. These provide Irish Water's to Developers in the provision of wastewater infrastructure that is to be installed by Self-Lay methods in developments and that would be connected to Irish Water's networks and subsequently vested in Irish Water.

The Technical Documentation outlines design and construction requirements to ensure consistency in the provision of materials, equipment, workmanship, etc. They will also provide the basis for developers detailed design proposals for wastewater infrastructure, leading to the provision of infrastructure that is suitable for connection to Irish Water's networks and easy operation and maintenance.

The Technical Documents are based on best practice within the water industry. They take account of the experience of Local Authorities in the provision of these services to new developments.

This document (IW-CDS-5030-03) comprises the Code of Practice for Wastewater Infrastructure and outlines design and construction for developers. It should be read in conjunction with its associated Design Risk Assessment (IW-CDS-5030-04).

The Standard Details for Wastewater (IW-CDS-5030-01) and its associated Design Risk Assessment (IW-CDS-5030-02) are published and available at www.water.ie

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Glossary of Terms and Definitions

In this document, the following definitions apply -

"the Water Service Act" means the Water Services Act 2007 – 2014;

"Accessories" includes any manholes, ventilating shafts, overflow weirs, chambers, fittings, valves, tanks, sluices, culverts, washout pipes or stop valves fro them or any machinery or other apparatus which is designed or adapted for use in connection with the use or maintenance of the Wastewater collection infrastructure or other pipe;

"Applicant" means a Customer who has made an application for a connection to Irish Water's Networks;

"Application to Connect" means an application by a Customer for a connection to Irish Water's Network;

"Attendant Grounds" means in relation to a structure, the lands lying outside the Curtilage of the Structure;

"Backfill" means material that is used in a pipe trench to replace excavated material above the granular surround of the pipe to the underside of the roadway/footway construction or the underside of the top-soil reinstatement in a greenfield area as set out in this Code of Practice;

"Boundary" means the outer edge of the Curtilage of the Customer's Premises;

"Brownfield" means an area that has already been developed;

"Capital Investment Plan (CIP)" means the document outlining a programme of schemes and contracts identified by Irish Water for advancement to various stages in a specific time period and published by Irish Water as required under Section 34 of the Water Services (No 2) Act 2013 which sets out and particularises the investment in Water Services infrastructure that Irish Water considers necessary for the effective performance by it of its functions in a particular period;

"Chamber" means an enclosed structure which houses Pipes, Accessories and related fittings including meters;

"Commission for Regulation of Utilities (CRU)" means the body established pursuant to Section 8 of the Electricity Regulation Act 1999, formerly the Commission for Energy Regulation (CER) as amended;

"Completion Certificate" means a certificate issued by Irish Water to the Customer at the end of the Defects Liability Period;

"Conformance Certificate" means a certificate issued by Irish Water to the Customer following completion of construction, inspection and commissioning of the Works and the provision of the Final Documentation pursuant to this Code of Practice;

"Connection" means the physical connection to the Irish Water Network to facilitate the provision of Water Services to the Customer's Premises;

"Connection Agreement" means the written agreement entered into between the Customer and Irish Water setting out the commercial and technical terms governing the Connection;

"Connection Offer" means the letter issued to the Customer by Irish Water and which details the Connection terms and conditions that are offered to the Customer;

"Combined Sewer" means a Sewer used to convey a combination of Storm Water and Wastewater;

"Customer" means a developer who intends to provide Works for housing, mixed use and commercial developments and who intends to or has applied to enter into a Connection Agreement or has entered into a Connection Agreement;

"Curtilage" means an area of land immediately surrounding a building or group of building structures which is used for the enjoyment of such building, group of building structures;

"Deed of Grant of Easement" means a deed which grants a legal easement over a person's real property for a specific purpose;

"Defects Liability Period" means a minimum period 12 months or such other period as may be specified by Irish Water from time to time, between the issue of the Conformance Certificate and the issue of the Completion Certificate during which the Customer is responsible under the Connection Agreement for the cost of rectification of any defects in or connected to the Works;

"Defects Report" means a list of correction works that is issued with the Conformance Certificate that Irish Water's Field Engineers have identified and which require remediation by the Customer;

"Domestic Wastewater" means Wastewater of a composition and concentration (biological and chemical) normally discharged by a household, and which originates predominantly from the human metabolism or from day to day domestic type human activities, including washing and sanitation, but does not include fats, oils, grease or food particles discharged from a Premises in the course of, or in preparation for, providing a related service or carrying on a related trade;

"Drain" means a drainage pipe, or system of such pipes and related fittings for collection of Wastewater, that is not owned by, vested in or controlled by Irish Water, and that is not a Service Connection, which is used, or to be used as the case may be, to convey Wastewater from one or more Premises or to any Wastewater treatment system on a Premises where the Wastewater is generated;

"Easement" means a legal right or interest over a person's real property for a specific purpose;

"Final Documents" means the suite of documents as set out at Section 1.8 of this Code of Practice;

"Fire Authority" means the relevant Local Authority exercising its Fire Authority functions;

"Greenfield" means an area that has not been developed;

"Gravity Sewer" means a pipe through which Wastewater is conveyed under the force of gravity;

"Irish Water" means Irish Water (Uisce Eireann), a private company limited by shares with registration number 530363, established pursuant to the Water Service Act and having its registered office at Colvill House, 24-26 Talbot Street, Dublin 1, Ireland;

"Local Authority" means the County Council or City Council (as defined in the Local Government Act 2001) responsible for the functional area in which the Customer's Premises is located;

"Manhole" means a large Chamber which facilitates human access to and working space at Pipe level;

"Network" means the Irish Water owned and controlled Wastewater Infrastructure;

"Pipe" includes—

(a) any Sewer, service connection, Drain, channel, culvert, drainage pipe, and

(*b*) any system of such Pipes, Accessories and related fittings including meters,

that is used, designed or intended to be used to collect, store, distribute or measure water, waste water, Domestic Wastewater or Trade Effluent;

"Premises" has the meaning assigned to it in Section 2 of the Water Service Act, and includes any part of any public or private building, vessel, vehicle, structure or land (whether or not there are structures on the land and whether or not the land is covered

with water), and any plant or related Accessories on or under such land, or any hereditament of tenure, together with any out-buildings and Curtilage and which is:

(a) receiving Water Services; or

(b) specified in an application for Water Services completed by the Customer; or

(c) a Premises deemed to be a Premises by Irish Water; or

(d) such other Premises as may be notified by the Customer to Irish Water and accepted by Irish Water from time to time,

but does not include land which is a Public Road, a road which is the subject of an order under Section 11 of the Roads Act 1993 or a road which has been taken in charge by a Local Authority pursuant to a non-statutory Local Authority Taking in Charge scheme.

"Public Road" means a road over which a public right of way exists and the responsibility for the maintenance of which lies with a Roads Authority;

"Quality Assurance Folder" means a document that is developed and retained by the Customer to include information about and on-site quality assurance records of the water services infrastructure installation which will be updated as required and made available to the Irish Water Field Engineers for inspection and which can be used to facilitate the collation of the Final Documents;

"Regulator" means where applicable all present and future regulatory bodies having regulatory oversight over Irish Water including, but not limited to, the Commission for Regulation of Utilities, the Environmental Protection Agency, the Department of Planning Housing Local Government, the Office of the Data Protection Commissioner and/or any other statutory body or regulatory authority which regulates on an on-going basis or from time to time the business or operations of Irish Water;

"Rising Main" means a pipe through which Wastewater is pumped and conducted under pressure;

"Roads Authority" means the relevant Local Authority or Transport Infrastructure Ireland (TII) exercising it road authority function;

"Security" means a Surety in the form of a Bond under the Major Water and Wastewater Connection Agreement and a Self-Lay Surety under the Housing and Mixed Used Connection Agreement;

"Service Connection" means a drainage pipe, together with any Accessories and related fittings, extending from a Wastewater Works to the outer edge of the boundary of the Curtilage of a Premises, and used, or to be used as the case may be, for the purpose of connecting one or more Premises with a Wastewater Works, and, where

used or to be used for connecting more than one such Premises it shall extend to the outer edge of the boundary or the Curtilage of the Premises which ever is furthermost from the said Wastewater Works;

"**Sewer**" means drainage pipes and Sewers of every description, excluding Storm Water Sewers, owned by, vested in or controlled by Irish Water, but does not include a Drain or service connection;

"**Storm Water"** means run-off rainwater that enters any pipe;

"Storm Water Sewer" means any pipe or other conduit (a) used solely for the conveyance of Storm Water; or (b) designed or intended to be used for the conveyance of Storm Water (whether or not it is connected to a Sewer by a Storm Water overflow within the meaning of the Waste Water Discharge (Authorisation) Regulations 2007 (SI No 684 of 2007);

"**Structure**" means any building, erection, structure, excavation, or other thing constructed, erected, or made on, in or under any land, or any part of a structure so defined, and, where the context so admits, includes the land on, in, or under which the structure is situated;

"**Surface Water**" means all rainwater or other water that is not in a pipe, but is on the surface of the land;

"Sustainable Urban Drainage System (SUDS)" means a system of practices and control structures designed to minimise the impact of Surface Water runoff by replicating, as close as possible, the natural drainage of the site prior to the development;

"Taking in Charge" means the process for taking infrastructure into the sole control and responsibility of a Local Authority pursuant to Section 180 of the Planning and Development Act 2000;

"TII" means Transport Infrastructure Ireland;

"Vesting" is the mode by which the ownership of non-real property water services infrastructure transfers to Irish Water pursuant to the requirements of the Connection Agreement between the Customer and Irish Water.

"**Trade Effluent**" means effluent from any works, apparatus, plant or drainage pipe used for the disposal to a waste water works of any liquid (whether treated or untreated), either with or without particles of matter in suspension therein, which is discharged from Premises used for carrying on any trade or industry (including mining), but does not include domestic waste water or Storm Water;

“Water Main” means a water supply pipe owned by, vested in or controlled by Irish Water and does not include pipes, fittings and appliances to which the words “Distribution System” or “Service Connection” apply;

“**Wastewater”** means sewage or other effluent discharged, or to be discharged, to a Drain, service connection or Sewer, but does not include Storm Water;

“Wastewater Connection Point” means the point of connection of the Customer’s pipe work to the Irish Water Network where such connection is completed by Irish Water;

“Wastewater Works” means Sewers and their accessories, and all other associated physical elements used for collection, storage or treatment of Wastewater, and any related land, which are owned by, vested in, controlled or used by Irish Water;

“Water Services” has the meaning assigned to it by Section 2 of the Water Services Act 2007 and means all services, including the provision of water intended for human consumption, which provide storage, measurement, treatment or distribution of surface water, ground water, or Wastewater collection, storage, measurement, treatment or disposal, with the exceptions as outlined in the Water Service Act;

“Water Services Acts” means the Water Services Act 2007 to 2014;

“Works” means the provision by the Customer of Wastewater pipes and related infrastructure which are to be connected to the Irish Water Network.

Part 1 - General

1.1 Introduction

This Code of Practice outlines Irish Water's technical requirements for the design, construction and commissioning of Wastewater Works (Sewerage systems) for housing and industrial/commercial developments, which is to be vested by Irish Water. This Code of Practice will be kept under review and the latest edition is available on the Irish Water website, at www.water.ie. The reader should ensure that they are using the most up to date version of this Code of Practice.

It is important that the Customer consults with Irish Water on all technical matters regarding the provision of the Wastewater Works for proposed developments as early as possible. This can be done by engaging in a Pre-Connection Enquiry process as outlined in the Irish Water Guide to Connect which is available on the Irish Water website, at www.water.ie.

Failure to conform to the Code of Practice may result in Irish Water declining to allow the Works to be connected to its Network and/or the refusal of Irish Water to vest or adopt the Works.

This Code of Practice covers the provision by the Customer of new Wastewater pipes and infrastructure which are to be connected to the Irish Water Network and should not be used as a guidance document for all Wastewater related construction. In these cases the appropriate Irish Water technical standards and guidance documents should be used.

1.2 Statutory Relevance

The Water Services Act 2007 is the primary legislation governing Water Services in Ireland. It is a broad ranging piece of legislation concerning the supply of water for both domestic and non-domestic use, and the collection and treatment of Wastewater.

The Water Services Act 2013 provided for the establishment of Irish Water in March 2013. It was established as a semi state company as a subsidiary of Ervia. The Water Services Act 2013 also gave Irish Water and the Commission for Energy Regulation (CER) powers to prepare for the transition of Water Services from Local Authorities to Irish Water. Irish Water is responsible for the water supply and Wastewater Services previously provided by 34 Local Authorities. The Water Services Act 2013 also provided for the commencement of the metering programme and the installation of meters on domestic connections.

The Water Services Act (No2) 2013 was enacted in December 2013 and provided for the transfer of Water Services functions from the Local Authorities to Irish Water from January 1st 2014. The Water Service Act also provided for the transfer of assets and certain liabilities related to Water Services from Local Authorities to Irish Water.

1.3 Options for Works Construction

Various options will be available to the Customer for the construction of the Works as follows:

1.3.1 Customer undertakes the design and construction of the Works (Self-Lay); or
1.3.2 Customer undertakes design of the Works and subsequently uses an Irish Water Regional Contractor to undertake its construction (Irish Water Lay),

This Code of Practice deals with the provision by the Customer of Wastewater pipes and related infrastructure which are to be connected to the Irish Water Network (the "Works").

Note: The Customer shall provide separate Wastewater and Storm Water Drainage systems for any new developments in both greenfield and brownfield sites. Irish Water **does not** have responsibility for Storm Water Drainage systems. These Storm Water drainage systems are the responsibility of the Local Authority. It is Irish Water's policy not to accept Surface Water or Storm Water runoff into its Network.

1.4 Connection Procedure

The steps that Irish Water will utilise for the Works comprises:

1.4.1 Pre-Connection Enquiry (Optional);
1.4.2 Design Submission;
1.4.3 Connection Application;
1.4.4 Connection Offer (followed by acceptance and payment);
1.4.5 Construction Stage (including Irish Water supervision, inspection, etc.);
1.4.6 Commissioning Stage (including infrastructure documentation inspection, etc.);
1.4.7 Connection of infrastructure to Irish Water asset (on issue of a Conformance Certificate);
1.4.8 Vesting;
1.4.9 Defects Liability Stage;
1.4.10 Completion (on issue of a Completion Certificate).

The Pre Connection Enquiry and Connection Application Stages are outlined in greater detail in the Irish Water Guides to Connect which are available on the Irish Water website, at www.water.ie. Specific information is required in a Design Submission in advance of the submission of the Connection Application as outlined in **Section 2.2** and **Section 2.4** below. A Connection Agreement is required in all cases before Irish Water will make a connection to its Networks.

1.5 Types of Sewage Collection Systems

Service Connections extend from a Sewer to connect to Premises Drains which collect the Wastewater discharges from Premises.

Drains provide for the collection of Wastewater from toilets, baths, wash-hand basins, showers, utility rooms including washing machines, dishwashers and from kitchens utilities in domestic properties. Drains also collect domestic quality wastewater and trade effluent from commercial properties. Drains are connected into Wastewater Works outside the Boundary of the Premises.

In some instances, due to the topography of the area served, the Wastewater Works may contain pumping stations(s). In these instances, the Wastewater is collected at these low points and it is lifted by pumping and conveyed through a Rising Main to Gravity Sewers discharging to the point of treatment.

It is Irish Water's policy to minimise Storm Water inputs to Combined Sewer and to limit new inputs to Sewers. Many Combined Sewers have Combined Sewer Overflows (CSO) that allow for the release of combined Storm Water and Wastewater in times of heavy rainfall.

Storm Water Sewers carry only runoff from roofs, paved surfaces, roadways, etc. These flows are discharged without treatment to Watercourses or land drainage systems. It is not permitted to discharge Wastewater to a Sewer designated as a Storm Water Sewer Network. **Irish Water does not have responsibility for Storm Water Sewers**.

Storm Water Sewer systems are outside the scope of this document and should be constructed in accordance with the requirements of the relevant Local Authority or Roads Authority.

Watercourses or land drainage systems are not permitted to be directly or indirectly connected to Irish Water Network. Satisfactory and separate arrangements should be agreed with the relevant Local Authority or Road Authority.

Note: The Customer shall provide separate Wastewater and Storm Water drainage systems for any new developments in both greenfield and brownfield sites. Irish Water **does not** have responsibility for Storm Water drainage systems. Surface Water or Storm Water drainage systems are the responsibility of the Local Authority. It is Irish Water's policy not to accept Storm Water runoff into its Network.

The reduction of storm water runoff arising within new developments and discharging to the storm water sewer network or to existing watercourses may be required by a Local Authority. This reduction can be achieved using Sustainable Urban Drainage Systems (SUDS). This will be a matter for the Customer to design and put in place in consultation with the relevant Local Authority. A suitable Sustainable Urban Drainage System (SUDS) may be required within the development to the requirements of the Local

Authority for the area. The SUDS can be undertaken to the requirements outlined in the Greater Dublin Region Strategic Drainage Study (GDSDS) Report or any other Design Guidance Document for SUDS considered appropriate for the location of the development.

In very exceptional circumstances, where there is no other outlet for storm water and the Customer can prove to Irish Water that he has exhausted all other options, discharge of storm water to a combined sewer may be allowed, subject to the approval of Irish Water. Where wastewater and storm water sewer systems from the new development area are allowed by Irish Water to be connected to an existing Irish Water combined sewer, the new wastewater sewer and storm sewer systems shall be separated within the development and may only be connected together immediately prior to the connection point to the existing Irish Water Network. Irish Water, in this instance, shall also be consulted on the design of the Sustainable Urban Drainage System (SUDS) for the storm sewer network and its recommendations in relation to the acceptance levels of additional storm water to its sewer network shall be taken into account.

In these exceptional circumstances, storm water discharges are to be minimised and are to:

- be below or as near to greenfield storm runoff rate and discharge volumes as in practically possible, and
- be no greater than that which existed prior to the redevelopment of a brownfield development area that already discharged storm flows to a combined sewer, and
- be such as to ensure that there is no increased risk of causing environmental harm or increased flooding risk.

Storm water sewer systems are outside the scope of this document and should be constructed in accordance with the requirements of the adopting authority.

1.6 Specialist Works

Pressure pipe, vacuum pipe and other specialised systems are outside the scope of this document and should be discussed separately with Irish Water if such are being proposed. For specialist Wastewater systems the Customer will be asked to provide specific information to establish the whole life cost based on a 20-year operation, and durability of the fixed and buried components relative to a conventional system, to enable a decision on suitability.

The use of inverted siphons is also outside the scope of this document. Where proposed, specific Irish Water approval shall be sought and the siphon shall be designed to ensure that variation of flow is accommodated, self-cleansing velocities are achieved, and venting is incorporated to prevent air-locking, etc.

1.7 Private Pipework

Irish Water will not have responsibility for Drains located within the Boundary of Premises. Irish Water has wide-ranging powers pursuant to Section 43 of the Water Service Act 2007 to direct an owner of Premises to carry out relevant work, or, to undertake the work itself and recover costs from the owner of the pipework.

Private drainage systems shall:

1.7.1 Comply with the current Building Regulations and be constructed in accordance with procedures and requirements outline therein;
1.7.2 Be located within the final site boundary to ensure that the private Drains, gullies traps, manholes, inspection chambers, Armstrong Junctions and similar private fittings are on the private property, with the exception of the private Drain connection to the public sewer;
1.7.3 Not pass through property they do not serve;
1.7.4 Whether domestic or non domestic shall serve only one unit;
1.7.5 The Connection and/or using any other mechanism to provide Water Services onwards to another location or Premises other than the Premises as set out in the Connection Agreement;

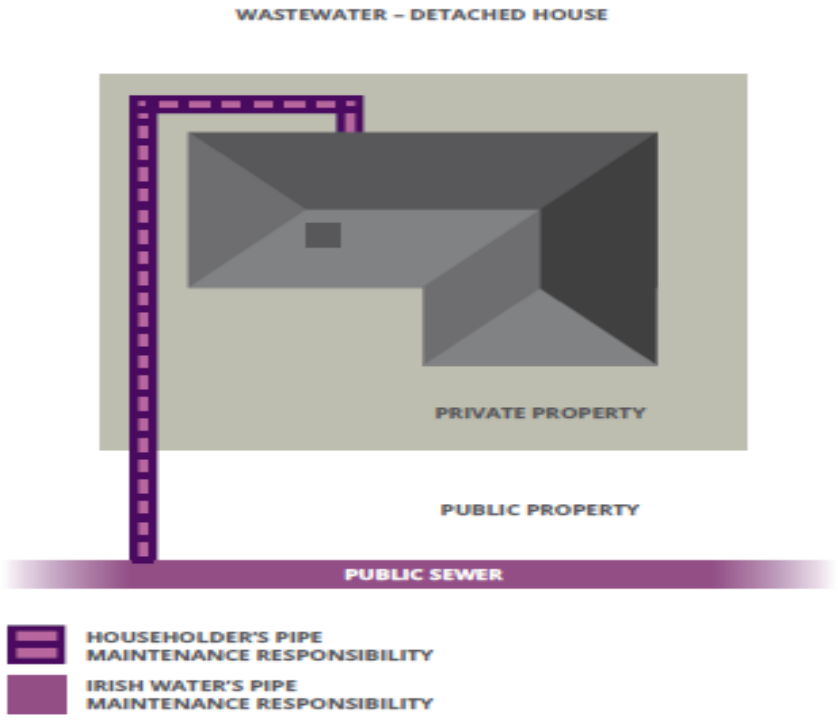

Figure 1: Maintenance Responsibility

The Customer shall provide and where necessary renew any Drain and shall take all reasonable and proper care of same. Irish Water shall accept no responsibility for the maintenance, renewal, adequacy, safety or other characteristics of any Drain. For clarity, this means that the Customer shall be responsible for the renewal, maintenance, repair of the Drains on the premises and for the Drain connection between the curtilage of the premises and the Wastewater Works as outlined in **Figure 1** above.

1.8 Application for a Conformance Certificate

The level of site inspection, supervision and auditing carried out by Irish Water during the installation of the Works will depend on whether the Customer uses his own contractors to carry out works (Self-Lay) or the Customer uses Irish Water's Regional Contractors to construct the Works (Irish Water Lay) (See **Section 1.3** above).

Irish Water's Field Engineers will undertake site inspections on the Works in line with the Critical Site Inspection Policy during the construction of the Works. The Customer's site staff shall retain on the site of the Works a **Quality Assurance Folder** to include information on as well as on-site quality assurance records of the water services infrastructure installation. The document shall be updated as required and made available to the Irish Water Field Engineer for inspection. This document shall be used to facilitate the collation of the Final Document as referred to below. A CCTV survey of the pipework and a SUS25 survey of the manhole chambers shall be undertaken by the Customer at the end of the construction and this is to be witnessed by the Field Engineer during a separate site visit. Final site inspections will be carried out after the submission by the Customer of an application for the issuing of a **Conformance Certificate**. The **Conformance Certificate** is a document that will be issued to the Customer by Irish Water indicating satisfaction with the construction of the Works following:

1.8.1 Inspection of the constructed infrastructure confirming that it is constructed in accordance with the Code of Practice and Standard Details. (If minor corrections are required to the infrastructure (snags) a '**Defects Report**' will be issued with the Conformance Certificate outlining these minor defects); and

1.8.2 The Customer's submission of **Final Documents**

The **Final Documents** shall comprise the following typical scope of documentation:

1.8.3 Confirmation by a Chartered Engineer that the Works has been installed in accordance with the design submitted in the Connection Application;

1.8.4 Confirmation by a Chartered Engineer that the Works has been installed in line with the Codes of Practice and Standard Details;

1.8.5 Confirmation by a Chartered Engineer and test result certificates indicating that the Works has undergone appropriate on-site testing, off-site testing and commissioning. The appropriate site tests for the Works would be, but are not limited to, the following:

1.8.5.1.1 Air tests and water tests of gravity sewers;
1.8.5.1.2 Water retaining tests completion results for manholes, chambers and pumping station structures;
1.8.5.1.3 Testing completion results of pumping plant (if appropriate);
1.8.5.1.4 Pressure testing completion results of Rising Mains complete with a hard copy print out from the logger of the relaxation curve as proof of the outcome of the test;
1.8.5.1.5 A printout of the joint details, with a GPS location of each joint;
1.8.5.1.6 Visual inspection completion results of manholes;
1.8.5.1.7 CCTV report of the Works shall conform to Irish Water CCTV Survey requirements
1.8.5.1.8 Commissioning reports;

1.8.6 Provision of "As-Constructed" drawings and records of the constructed Works in hard and soft copy to the Irish water Field Engineers;

1.8.7 "As Constructed" record of service pipe installation completion (including link to House Numbers within the development);

1.8.8 Provision of Safety File in accordance with the current Safety and Health Construction Regulations;

1.8.9 Provision of Operation and Maintenance Manuals for pumping plant (if such provided) including full pump details, performance curves and power ratings, etc., and all warranty documentation for the installed equipment as well as drawings of the pump station demonstrating the Area Classification of the pump station or otherwise the absence of zoning;

1.8.10 Provision of Deeds of Grant of Easement;

1.8.11 Proof of ownership of the Premises in the form of Deed/Solicitor letter;

1.8.12 Confirmation by a Chartered Engineer of compliance with the Building Regulations and the Building Control (Amendment) Regulations, in particular evidence of compliance with the Building Regulations to ensure plumbing systems compliance and no risk of contamination;

1.8.13 A construction stage hydraulic model (if relevant);

1.8.14 As Built Record Drawings shall be provided in hard copy and digital format. Location and layout plans, longitudinal sections and details should show the Works and development in full. Plan scales should be in common use, i.e., 1:500, 1:1000 or 1:2500 as appropriate. Drawings should be prepared using an electronic system and submitted in "AutoCAD compatible (dwg/dxf)" file format. These drawings shall contain the following information:

1.8.14.1 Manhole, pipe, pump station, service connection and inspection chamber locations, (to Irish National Grid coordinates (ING)) to +/- 100mm accuracy in the horizontal plane, with dimensions relating to fixed Ordnance Survey co-ordinates;
1.8.14.2 Cover level and invert levels relating to fixed Ordnance Survey Datum (Malin Head) to an accuracy of +/- 20mm;
1.8.14.3 Longitudinal sections, to an exaggerated vertical scale, (such as 1:1000 horizontal and 1:100 vertical) showing pipe installed levels, finished ground levels, pipe invert levels, pipe sizes, bedding type, haunch and surround details, backfill details, together with

manhole locations, fitting and inspection chamber locations, chainages, gradients, pipe materials, etc. All manholes should be identified and provided with a location to an Irish National Grid co-ordinate (Information in Tabular Format on a Schedule of Manholes);

1.8.14.4 Dwelling and building numbers;

1.8.14.5 Construction details of pump station as well as mechanical, electrical and instrumentation equipment details;

1.8.14.6 Details of any services and structures on the site, existing and proposed, especially those in close proximity to the Works including offset measurement to the Wastewater collection and water supply systems.

Necessary updates of the As-Built record drawings shall be provided on completion of the development works and prior to occupation of the Premises. Where works are being carried out in a phased basis, a timeline schedule of submitting the “as built” records shall be agreed with Irish Water. As a minimum, updated drawings shall be submitted to Irish Water every 6 months or when new elements of a Wastewater Network have been made live.

1.9 CCTV and Manhole Surveys in Advance of Commencement of the Defects Liability Period

Irish Water requires a CCTV and manhole survey to be carried out in advance of the commencement of the Defects Liability Period and the issue of the Conformance Certificate. The CCTV and manhole surveys will be carried out by the Customer and shall be accompanied by a report dealing with the condition of the Works. It is the responsibility of the Customer to notify Irish Water at least ten working days ahead of survey works commencing. Irish Water and its agents will conduct audit inspections of these survey works at their discretion. The Customer must engage the services of a competent surveying contractor with suitably qualified personal. CCTV and manhole survey information should be submitted to Irish Water in accordance with current Water Research Centre (WRc) specifications and Irish Water requirements, which are set out as follows;

Sewer Condition Classification Format; sewer condition classification for each survey shall be undertaken in accordance with the Water Research centre (WRc) *Manual for Sewer Condition Classification (MSCC) 5th Edition*.

Sewer Condition Scoring Scheme; the sewer condition scoring scheme within the CCTV report shall be in accordance with the scoring scheme of the Sewerage Risk Management (SRM) Manual 5 produced by WRc.

Qualifications and Training Requirements; all personnel responsible for classifying wastewater infrastructure condition, including those undertaking quality control, shall have completed training and achieved successful accreditation in a sewer condition classification course, such as Pipe Sewer

Condition Classification OS19x. Evidence of appropriate training and qualifications of personnel shall be provided to Irish Water by the Customer on request. The above course shall have been successfully completed to enable personnel to classify pipe conditions to the level of Manual of Sewer Condition Classification 5th Edition.

Calibration of Equipment; all plant and equipment used during surveys shall be maintained and calibrated in accordance with the manufacturer's requirements. Calibration certificates shall be made available when requested by the Irish Water Field Engineers/agents.

CCTV Recording; recordings shall show a continuous record of data displayed automatically on the monitor screen containing the following information:

- Automatic update of the camera's position (in metres) in the sewer line;
- Date of survey
- Direction of survey
- Pipe dimensions
- Manhole/pipe length reference
- Condition assessment
- Pipe material
- Connection details

Camera Speed**;** the speed of the camera in the sewer shall be limited to 0.10 m/s for sewers of diameter less than 200mm, 0.15 m/s for diameters exceeding 200mm but not exceeding 300mm and 0.20 m/s for those exceeding 300mm, or such other speed as agreed with Irish Water as will enable all details to be extracted from the DVD recording.

Digital colour photographs**;** digital colour photographs shall be taken at the following points in all sewer surveys;

- general condition of the sewer at 20m intervals or each Sewer section length whichever occurs most often
- service connections(photograph taken a right angle to service connection to identifying unobstructed service connections)
- protruding pipework
- defective connections & junctions
- debris
- Cracks
- Fractures
- Broken Pipes
- Deformation
- Open Joints
- Displaced Joints
- At the point where a survey is required to be abandoned

Photographs must show clear definition and accurately reflect what is shown on the monitor, which shall be in proper adjustment. Photographs shall be of sufficient quality to enable clear interpretation of defect on a personal computer screen, laptop screen or on A4 print out. The digital photographs shall clearly identify the following:

- Automatic update of the camera's position in metres along the sewer line from adjusted zero
- Sewer dimensions
- Upstream and downstream manhole references
- Direction of the survey
- Photograph number within the survey report
- Date photograph taken
- Remark, identifying the reason for the photograph

Manhole Condition Surveys; a specific manhole condition survey shall be completed in accordance with WRc Manual of Sewer Condition Classification 5th Edition and Irish Water manhole survey requirements as set out below. Survey report cards should include the following data;

- Grid reference of manhole, to Irish national grid coordinates;
- Cover Material
- Cover integrity
- Biscuit integrity
- Chamber material
- Chamber size
- Chamber integrity/ Confirmation that no infiltration exists
- Material and diameter of all incoming and outgoing pipes;
- Diagram showing incoming/outgoing pipes
- Benching quality
- Step Material
- Step integrity

Manhole Condition Survey Photographs; photographs shall be submitted in digital '*.jpeg' or similar suitable format and shall be a resolution of 1024 X 768 pixels. Photographs are required to clearly identify the following;

- Cover condition
- Internal chamber condition
- Benching
- Backdrop details etc.

Manhole Survey Format; it is a requirement of Irish Water that data collected during manhole survey is delivered to Irish Water in a format compatible with InfoNet.

Customers Quality Control Responsibility; before submitting CCTV & manhole survey information to Irish Water the following quality control regime should be implemented by the customer;

Stage 1: The customer is responsible for checking that the CCTV and manhole surveys show no defects or debris. Any defects should be rectified followed by the generation of a final survey reports.

Stage 2: The customer's consulting engineer shall administer a quality checking system. The quality checking system should incorporate visual inspections of the wastewater network and desk top studies which effectively gauges the accuracy and consistency of the survey report produced by the surveying contractor. Any defects identified at this stage should be rectified by the contractor.

Note: Survey reports submitted to Irish Water must meet Grade 1 Structural & Operational classification as set out Sewerage Risk Management (SRM) Manual 5 produced by WRc. Reports submitted to Irish which do not meet this classification will be returned to the customer.

Reporting & Deliverable; The Final Reports and Deliverables to Irish Water shall include the following items:

a. ***CCTV Survey footage;*** files in "xml" format submitted to Irish Water in CD or DVD, in accordance with MSCC, 5th Edition, compatible with InfoNet.
b. ***CCTV Reports***; reports submitted identifying that no defects exist. Reports submitted in CD or DVD format with a hard copy of the survey report.
c. ***Manhole Survey Reports***; reports submitted identifying that no defects exist. Reports submitted in "csc" format on CD or DVD with a hard copy of the survey reports. Manhole referencing shall be consistent with the As Constructed Drawings (to Irish National Grid coordinates (ING)) to +/- 100mm accuracy in the horizontal plane, with dimensions relating to fixed Ordnance Survey co-ordinates).
d. ***Certification from the Customer's consultant engineer***; confirmation that a quality control regime has been implemented with the result that no defects exist in either the sewers or the manholes.

All CCTV & manhole reports will be reviewed by Irish Water which will include visual site inspection against the information submitted. It is the responsibility of the Customer to ensure that defects do not exist. Irish Water will validate the data received using in-house software which is based on InfoNet and any anomalies will be returned to the Customer for rectification and cleansing. A charge may be levied by Irish Water for additional review of CCTV and manhole reports should the customer fail in their responsibility to adequately enforce quality checking ahead of submitting reports to Irish Water. This charge will be recovered from the Self-Lay Surety.

In the event of the existence of deficiencies in the Works, Irish Water will identify areas of deficiencies and a programme of remedial works to rectify these deficiencies. Repairs of these deficiencies shall be carried out by the Customer and confirmation obtained that the repairs achieved an adequately watertight system by a re-run of the CCTV survey along the sewer at the defect location.

If the Customer does not carry out the CCTV and manhole surveys or does not carry out repairs of any deficiencies, Irish Water retains the right not to connect the Works to the Irish Water Network.

1.10 Conformance Certificate

Following Irish Water's examination of the Final Documentation and completion of all site inspections of the Works, the Customer will be made aware of the outcome of these inspections in writing and may be required to undertake remedial work. An additional inspection will be carried out if deemed necessary and, if accepted, Irish Water will issue a **Conformance Certificate** and complete the connection of the new infrastructure to the existing infrastructure within the timeframe outlined in the Connection Agreement. If minor corrections are required to the infrastructure (snags) a '**Defects Report**' will be issued with the Conformance Certificate outlining these minor defects.

If the Customer does not attend to the listed remedial requirements outlined in the "Defects Report" or if these remedial works are not carried out or undertaken in a reasonable timeframe, Irish Water will have recourse to call upon the Self-Lay Surety of the Connection Agreement or may not connect the Works to the Network.

Irish Water reserves the position that Vesting of the Works in Irish Water will not take place until all Final Documents of the Works have been provided to Irish Water and are deemed to be acceptable.

1.11 Connection of Development to Irish Water Network

Following the completion of the minor corrections outlined in the Defects Report, Irish Water or its agents will carry out the connection of the Works to the Irish Water's Network. The **Defects Liability Period** commences on the date of the Conformance Certificate. Irish Water will Take in Charge the Works upon its connection to the Irish Water Network. However, the Customer will remain responsible under the Connection Agreement for the cost of remediation of any defective works that are deemed necessary during the Defects Liability Period.

The Customer shall not proceed with "step-by-step" extensions of the initial approved infrastructure beyond that which has received Irish Water agreement/consent via the Connection Agreement without making a formal application for and receiving Irish Water approval of any extension(s) of the Wastewater collection infrastructure associated with the initial development. This will also apply where another Customer is seeking to

connect into the infrastructure installed in the development. Such extensions are regarded as additional new connection works and are subject to the same level of Irish Water compliance, governance, etc., as the initial connection. These extensions will require separate Connection Agreements, payment, supervision, inspection, auditing, etc.

1.12 Vesting

Under the Connection Agreement, the Customer agrees that the Works will become vested in Irish Water immediately upon issuance of the Conformance Certificate by Irish Water.

If the Works is deemed adequate after final inspections a Conformance Certificate will be issued and thereafter a connection will be made to the Network. Upon the issuance of the Conformance Certificate the new infrastructure (the Works) will be vested in Irish Water in accordance with the Connection Agreement.

Prior to Vesting, the Customer will be required to provide proof of title of the development land as well as whatever formal Deeds of Grant of Easements are required for pipework routes for the benefit of Irish Water. Deeds of Grant of Easements for the routed of pipework for Irish Water required extensions for new developments adjacent to the development being advanced may also be required if Irish Water has required this as part of the Connection Agreement or has required the upsizing or extension of the Works to facilitate the adjacent future developments.

The Customer shall provide a Deed of Grant of Easement for the benefit of Irish Water in a form as set out in the Connection Agreement over all the lands which are intended to be taken in charge by the Local Authority under Section 180 of the Planning and Development Act, 2000. These areas shall be highlighted on a Property Registration Authority (PRA) compliant map and approved by Irish Water prior to execution of the Deed.

The Customer shall provide, where part of the Works are located in private land and fall outside lands intended to be taken in charge by a Local Authority, a Deed of Grant of Easement in a form as set out in the Connection Agreement for the benefit of Irish Water, by the applicable landowner, of a wayleave incorporating a protected strip of a specified width at either side of the water services infrastructure in that particular area in respect of the full length of the infrastructure. This is to ensure the ability of Irish Water to access the Works in the private land which will be highlighted on a Property Registration Authority compliant map and approved by Irish Water prior to execution of the Deed.

As part of the Connection Agreement, the Customer shall agree to procure the completed registration of the Deeds of Grant of Easements outlined above by a Solicitor acting for the Customer as soon as possible and within all applicable time limits prescribed by law.

Information relating to the assets will be uploaded to Irish Water Asset Information. In addition, at this point Irish Water's Operation & Maintenance will assume responsibility of the operation and maintenance of the Works and this will be undertaken in accordance with Irish Water procedures.

1.13 Defects Liability Period

A **Defects Liability Period** will apply to the Works. The Defects Liability Period will apply for a minimum of 12 months or such other period as may be specified by Irish Water in the Connection Agreement, between the issue of the Conformance Certificate and the issue of the Completion Certificate during which the Customer is responsible under the Connection Agreement for the cost of rectification of any defects in or connected to the Works. Any defects found during the Defects Liability Period are the responsibility of the Customer.

During the Defects Liability Period the Customer shall execute or procure the execution of all works of repair reconstruction rectification and making good of defects imperfections, shrinkages or other faults as may be required of the Customer in writing by Irish Water during the Defects Liability Period. Irish Water may undertake additional inspections, surveys, investigations to assess the continued adequacy of the Service Connection Works during this period. Irish Water will notify the Customer in writing of the need for such repair reconstruction or rectification works. All such works shall be carried out at the Customers expense.

In the event of the existence of deficiencies in the Works during the Defects liability Period, Irish Water will identify areas of deficiencies and a programme of remedial works to rectify these deficiencies. Repairs of these deficiencies shall be carried out by the Customer and confirmation obtained that the repairs achieved an adequately watertight system by a re-run of the CCTV survey.

If the Customer fails to execute or procure the execution of repair works, Irish Water shall be entitled to carry out such works and shall be entitled to recover from the Customer the expenses reasonably incurred by way of deduction from the Security (Self-Lay Surety or Bond) provided under the Connection Agreement.

The Self-Lay Surety or Bond shall be returned to the Customer twenty eight (28) days after the completion of the Defects Liability Period subject to any deductions made pursuant to the Connection Agreement and subject to the Works being deemed adequate and satisfactory.

The Customer will remain responsible for the repair to the final road restoration of trenches. It is to be noted that the Customer will be responsible for the upkeep of roads, footpaths, etc. until such time as the development is taken in charge by the Local Authority. The Customer shall alert Irish Water of the proposed Taking in Charge schedule for the development by the Local Authority.

Following the installation of Service Connections within the development during the Defects Liability Period, additional record documentation shall be provided by the Customer to Irish Water. This shall comprise updated “As Constructed” records of service pipe installation, location of inspection chamber, etc. This information may be provided on a phased basis as blocks of houses are made ready for occupation by the Customer.

1.14 Completion Certificate

Following The Defects Liability Period Irish Water shall issue a **Completion Certificate** to the Customer. Irish Water may deduct from the Self-Lay Surety any costs which Irish Water may incur:

1.14.1 in undertaking any works of construction, reconstruction, maintenance, rectification or repair or making good of defects, imperfections, shrinkages or other faults by reason of the Customer or the Contractor failing to complete in a good and workmanlike manner and in accordance with the specification aforesaid the entirety of the Service Connection; or,

1.14.2 towards invoices or sums payable by virtue of any actions, claims or demands made against Irish Water by any third party as a result of any act or default by the Customer.

1.15 Final Inspection at Defects Liability Termination

Irish Water will carry out a final inspection of the infrastructure nearing the end of the Defects Liability Period. This inspection will amongst other things establish if any additional work has been carried out by the Customer that might impact on the integrity of the works since the issue of the Conformance Certificate and commencement of the Defects Liability Period. Such impacts may be associated with the installation of other utility services without proper horizontal and vertical separation, installation of structures closer to the Works than allowed, damage to the infrastructure by building works, etc.

If defects are observed, additional CCTV or dye surveys may be required to identify and locate such defects. The cost of such surveys shall be recovered through any Surety associated with the Connection Agreement. The undertaking of the CCTV surveys shall be as outlined in **Section 1.9** above.

Additional works may have to be carried out by the Customer to rectify these defects if deemed necessary by Irish Water. If this is not executed by the Customer, it will be

carried out by Irish Water and its funding covered by the Financial Security put in place via the Connection Agreement.

If the infrastructure is deemed adequate after the Defects Liability final inspections, Irish Water will the release of any Security to the Customer subject to any deductions that might arise due to monies owed for remedial works or other costs incurred by Irish Water.

1.16 Statutory and Other Consents

The Customer shall obtain all necessary consents and other permissions for the proposed development, including the Works.

1.17 Fire Authority Liaison

The Customer or his/her designer shall be responsible for all liaisons with the Local Fire Authority and for agreeing all arrangements for the advancement of the development. Any approvals that the Customer obtained from the Fire Authority shall be provided to Irish Water.

1.18 Regulations

The Customer shall comply with all relevant Irish legislation. The version of Acts and Regulations current at the time of the project shall be applicable.

1.19 Standards

All materials shall be in accordance with the relevant European Standards (EN) covering the subject which is in force in the European Union. In Ireland ENs are published as IS EN and in the UK as BS EN. Where there is no relevant European Standard, materials shall be in accordance with an Irish Standard (IS) or a British Standard (BS). A UK Water Industry Specification (WIS) may be used where there is no relevant European Standard, Irish Standard, British Standard (BS) or European Union National Standard available.

In the case of recently developed or innovative products, there may be no European Standard, Irish Standard, British Standard or European Union National Standard available. This may not preclude the use of a product where its performance or properties can be determined to align with its intended duty and design life. Careful consideration should be given to any independent assessment of evidence of product performance.

Customers should discuss and agree the proposed use of newly developed products with Irish Water. Additional quality assurance requirements, including third party certification may be required (in Ireland this will be provided by or endorsed by the National Standards Authority of Ireland). The use of products which are not in

accordance with the provision of a European Standard, an Irish Standard, British Standard or of a European Union National Standard could result in the material, product or unit being excluded from use or, if installed, being removed from the works at the Customer's cost.

1.20 Civil Engineering Specification for the Water Industry (CESWI)

The design and construction of Wastewater collection infrastructure shall conform to the current version of the Civil Engineering Specification for the Water Industry (CESWI), subject to the particular requirements applied to it by Irish Water, as outlined in this Code of Practice. CESWI is a base document and it is published by the Water Research Centre (WRc plc). Irish Water has developed additional Amendments and Notes for Guidance to CESWI to reflect its own additional general specification requirements. This Code of Practice is based on CESWI an on the Irish Water Amendments thereto.

1.21 Standard Details

Irish Water has developed Standard Details describing typical infrastructure associated with the Works. These Standard Details shall be used as a guide for the development of designs and provision of infrastructure. Extract from these Standard Details for the most common types of infrastructure are included in **Appendix B** below. A full set of the Standard Details for Wastewater collection infrastructure is available on the Irish Water website, at www.water.ie/connections/.

1.22 Temporary Wastewater Connection for Construction Purposes

A Customer requiring a Wastewater connection during the construction period for collection of Wastewater from temporary construction site office accommodation shall apply to Irish Water for the provision of this temporary connection. This temporary Wastewater connection shall only be used for the collection of Wastewater arising during construction activities and the connection shall **not** be used for permanent Works of the development Premises.

A Connection Application is required for a temporary Wastewater connection. This is outlined in the Irish Water Guide to Connect which is available on the Irish Water website, at www.water.ie/connections/. A Connection Agreement is required in all cases before Irish Water advances the provision of a temporary connection to its Wastewater collection Network.

On completion of the construction of the development, the temporary Wastewater connection shall be disconnected by Irish Water or its agents and all of the infrastructure relating to it shall be removed by the Customer to ensure that it is not used as an unauthorised connection in the future. The cost of the disconnection work will be the responsibility of the Customer and will be obtained through the Connection Agreement payments.

1.23 Extensions to Undeveloped Contiguous Areas

Where it is identified by Irish Water that there is a strategic benefit in the possibility of connecting into or extending the Wastewater Works to adjoining land that is not developed, the Customer shall provide for future connections to these areas by upsizing and/or extending the Works to the boundary of these contiguous properties, if required by Irish Water. This will be the subject of a separate Technical Requirements Agreement.

This upsized or extended pipe will terminate in a “blind” manhole, i.e. a manhole built at the end of the extension pipe without an invert or an inlet connection. A temporary bung shall be installed in the outlet pipe from this “blind” manhole.

Irish Water will reimburse the Customer for the cost of this pipe upsizing or extensions at a unit rate commensurate with the average cost of providing the Sewer. Irish Water will also cover the cost increase due to the marginal increase in pipe size within the new Network within the development to service the future Wastewater load of the adjoining development area. The Connection Agreement and associated the Technical Requirement Agreement shall outline how such reimbursement is applied.

Part 2 – Design Requirements and Submissions

2.1 Introduction

A Customer intending to seek a new connection from Irish Water should refer to the Irish Water Guide to Connect which is available on the Irish Water website, at www.water.ie.

The Customer shall carry out or procure the design of the Works. The design shall be carried out strictly in accordance with this Code of Practice. Irish Water shall nominate the location of the connection point the Irish Water Network.

The provisions of the Safety, Health and Welfare at Work Act 2005 and associated Safety, Health and Welfare at Work (Construction) Regulations shall apply in relation to the design and construction of all Works.

2.2 General Design Requirements

The design should incorporate a risk assessment to ensure that risks to both the local community and operators of the Works are minimised. The provisions of the Safety, Health and Welfare at Work Act 2005 and associated Safety, Health and Welfare at Work (Construction) Regulations shall apply in respect of the appointment of competent designers, Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS).

The Customer or his designer shall certify that the design complies with the Code of Practice and Standard Details and accepts liability for compliance through their professional indemnity insurance, which shall be kept in place for a period of 6 years after the completion of the works. The Customer shall ensure that this professional indemnity insurance is retained and that evidence of this is available if requested by Irish Water. The design responsibilities and liabilities shall not be discharged by Irish Water after the design passes a satisfactory inspection and issue of a de-facto statement of no objection via the Connection Agreement.

The design of the Wastewater infrastructure shall be such that a minimum design life is achieved of 50 years for pipework and structures, 25 years for mechanical and electrical plant and 15 years for information, communication and telemetry equipment (ICT).

The Customer shall also provide separate Wastewater and Storm Water drainage systems for redevelopment proposals of brownfield developments. If infill development is proposed on brownfield sites and the Storm Water Sewer system already discharges to a Irish Water Combined Sewer, the Storm Water drainage system shall be designed to ensure that Storm Water discharge from the infill development area is at or less than that which existed prior to the development and ideally as near to a greenfield storm runoff rate as practicably possible based on a SUDS assessment. The Customer can

reduce discharges of Storm Water from a development by the application of appropriate Storm Water controls systems, such as SUDS.

If these requirements, Standards Details and Code of Practice guidelines, are not met, Irish Water is under no obligation to provide a connection to its Network or to Take in Charge the Works.

2.3 Design Submissions

Before an application for a new Connection or an additional Connection can be considered, appropriate information is required from the Applicant to allow Irish Water to assess the Customer's Works proposal. This should be provided in a design submission in advance of a Connection Application for developments. Design submissions are to be submitted to Irish Water using cdsdesignqa@water.ie. Irish Water will engage with the Customer to vet the design of the Works ahead of the Customer finalising a planning application (for housing and mixed use developments to ensure compliance with the Codes of Practice and Standard Details). The design submission shall comprise the following:

2.3.1 The applicant's details, including name, address (Customer's or Agent's details are also required if different from the Applicant);
2.3.2 Location of the Premises with grid reference to the Irish National Grid;
2.3.3 Type of development proposed that requires the Connection, along with details of domestic and non-domestic properties that will be connected to the Works;
2.3.4 Servicing details, including the required Wastewater discharge volume, Wastewater quality parameters, Wastewater discharge profile;
2.3.5 Drawings outlining details of the development as outlined in **Section 2.4** below,
2.3.6 Design calculations as outlined in **Section 2.4** below;
2.3.7 Site Investigation Report;
2.3.8 Contaminated Ground Report (if relevant);
2.3.9 Mechanical and Electrical plant information (if relevant);
2.3.10 Surge analysis report and proposals for surge protection plant, if required;
2.3.11 An Environmental Impact Assessment (EIS) or Appropriate Assessment (AA) Report (if relevant);
2.3.12 An integrated utility layout plan showing the layout of all utility pipes, ducts, etc. and indicating the relative separation distances between the various utility infrastructure;
2.3.13 Details of the Planning Permission and other statutory requirements relating to the development;
2.3.14 A document outlining impact risks of the new infrastructure to existing Irish Water's Wastewater collection and water supply infrastructure to ensure that risks to both the local community and operators of the Works are minimised;
2.3.15 Preliminary Health and Safety Plan;

2.3.16 Construction Method Statements;
2.3.17 The identity of the MDPE/HDPE/HPPE pipeline manufacturer, if PE material is proposed;
2.3.18 Specific information in relation to Specialist Works (See **Section 1.6** above) to establish the whole life cost based on a 20-year operation, and durability of the fixed and buried components relative to a conventional system, to enable an Irish Water assessment of suitability;
2.3.19 Where wastewater pumping stations or pumped systems are being proposed, an assessment of the whole life cost of the system indicating that it's capital and operating costs are less than the cost of conventional gravity systems over a period of 40 years, based on a Net Present Value (NPV) assessment;
2.3.20 Where wastewater pumping stations are proposed, drawings and specifications of the pump station should demonstrate the Area Classification of the pump station or otherwise the absence of zoning;
2.3.21 A report on specialist advice on separation distances between landscape works the Works as obtained from a competent landscaping architects and/or arboriculturists;
2.3.22 The specific location for any scour valve chamber on rising mains requiring the approval of Irish Water and the relevant Local Authority;
2.3.23 A design stage hydraulic model of the Works (if relevant).
2.3.24 If applicable, a written statement from the Roads Authority in whose functional area the development is located allowing the use of alternative Backfill material to that required by Irish Water's for the use of Clause 804/808 granular material.

Irish Water will require the provision of appropriate design parameters, calculations, drawings, details, etc. from the Customer. The Customer's design will be vetted by Irish Water to ensure that it is in compliance with the Code of Practice, Standard Details, specifications and good practice. Any deficiencies that are identified in the proposals will be advised to the Applicant during the design vetting assessment and these deficiencies shall be remedied to the satisfaction of IW. A revision of the design proposed shall be submitted and Irish Water will assess this revised design proposal. Irish Water will issue a Statement of No Objection if the design of the Works is deemed satisfactory. A Connection Agreement will not be issued unless the Customer's design proposal is acceptable to Irish Water.

If a Customer intends to proceed with a variation of the design proposal or construction standards which has already been assessed as being satisfactory by Irish Water, then he/she must apply to Irish Water for approval of the revised design proposal. This application for the variation must include all necessary data and information to prove that the proposed revised design meets the requirements of this Code of Practice. Irish Water is not obliged to accept the alternative design. If Irish Water accepts and agrees with the alternative proposals, written confirmation of acceptance of the waiver from the original design standards in whole or in part will be provided.

Irish Water will not provide retrospective approval of a variation of the design of Wastewater collection infrastructure and are to provide a connection or complete Vesting of the Works based on an unapproved design.

2.4 Drawings, Calculations and Design Information

Drawings and calculations shall be supplied for the Works, including elements that are not to be Taken in Charge by Irish Water i.e. Pipes that are not within the Attendant Grounds of the development.

Layout plans shall be prepared with standard legends and symbols as required by Irish Water's Drawing Standard and at least with water services industry norms. The drawings submitted by the Customer should show the precise layout as dictated by the local topography and all necessary detailed information required for guidance. The layout plans should show the site boundary, existing utility apparatus, North point, Ordnance Grid reference for the centre of the site, Ordnance Grid Reference for the connection point, etc.

Location and layout plans, longitudinal sections and details should show the drainage system and development in full. Plan scales should be in common use, i.e., 1:200, 1:250, 1:500, 1:1000 or 1:2500 as appropriate. Drawings shall be prepared in a digital format and submitted in standard "AutoCAD (dwg/dxf)" file format. Details to larger scales should be provided where necessary. The drawings submitted should also show the following:

2.4.1 The location of the site on an Ordnance Survey Map with the site outlined in red,

2.4.2 Layout roads and properties including plot numbers, phasing of development (if relevant);

2.4.3 Layouts of Sewer, outfalls, manholes, Storm Water Sewer, details of all associated features and external property drainage details, including details of existing services in the case of infill or brownfield sites;

2.4.4 Details of over ground or underground structures within the attendant grounds that are to be Taken in Charge by Irish Water;

2.4.5 Contours of existing ground levels, proposed ground levels and property floor levels relative to Ordnance Datum (Malin Head);

2.4.6 Longitudinal sections, to an exaggerated vertical scale, showing proposed levels, existing ground levels, invert levels, pipe sizes, bedding, haunch and surround details, backfill details, together with manhole locations, chainages, gradients, pipe sizes, pipe materials, etc. All manholes should be given unique, sequential numbers/letters for identification;

2.4.7 Locations of all natural features, such as trees, streams, rivers, springs, etc., which are in the vicinity of the drainage system;

2.4.8 Location of manmade features, such as existing structures, buildings, roads, bridges, etc., which are in close proximity to the proposed Works;

2.4.9 An integrated utility layout plan showing the layout of all utility infrastructure (ESB Networks, Gas Networks Ireland, telecommunication provider ducting, etc.) and indicating the relative separation distances between the various utility infrastructure;
2.4.10 Layout taking into account possible future developments;
2.4.11 Location of Ordnance Survey (OS) Benchmarks and their value to Malin Head Datum.

The design should be clear and unambiguous outlining the Wastewater flows based on the type and number of units served, occupancy rate of the units, per-capita Wastewater, organic loads, etc. The design should outline the dry weather flow, peak flow, etc. The Works should be designed using an approved software package, which generates a Network model or spread-sheet, Sewer flow, etc. in its output.

The design should cover associated works such as pipe supports, beds, surrounds, backfill, surface restoration, access requirements, etc.

The submission should include a soil investigation report including details of soil analysis, results of the soil analysis in tabular format, plans showing the locations where site investigations were carried out and the location of samples taken, details of known contaminants, details of possible contamination, mitigation proposals/measures to address soil contamination, details of standing water tables, etc. Irish Water reserves the right to have its own independent site investigation work carried out to verify the results of the submitted site investigation data and reports. The cost of this will be recovered by Irish Water from the Customer under the Connection Agreement or under a separate Project Works Service Agreement.

The submission should include a schedule of materials required for the proposed Works, including the size and lengths of pipes, fittings, etc.

The design submission should provide specific information of any business (non-domestic) developments that are to be served, including information on Wastewater arising from such developments, any special characteristics associated with the Wastewater, organic loads, etc., and Section 16 (Water Pollution Act) Licences (existing and future) associated with these developments.

The submission should also provide any relevant reports and information pertaining to the development, such as Flood Risk Reports, Habitat Directive Reports, Appropriate Assessments, Sub-Threshold Environmental Impact Assessments, etc.

Irish Water will nominate a suitable location for the Wastewater Connection Point(s) for connection of the Works to the Irish Water Network to provide adequate discharge capacity to meet the level of service, bearing in mind proposals for future development

2.5 Hydraulic Modelling

Irish Water may require the Customer to provide a hydraulic model of the Works within the new development to confirm that the proposed Works provides the best engineering solution and value proposal.

The ‘design stage’ hydraulic model of the proposed development shall be constructed using appropriate data and all flow assumptions shall be comprehensively explained in accompanying documentation. At the discretion of Irish Water the Customer may be required to assist in the determination of the impact of the additional Wastewater flows on the existing Works using the ‘design stage’ model inputs.

Upon completion of the proposed development, or at a designated stage of the development as required by Irish Water, the Customer shall upgrade the ‘design stage’ hydraulic model to a ‘constructed stage’ hydraulic model. The ‘construction stage’ hydraulic model shall include information from as-built surveys and shall be verified in accordance with Irish Water’s latest model specifications.

The Customer shall demonstrate to Irish Water (i.e. using the ‘constructed stage’ hydraulic model) that the constructed Works is performing to the hydraulic standards for which it was designed with results comprehensively demonstrated in accompanying documentation. On site flow verification of the hydraulic model results shall be used to confirm this.

Part 3 – Works Design

3.1 Compliance

The Works should comply with this Code of Practice. The Works should also comply with:

3.1.1 The Standards set out in Appendix A;
3.1.2 The Civil Engineering Specification for the Water Industry, 7th Edition (CESWI), published by the Water Research Centre (WRc plc). This document is subject to amendments set out by Irish Water appropriate to Ireland's Water Services sector and this Code of Practice takes account of these amendments;
3.1.3 The Environmental Protection Agency Guidance Document for Small Wastewater Treatment Plants in terms of the expected Wastewater loadings from various types of facilities.

Proposed Premises should be drained on the basis of a completely **separate Wastewater Sewer system** and **Storm Water Collection system** as outlined in **Section 1.5**.

3.2 Reliability and Design Objectives

Pipes should be free from defects or other features that might cause blockage or otherwise impede the design flow. Gravity Drains, Service Connections and Sewers should have adequate gradient to maintain self-cleansing conditions (full pipe velocity generally greater than 0.6 m/sec). Rising Mains should be sized to achieve self-cleansing velocities and excessive velocities in the Rising Main should be avoided. The range of flow velocity within the Rising Main should be between 0.75 m/sec and 1.8m/sec.

3.3 Materials – General Requirements

Materials including products, components, fittings or naturally occurring materials used in the construction of the Works shall comply with this Code of Practice and be of suitable nature and quality for their intended use. In addition, materials used in the Works design and construction shall achieve the following:

3.3.1 pollution of surface receiving waters and groundwater is prevented;
3.3.2 for all practicable purposes, they are watertight;
3.3.3 odour nuisance or creation of toxic explosive or corrosive substances is avoided;
3.3.4 noise and vibration is minimised.

The suitability of materials and products can be demonstrated by appropriate use of a product bearing CE marking in accordance with the EU Construction Products Regulations (No. 305/2011 –CPR) and any other relevant Directives which require:

3.3.5 a product complying with an appropriate technical specification (as defined in appropriate Directives and Regulations);
3.3.6 compliance with an appropriate harmonised Standard or European Technical Assessment in accordance with the provisions of the Construction Products Regulations (No. 305/2011 –CPR);
3.3.7 Compliance with an appropriate Irish Standard or Agreement Certificate or with an alternative national technical specification of the European Union;
3.3.8 a product bearing a CE Marking in accordance with the Construction Products Regulations (No. 305/2011 –CPR).

From 1st July 2013, CE MARKING of construction products covered by harmonised European Standards is mandatory.

Pipes should have sufficient ring stiffness to prevent deformation during storage, embedment and backfilling. Materials and components should comply with the following:

3.3.9 the manufacturing process should minimise the use of solvent-based substances that emit volatile organic compounds or ozone-depleting substances;
3.3.10 products should be made from recycled material, where reasonably practicable.

In the event that ground conditions in any part of the site prove to be anything other than inert material, the Customer shall inform Irish Water accordingly and take whatever precautions are deemed necessary by Irish Water to deal with the situation. These precautions may include, but are not limited to, the laying of the Sewers which are specially designed for use in contaminated ground. Such Sewers shall also be installed in specifically designed trenches as approved by Irish Water.

3.4 Structural Design and Integrity – Specific Requirements

The Works shall be designed and constructed to ensure structural integrity over their design life. The design shall ensure that:

3.4.1 all connections to existing Sewers are carried out in a manner that do not compromise the structural integrity of the existing Sewer and that the connection to the Sewer does not damage the structural integrity of the pipe;
3.4.2 buried pipes have sufficient depth of cover, as set out in **Section 3.9** below, to afford adequate protection from anticipated imposed loading, including loading from the passage of construction plant as well a normal design loading, low temperatures and damage from normal use of the land and

where this cannot be achieved, there should be suitable alternative protection measures provided;

3.4.3 manholes and branch pipework are built into the Works for planned future connections, to the requirements of Irish Water, if requested;

3.4.4 if the depth of cover to the crown of the pipe is less than the values recommended herein, protection measures are provided by a concrete slab, a concrete surround with flexible joints or a ductile iron pipe;

3.4.5 all pipes have the structural ability to resist the possible incidence of punching shear;

3.4.6 no vertical load is imposed by structures such as shafts onto non-load bearing components such as the pipes;

3.4.7 the Sewer system is resistant to tree root ingress where there is a risk of such intrusion, (e.g. by use of appropriate barriers or pipelines constructed from polyethylene with welded joints).

3.5 Layout of Works and Manholes

The layout of Gravity Sewers, Rising Mains, manholes and chambers in the Works should:

3.5.1 be as simple as possible;

3.5.2 ensure infrastructure is located so that if there is a structural failure an excavation may be carried out to repair the failure without impairing the integrity of adjacent buildings or other infrastructure;

3.5.3 ensure infrastructure is located in public pavements, roads or in public open spaces (Rising Mains may be located in either public roads/areas or in private property, subject to the availability of a Easement giving Irish Water access for maintenance and operational activities);

3.5.4 ensure infrastructure is designed and constructed in order to provide access for any reasonably foreseeable maintenance activities

3.5.5 ensure infrastructure is located so that it is accessible and apparent to Irish Water or their Agents;

3.5.6 ensure infrastructure is laid on the side of the street/road where the housing density is greatest so that the number of service pipes road crossings are minimised;

3.5.7 ensure a single as opposed to dual Sewer infrastructure system layouts;

3.5.8 ensure that the maximum distance between manholes does not exceed 90m.

Alternative routes should be considered to identify the best achievable route that takes account of whole-life cost arising from construction, maintenance, operation and eventual decommissioning of the asset (See also **Section 5.2**, Pumping Station General Requirements).

Sewers should be located to ensure acceptable clearances between the line of the new Sewer and the proposed property construction and any existing structures and features on the site. **Under no circumstances will Irish Water accept Sewer installations**

under structures, existing or proposed, or in close proximity to existing structures or features that will inhibit access for post installation maintenance and access.

The following general requirements apply to the locations of the Works in new developments:

3.5.9 The external face of any new Sewer should be at least **3.0 m** or a distance equivalent to the depth of the Sewer below the foundation, whichever is greater, from the external face of any building or development structure. This is to allow future access and maintenance of the pipeline. Foundations and basements of adjacent buildings should be designed to ensure that no extra loads are transferred to the pipeline. The minimum clear distance will be increased if the Sewer is greater than 3m deep or if the diameter is greater than 375mm. The minimum clear distances in these situations shall be greater than the depth to invert or ten (10) times the Sewer diameter, whichever is the greater;

3.5.10 Sewers and service connections should not be constructed under any building or structure. No building may be constructed over the line of a Wastewater Sewer, service connection or Drain, in accordance with the Section 29 of the Public Health Act 1878 and the Water Services Act;

3.5.11 Sewers, where practicable, should be located in areas maintained by the Local Authority, i.e., road verges, roads and public open space or a space where they are reasonably accessible and visible. Sewers should not be laid in enclosed private land, where there is a practicable alternative route;

3.5.12 Sewers should be laid in straight lines in both the vertical alignment (profile) and horizontal alignment (plan) except that bends up to 45 degrees may be laid immediately outside inspection chambers;

3.5.13 Where Wastewater and Storm Water manholes are adjacent, their positions should be staggered to allow for crossing over of Sewers. Staggered positioning of Wastewater and Storm Water manholes is required with a full separation between the Wastewater and Storm Water Sewer systems (Note that Irish Water does not have responsibility for Storm Water Sewer systems.);

3.5.14 The design of landscaping should be undertaken at the same time as the design of the Drains and Sewers so that the impact of tree roots on The Works can be considered. A Sewer or service connection should not be located closer to trees/bushes/shrubs than the canopy width at mature height, except where special protection measures are provided. A tree should not be planted directly over Sewers or where excavation onto the Sewer would require removal of the tree;

3.5.15 When in a road or highway, the outside of the Sewer should be in the vehicle carriageway (not footway) and be at least 1.0 m from the kerb line. The external faces of manholes should be at least 0.5 m from the kerb line;

3.5.16 A Storm Water sewer or a wastewater Sewer should generally not be installed to cross over a Water Main. Where crossing over a water main is

unavoidable, joints in the Water Main shall not be located directly above surface water or Wastewater Sewer crossings. No other utility service should be laid longitudinally directly above the line of the Wastewater Sewer;

3.5.17 Any Sewer crossing of a Water Main shall do so at right angles, or as near to as possible, to avoid prolonged envelopes of influence between the services. Crossings should be located midway between the Water Main joints with a minimum vertical clear distance of at least 300mm and up to 500mm in some instances between the Sewer pipe and the Water Main. All such crossings shall be to Irish Water approval and shall not be undertaken until Irish Water or its agents has examined the work at the crossing point and deemed it fit for backfilling;

3.5.18 There should be a minimum clear horizontal distance of at least 300mm between the Gravity Sewer/Rising Main and other utilities running parallel to it, as well as to cabinets, poles, junction boxes, manholes or chambers;

3.5.19 Specific separation clearance distances in excess of those outlined above shall be provided for services such as gas, electricity, fibre-optic or oil filled cables as the case may be. The particular utility providers shall be consulted to determine these minimum separation distances and evidence of this consultation, with the specified separation distances, shall be provided to Irish Water at design submission stage. For example, the minimum separation distances for Gas Networks Ireland infrastructure shall be in accordance with IS329 ‘Gas Distribution Mains’ and IS328 ‘Code of Practice for Gas Transmission Mains’ as amended/updated;

3.5.20 Where it is proposed to lay pipes in third party land, a Deed of Grant of Easement should be obtained from the owner of the land surface as to the acceptable level of predicted settlement, prior to the construction. Construction and permanent Deed of Easement, comprising a conditional Burden on the Title, are to be obtained complying with particular widths requirements and such Easement should be to the benefit of and registered with Irish Water as the owner following Vesting. The Easement shall not be built upon after the installation of the Sewer. The construction techniques should be selected to ensure that the maximum settlement is within the agreed limits;

3.5.21 Rising Mains shall be laid in straight lines or in gentle curves utilising allowable joint deflection, to manufacturer’s requirements, or using long radius bends. Where bends are used, they should be formed with proprietary bends of suitable material allowing for a fully integrated joint, and securely anchored with thrust blocks. The provision of access points for pigging or rodding the Rising Main is desirable, especially along long Rising Mains. If possible, Rising Mains should be evenly graded between the intake point and the discharge point. If this cannot be achieved, the Rising Main should be fitted with sewage air valves and scour valves. Both of these should be suitable for use with raw Wastewater. Containment of the Wastewater volume at the scouring point should be accommodated and arrangements made for its collection by vacuum tanker and transportation

to a suitable point for treatment or reintroduction into the Wastewater collection Network;

3.5.22 The route of Rising Mains should be marked at every field boundary and, where practicable, at every change of direction by marker posts. The Words 'Pumped Sewer' and the depth to the top of the Rising Main should be provided. Non-degradable marker tape should be installed 300mm above the crown of the Rising Main. In the case of non-metal pipe material, the marker tape should incorporate a trace wire which is linked to the marker posts and terminating at the Wastewater pumping station and the discharge manhole;

In the case of installations to be constructed in close proximity to **existing Sewers**, specific approval of Irish Water shall be obtained. In the case of existing Network pipework, alternative minimum horizontal distances shall be maintained between pipes/ducts, cabinets, poles, manholes, junction boxes, chambers, etc., as outlined in **Section 3.20** below.

3.6 Hydraulic Design for Gravity Sewers

The hydraulic design of the Works shall include an allowance for envisaged flows as well as increased flows that might be reasonably foreseeable within the development, based on Local Authority Development Plans or as advised by Irish Water.

Gravity Sewers should be designed to convey the projected flows together with an allowance for:

3.6.1 variations in Wastewater flows resulting from increased occupancy or intensification of the development commensurate with the introduction of water saving measures;

3.6.2 increased trade effluent flows resulting from reasonable changes in use or intensification of development of an industrial or commercial development;

3.6.3 levels of groundwater infiltration that might reasonably be expected over the life of the Drain or Sewer system;

3.6.4 inflow of surface water that might reasonably be expected due to leakage or accidental connection, giving rise to partially separate flows.

The Irish Water requirements for the design of wastewater gravity sewers are set out in **Appendix C** of this Code of Practice

The Works should be watertight to minimise the ingress of groundwater and Surface Water.

The Works which carry domestic Wastewater shall be designed to carry a Wastewater volume of between 6 times and 2.5 times the dry weather flow depending on the size of the development, as outlined in **Section 1.2.5** of **Appendix C**. Dry weather flows (DWF) should be taken as 446 litres per dwelling (2.7 persons per house and a per capita

Wastewater flow of 150 litres per head per day along with a 10% unit consumption allowance in line with **Section 3.6.3** above and **Section 1.2.4 of Appendix C**). For small numbers of housing units, the use of higher peak flow multipliers may be used for design purposes to reflect the proximity to source and the attenuation that naturally occurs in the Sewerage system.

Where the Works carry industrial or commercial wastewater, the wastewater collection system shall be designed to carry the wastewater flows outlined **Section 1.2.6 to 1.2.9** of **Appendix C**.

Allowances for flows associated with **Section 3.6.4** above and for Urban Creep, as outlined in **Section 1.2.10** of **Appendix C**, shall also be incorporated into the design of the wastewater collection system.

When calculating emergency storage requirements in accordance with **Section 5.2**, **Section 5.7** and **Section 5.11** of this Code of Practice**,** average trade wastewater flows should be used towards the calculation of the storage capacity requirement. The storage capacity requirement shall be between 6 and 24 hours, depending on the size of the development. Where the trade wastewater flow of 0.16 litre/sec/ha, 0.33 litre/sec/ha or 0.66 litre/sec/ha (as outlined in **Section 1.2.8** of **Appendix C**) are used to estimate the maximum trade wastewater flow, these can be converted to an average trade wastewater flow by dividing by a factor of 3.

Storage facilities may be required at the Premises site to balance the discharge from the site if requested by Irish Water to limit the effluent discharge so that the allocated capacity of the Irish Water Network is not exceeded. Details of such storage should be provided in the design provided at Connection Application Stage.

As a general rule, it is preferable to aim to achieve self-cleansing velocity in the pipe system at least once per day. This varies for pipe sizes with self cleansing velocity of 0.75m/sec for pipes less than 300mm diameter and 0.77m/sec for pipes 375mm and 450mm diameter. The designer should aim to achieve a flow velocity at the design flow (i.e. peak flow) of between the required self cleansing velocity and a velocity of 2.0m/s, with 2.5m/s as an upper limit.

Subject to the limitations imposed by the foregoing, pipe sizes and gradients should be selected from approved pipe design tables, based on an approved design approach, such as the use of the Colebrook White equation. It may not be possible to provide a self-cleansing velocity within small diameter pipe sizes, while meeting the minimum flow velocity requirement of 0.75m/sec design flow. Where this requirement cannot be met, the criterion would be considered to be satisfied by the following:

3.6.5 a 150 mm nominal internal diameter Gravity Sewer is laid to a gradient not flatter than 1:150 where there are at least ten dwelling units connected or 1:60 for up to nine connected dwelling units; or

3.6.6 a service connection with a nominal internal diameter of 100 mm laid to a gradient not flatter than 1:80, where there is at least one WC connected and 1:40 if there is no WC connected.

These parameters should not be taken as a norm when the topography permits steeper gradients. Hydraulic studies indicate that these requirements may not necessarily achieve a self-cleansing regime. When a choice has to be made between a Gravity Sewer system and pumped pipe system, these criteria should not be regarded as inflexible. The roughness value (ks) for Gravity Sewer design should be chosen to suit the material being proposed and the "long term roughness value" should be chosen.

In general, pipes of **100mm** diameter should be laid at minimum gradients of between 1:60 and 1:100. Pipes of **150mm** diameter should be laid at a minimum gradient of 1:150. Pipes of 225mm diameter should have a minimum gradient of 1:200 and pipes of greater diameter should comply with self cleansing and maximum velocity requirements. Pipe gradients for private side drainage should be constructed in accordance with that indicated above as a minimum, or with Building Regulations requirements.

3.7 Hydraulic Design for Rising Mains

Rising Mains should comply with the following:

3.7.1 The hydraulic design shall include an allowance for envisaged flows that might be reasonably foreseeable within the development;

3.7.2 The diameter should be such that the velocity of discharge is in the range 0.75m – 1.8m per second and that any blockages of the pipeline are avoided;

3.7.3 Diameters of less than 80mm should not be provided and the typical minimum diameter should be 100mm diameter (Rising Mains of lower diameter might not be taken over by Irish Water);

3.7.4 Pipes less than 80mm will only be considered with the use of appropriately sized/type pumps. Such systems are only appropriate for taking low flow volumes and shall be provided with suitable anti-septicity systems;

3.7.5 The roughness value **(k_s)** should be chosen to suit the material being proposed and the "long term roughness value" should be chosen suitable for mean velocities between 1.1 and 1.8m/sec;

3.7.6 The installed minimum gradient shall be **1:500** rising and **1:300** falling with Wastewater type air release valves at the high point to facilitate air removal;

3.7.7 The gradient shall be a continuous rise without air valves if possible;

3.7.8 Where it is proposed to install rising mains with gradients that are steeper than 1:10, the Developer shall advise and seek review by Irish Water's Connection and Developer Services. Alternative gradient proposals may be required in such instances;

3.7.9 Rising Mains longer than 500m in should have provision for in-line rodding, access and cleaning by the provision of on line proprietary "hatch boxes";

3.7.10 Drain and washout facilities at low points should be provided with infrastructure for collection and appropriate treatment of the drained contents in order to ensure protection of the environment during such operations;

3.7.11 Wastewater type air release valves should be provided at high points to counteract air coming into solution;
3.7.12 Rising Mains should be designed to avoid septicity (twin pipe systems if necessary);
3.7.13 Surge analysis, subject to Irish Water approval, should be carried out for all Rising Mains and surge protection should be provided, where deemed necessary, for Rising Mains to protect the pipe from shock. Cyclic fatigue of pressure pipe systems should also be taken into account in the design of the pipeline;
3.7.14 Rising Mains should not discharge directly to a Sewer. In all cases, a separate discharge manhole or header chamber shall be provided (see **Section 3.15**). This manhole/chamber will be linked to the receiving Sewer by a short section of Gravity Sewer (minimum of 100mm diameter) connected to the receiving Sewer at a manhole location. A saddle connection between the gravity discharge pipe and the Sewer may be appropriate for single house pumped discharges. The discharge manhole or header chamber shall be sized and designed to avoid turbulence and to achieve a smooth discharge to the Gravity Sewer system. Venting of the header manhole to a vent-column shall be provided where required and deemed practicable. If not feasible, a pressure sealed manhole should be provided.

3.8 Pipe Sizes

The minimum size for a Gravity Sewer, subject to the criteria outlined in **Section 3.6** above, should be:

3.8.1 150mm nominal internal diameter for carrying Wastewater from 20 properties or less;
3.8.2 At least 225mm nominal internal diameter carrying Wastewater from more than 20 properties.

The minimum size for a Service Connection shall be 100 mm. The minimum size for Gravity Sewer serving less than 20 properties shall be 150 mm diameter. The minimum pipe size for Gravity Sewer where more than 20 housing units are connected is 225mm diameter subject to hydraulic design capacity assessment requirement. A pipe size greater 225mm diameter shall be provided where the design flow exceeds the capacity of the 225mm diameter pipe.

The minimum size for a Rising Main should not be less than 80mm internal diameter. Rising Mains less than 80mm will only be considered with the use of appropriately sized/type pumps. Such systems are only appropriate for taking low flow volumes and shall be provided with suitable anti-septicity systems.

3.9 Depth of Cover

Gravity Sewers and Rising Mains shall be designed in accordance with the requirements of BS 9295. As a general guide the, minimum depth of cover from the finished surface to the crown of pipework **without protection** should be as follows:

3.9.1 Areas without any possibility of vehicular access - depth not less than 0.5 m;
3.9.2 Driveways, parking areas and yards with height restrictions to prevent entry by vehicles with a gross vehicle weight in excess of 7.5 tonnes - depth not less than 0.75 m;
3.9.3 Driveways, parking areas and narrow streets without footways (e.g. mews developments) with access for vehicles with a gross vehicle weight in excess of 7.5 tonnes - depth not less than 0.9 m;
3.9.4 Depths of pipes in gated estates shall be as outlined above points 3.9.1-3.9.3;
3.9.5 Agricultural land and public open space - depth not less than 0.9 m;
3.9.6 Other roadways, highways and parking areas with unrestricted access to vehicles with a gross vehicle weight in excess of 7.5 tonnes – depth not less than 1.2 m.

The depth of cover to pipework can be reduced by the installation of concrete beds and surrounds. This is discussed in greater detail below. The depth of cover is also dependent on whether the pipework installation is a rigid or a flexible construction.

3.10 Roadway/Footway Surface Reinstatement

Roadway's/footway's surface finishes above the trench backfill and pipe granular surround material in new developments shall be to the requirements of the Roads Authority in whose functional area the development is located and/or as outlined in the Planning Permission for the development.

Reinstatement of trench surfaces in existing Public Roads shall be to the requirements of the relevant Local Authority Roads Department's Road Opening Licence, unless otherwise specified by Irish Water. This will require compliance with the "Guidelines for the Opening, Backfilling and Reinstatement of Trenches in Public Road", 2nd Edition, or subsequent amendments published by Department of the Transport, Tourism and Sport.

The reinstatement of trenches on National Roads shall be in accordance with the TII "Specification for the Reinstatement of Openings in National Roads" or subsequent amendments published by Transport Infrastructure Ireland, unless otherwise specified.

3.11 Access to the Works

Access structures to Works shall be located to minimise the risk of damage to buildings or other infrastructures. Such access points are generally provided through manholes.

Inspection chambers may be provided as access points in the case of small diameter Sewers at shallow depths (less than 900mm cover). Manholes should be designed to:

3.11.1 Provide reasonable access for equipment to carry out maintenance activities;
3.11.2 Provide safe access and egress in accordance with Health and Safety Authority requirements and in accordance with Health and Safety Legislation;
3.11.3 Have a minimum clear access of 600 mm x 600 mm. (However, designers must have regard to safe access/egress requirements to Works by operatives with breathing apparatus in accordance with the Preliminary Safety and Health Plan as prepared by the Project Supervisor Design Process (PSDP) which must include requirements for a safe means of access and egress);
3.11.4 Incorporate an access shaft in situations where the manhole is of deep construction, with a minimum clear access opening of 600mm x 600mm and minimum internal dimension of 900mm x 900mm.

Access points to the Works shall should be located with due regard to public utility services, safety and security. Access to shallow Sewers via inspection chambers should be provided at maximum intervals of **45m**. Access to Sewers via manholes should be provided at maximum intervals of **90m** for Sewers of 225mm diameter and above, and at maximum intervals of **75m** where the Sewer size is 150mm diameter, and in the following positions

3.11.5 At all changes of pipe direction;
3.11.6 At all changes of pipe gradient;
3.11.7 At all changes of pipe material;
3.11.8 At all changes of pipe diameter;
3.11.9 At the head of all Sewers;
3.11.10 At all Sewer junctions of two or more pipes;
3.11.11 At every junction of a Wastewater Sewer with another Sewer serving three or more properties where the access point is a manhole;
3.11.12 At the point of connection of the Works to the Network.

In addition to the above, the following should also be adhered to:

3.11.13 An inspection chamber should be installed within the boundary to the Curtilage of a Premises or within 1m of the Premises, if practicable, to allow access to the private Drain and the service connection,
3.11.14 Drains and associated Accessories upstream of the point of connection to Works is the responsibility of the property owner and should be constructed in accordance with the Building Regulations subject to the provision of an inspection chamber as above.

Access points (manholes and chambers) should be located so that they are accessible and apparent to the maintainer at all times for use. They should avoid rear gardens or enclosed locations and they should never be overlain with surface dressing, topsoil, etc. Additional access points may be provided in other locations, as long as access is provided to the system from other access points.

3.12 Manholes

Manholes should generally be provided as the means of access to the Works and particularly where;

3.12.1 the depth from the surface to the crown of the pipe is greater than 900mm;

3.12.2 there are two or more upstream pipes each serving more than one property; or

3.12.3 the distance between manholes would otherwise be greater than **90** m for Sewers of 225mm diameter and above, and **75m** where the Sewer size is 150mm diameter.

Inspection chamber access may be acceptable where the pipe is of small diameter, the depth to invert of this pipe is less than 900mm and no part of the pipe is more than 22.5 m from the adjacent inspection chamber (i.e. the distance between the adjacent inspection chambers should be no more than 45 m).

A manhole, in general, should not be located in carriageways situations where traffic loading is anticipated to be heavier (e.g., in industrial developments where large numbers of HGV vehicles with a gross vehicle weight in excess of 7.5 tonnes are expected) than would occur on a typical residential estate distributor road. Manhole covers and frames to IS EN 124, with D400 load capacity, should be used where manholes are located on roads. If the manhole location is on a carriageway, a cover with a higher load bearing capacity than the standard IS EN 124, D400 cover, should be used. Covers with E600 rating should be used in heavily trafficked roads, as required on a case by case assessment basis.

Manholes are to be fitted with step rungs or fixed ladders as required depending on the depth of the manhole and to allow safe self egress. Step rungs are to be provided in manholes where the depth from ground to the soffit of the pipe is up to 3.0m. Fixed ladders are required in manholes where the depth from ground to the soffit of the pipe exceeds a depth of 3.0m and up to 6.0m. A site specific engineering solution shall be provided to Irish water for review for access arrangements in manholes where the depth between ground and the soffit of the pipe exceeds 6.0m.

Site specific risks are to be assessed relating to access to manholes during construction as well as during the operational phase and design mitigation measures implemented as required. All manhole entry and egress is to be carried out using a safety access plan incorporating the use of safety equipment, tri-pod and winch. The designer must ensure that the general principles of prevention, as well as relevant Health and Safety legislation, are taken into account when selecting manhole covers and frames in respect

of manual handling, opening size for access, egress and rescue, etc. Proprietary lifting equipment for covers should be provided to allow safe lifting of covers and this should be consistent to avoid risk of accident due to misuse.

Backdrop manholes shall be provided where there is a differential in depth between the incoming and outgoing Sewer inverts of 1m or more. These backdrop manholes should be provided with a horizontal rodding eye internally. Where the back drop from the Sewer is constructed at right angles to the vertical plane or where the drop exceeds 900mm, a vertical rodding pipe from ground level, complete with a surface cover and frame to IS 261, etc., shall be provided.

Manholes are to be constructed of the following materials:

3.12.4 In situ concrete, C30/37, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, with a minimum wall and floor thickness of 225mm for manhole depths up to 3.0m and 300mm or more when the manhole depth exceeds 3.0m, complete with a cast in situ concrete roof slab, minimum thickness of 225mm, depending on manhole dimensions, reinforced with high tensile steel bar reinforcement, with a minimum 40mm concrete cover.

3.12.5 Precast concrete manholes shall only be provided where the water table is low. The precast wall units shall be provided with rubber sealing ring gaskets between units, complying with the requirements of IS EN 1917 and BS 5911 – Part 3, subject to specific approval of Irish Water, complete with a 150mm minimum thickness cast in situ concrete surround, C16/20, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620. The precast concrete manhole shall have either pre-cast or cast in-situ concrete base (225mm minimum thickness beneath channel) and pre-cast or cast in-situ concrete roof slab (225mm minimum thickness), both constructed of C30/37 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, reinforced with high tensile steel bar reinforcement, with a minimum 40mm concrete cover. The concrete surround to the precast concrete wall units shall only be omitted if the manhole ring has a wall thickness of 125mm or more and where a proprietary watertight sealing system is provided as an integral part of the manhole wall system.

3.12.6 High density, high strength, solid concrete block work walls only in circumstances where the depth of the Sewer is less than 1,200mm (the use of block work in deeper manholes will be considered but such use will require detailed structural design and agreement with Irish Water). Block work to be flush pointed and not plastered internally, complying with the requirements of IS EN 771, with internal lining of solid engineering brick to IS EN 771 to a height of 1.0m above the benching, bonded to the concrete block work, supported on a 225mm thick concrete floor with a reinforced concrete roof of 225mm minimum thickness, both cast with in-situ C30/37 concrete, in accordance with IS EN 206, 20mm aggregate size, in

accordance with IS EN 12620, reinforced with high tensile steel bar reinforcement, with a minimum 40mm concrete cover.

Manhole Dimensions depend on the size of the main Sewer and the number of pipes accommodated in the manhole. The design size should permit safe entry and exit without unduly restricting operating space. All manholes shall have a minimum internal clear dimension of 1,200mm on manholes up to 3m depth. The internal dimensions of manholes will vary with the pipe size, the number of pipes entering the manhole, the direction of entry of the pipes relative to the outlet pipe, the variation in depth between the inlet and outlet pipes and the depth of the manhole itself. Manholes shall have an open channel allowing smooth flow between the inlet pipe(s) and the exit pipe. A safety chain shall be fitted on the downstream pipe where it exceeds 450mm diameter, subject to health and safety requirements. Manhole dimensions shall be in accordance with IS EN 752.

As a guide, the following nominal internal dimensions of manholes will apply

Nominal diameter of largest pipe in manhole (mm)	**Minimum nominal internal dimension of manhole (mm)**
Less than 375	1200
375 - 450	1350

It should be noted that this Code of Practice relates to pipe sizes of 450mm diameter and below. Larger diameter Sewer sizes are outside the scope of this document.

Manhole Bases should be constructed of cast in situ C30/37 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, with a minimum thickness of 225mm. Thicker manhole bases are required for Sewers in excess of 3m deep or where the manhole size is greater than the standard minimum size outlined above. Alternatively, approved precast concrete bases may be used, incorporating channels, benching, etc. subject to Irish Water approval and compliance with BS 5911, Part 4. Where precast concrete rings are used with cast-in-situ concrete bases, the bottom ring unit shall be cast into the base slab to ensure adequate sealing of the wall/base junction.

Manhole Walls should be constructed of cast in situ concrete, C30/37 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, with a minimum thickness of 225mm. Thicker manhole walls are required for Sewers in excess of 3m deep where the size is greater than the standard minimum size. Alternatively, approved precast concrete ring units may be used where the water table is low. These units shall comply with the requirements of IS EN 1917 and BS 5911 – Part 3, complete with a cast in situ concrete surround of 150mm minimum thickness of C16/20, 20mm aggregate size. The concrete surround to the precast concrete wall units shall only be omitted if the manhole ring has a wall thickness of 125mm or more and where a proprietary watertight sealing system is provided as an integral part of the

manhole wall system. In shallow manholes, less than 1.2m deep, high density solid concrete block work walls may be used.

Manhole Roofs should consist of a reinforced concrete slab of in situ C30/37 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, with a minimum thickness of 225mm, designed to carry all live and dead loads. Alternatively, approved precast concrete roof slabs may be used in compliance with BS 5911 - Part 4:2002. This approach would be the preferable option where pre-cast concrete ring units are used as manhole walls. An access opening shall be formed in the manhole roof slabs. The minimum dimensions of the roof opening shall be 600mm by 600mm. Circular manhole openings of 600mm diameter may be used if the manhole cover is circular. The opening in the roof slab shall be formed over the benching with the widest width at invert level.

Manhole Inverts should be fitted with smooth flow channels to accommodate the flow from the inlet pipe(s) to the outlet pipe. For straight through manholes, with similar size inlet and outlet Sewers, an open channel or half round pipe section, bedded in cement sand mortar, may be used. Otherwise, the manhole invert should be formed with cast in situ concrete, C25/30 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, finished with a 1:3 cement sand mortar. Alternatively, pre-cast concrete bases, incorporating pre-formed channels and benching, may be used. Such units shall be in accordance with the provisions of IS EN 1917 and BS 5911 – Part 3. Where there is more than one incoming Sewer discharging to the manhole, the benching shall be so shaped as to guide the flow in the direction of the outgoing Sewer. The benching shall be brought up vertically at the flow channel to the level of the crown of the incoming Sewer. The benching shall slope away from the vertical edge at a slope of 1:30. The crowns of the incoming and outgoing Sewers shall be kept at the same level. The flow channel shall be sloped gradually and evenly between the incoming and outgoing Sewer. Staggered toe-hole rebates, 200mm wide x 150mm high x 150mm deep, shall be provided in vertical invert benching at 300mm centres in channels of sewers of 600mm and greater to allow access from the benching to the channel invert.

Manhole Shafts are required in deep manholes for manholes in excess of 1,200mm x 1,200mm plan area or 1,200mm diameter. The distance between the top of the benching and the soffit of the main roof slab supporting the shaft structure should be not less than 2.1m. The minimum internal dimensions of the access shaft shall be 1,200m by 1,200mm, or 1,200mm diameter. The corresponding opening in the main chamber roof slab shall be at least 1,200m by 1,200mm, or 1,200mm diameter. The walls shall be formed in reinforced C30/37 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, cast monolithic with the main chamber roof slab. The minimum thickness of the shaft walls shall be 225mm. The supporting roof slab shall be formed in reinforced C30/37 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, and shall be 225mm thick. Alternatively, approved precast concrete ring units complying with the requirements of IS EN 1917 and BS 5911 – Part 3, may be used as manhole shafts, complete with a

cast in situ concrete surround of 150mm minimum thickness of C16/20 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620.

Rocker Pipes shall be provided for rigid pipe at the entry to and exit from manholes to form a flexible joint upstream and downstream of the manhole structure. The length of rigid pipe built into the manhole wall shall extend no further than 600mm from the inner face of the manhole wall. The length of the next pipe, the rocker pipe, shall be varied in relation to the pipe diameter with lengths of 600mm for pipes of 150mm to 600mm diameter. Lengths of 1,000mm for pipes of 600mm to 750mm diameter and lengths of 1,250mm for pipe diameters in excess of 750mm would apply but these pipe diameters are outside the scope of this Code of Practice. Where the pipeline is installed in ground which is varied or unstable, multiple rocker pipes may be required. If flexible pipes are being used, rocker pipes are not needed.

Manhole Covers and Frames shall comply with IS EN 124 and BS 7903 and be of suitable load grade, Class D400 (or E600 for heavy trafficked roads, as required on a case by case assessment basis). Covers shall be selected and designed to prevent the cover unit(s) falling into the chamber. Covers and frames shall be designed to be safely lifted with minimal risk of manual handling injury, suitable for use with lifting equipment and arranged to ensure rescue procedures are not impeded. Frames should be square or circular with a square or circular insert with a minimum clear diameter/dimension of 600mm. Class D400 shall either have a 100mm or a 150mm deep frame and Class E600 covers on heavily trafficked roads shall have a 150mm deep frame. All covers shall be of non-rock design and two closed keyways shall be provided in each cover. Manhole covers may be single units or double triangular. Third Party Certification shall be provided for all cast iron manhole covers and frames.

Manhole covers shall be set in position flush with the finished ground surface, whether road, pavement or open ground. The frame cover should be supported on Class B solid engineering brick to IS EN 771, one course minimum and no more than a maximum of three courses in height, set in C50/60 mortar. Standard concrete blocks or bricks shall not be permitted. The cover frame should be installed and bedded to the manufacturer's instructions. The finish of the road surface around the Chamber cover and frame shall be to the requirements of the relevant Roads Authority for the area.

Manhole Steps are to be provided in manholes with depths up to 2.5m and in shallow chambers. Manhole steps shall comply with the requirements of IS EN 13101, Type D, Class 1. Galvanised mild steel step rungs, 20mm diameter, shall be provided with plastic encapsulated finish. Steps rungs should be 300mm wide and located 300mm apart vertically. The vertical distance between the top of the manhole cover and the first step in the manhole shall not exceed 675mm. The distance between the bottom step and the benching shall not exceed 300mm. All step irons shall be centred under the access opening in the manhole roof slab. The centre face of the step rung shall be 120mm from the wall face within the manhole to align it with the roof slab opening.

Ladders are to be provided in manholes where the depth from ground level to soffit of the sewer pipe exceeds of 3.0m. Such fixed ladders within manholes shall comply with IS EN 14396. The vertical distance between the top of the manhole cover and the first step in the manhole shall not exceed 675mm. The distance between the bottom ladder wrung and the benching shall not exceed 300mm. All ladders shall be centred under the access opening in the manhole roof slab. Ladders, where provided, shall be manufactured of low carbon steel complying with IS EN 10025 with hot dipped galvanised finish to IS EN ISO 1461. Ladder stringers shall be 65mm x 12mm, 300mm apart with 20mm solid rungs at 300mm centres. Ladder stringers should be adequately supported from the manhole walls at intervals of not more than 1.5m. Stringers should be bolted to the support cleats to facilitate renewal. Alternatively, stainless steel fixed ladders may be required in accordance with Irish Water's requirements. These shall be fabricated from Grade X5CrNiMo 17-12-2 steel complying with IS EN 10088-3. Aluminium ladders shall not be provided. The base of all ladders shall be positioned on a horizontal landing platform. The tops of ladders shall be provided with proprietary fixings to extend the ladder above ground level, if deemed necessary. The centre line of the ladder rung shall be 150mm from the wall face within the manhole to align it with the roof slab opening. Manholes in excess of 6m depth shall be provided with intermediate landing platform(s) as part of an engineered access solution. Access to manholes is regarded as confined space access and shall be subject to a safety access plan.

3.13 Gravity Sewer Pipe Material Types

The types and fittings outlined herein shall be used in the construction of the Gravity Sewers. Pipe material should not change between manholes. The list below does not apply to pipes installed by pipe jacking or micro tunnelling.

3.13.1 ***Concrete;*** Concrete Sewer pipes with spigot and socket joints and rubber ring fittings shall comply with IS EN 1916 (2002), BS 5911, Part 1 (2002 – 2010) and IS 6 (2004) or equivalent standard, strength Class 120 with minimum crushing loads in accordance with Table 8 of BS 5911-1 (2002-2010). All pipes and fittings shall have gasket type joints of spigot and socket or rebated form. (Pipe diameters 225mm and above)

3.13.2 ***Thermoplastic Structured Wall Pipes;*** Thermoplastic structured wall pipes shall comply with the provisions of IS EN 13476 (2007/2009). Pipes to be of Stiffness Class 8kN/m^2 and to be capable of demonstrating a jetting resistance of 2,600 psi (180 Bar) without damage when tested in accordance with Section 3.3 of WIS 4-35-01 (2008). (Sewer diameters 150mm up to 450mm, Service Connections of 100mm diameter);

3.13.3 ***Unplasticised PVC;*** Unplasticised PVC pipes and fittings shall comply with the provisions IS EN 1401 2009/2012. Pipes to be application area code "UD", Stiffness Class 8kN/m^2. Provision for jetting shall be based on the WRc Sewer Jetting Code of Practice, June 1997. Pipes to be capable of resisting a maximum jetting pump pressure of 2,600psi (180 Bar) without damage. (Sewer diameters 150mm up to 450mm, Service Connections of 100mm diameter);

3.13.4 ***Other;*** The use of alternative pipe types and materials will require the prior written agreement of Irish Water.

3.14 Rising Main Pipe Material Types

The pipes types and fittings outlined herein shall be used in the construction of Rising Mains. Pipe material should not change along the Rising Main length.

3.14.1 ***Ductile Iron;*** Ductile iron pipes and fittings for Wastewater shall comply with the requirements of IS EN 598. The pipes and fittings shall be cement lined internally and zinc coated with an approved bituminous coating externally. Ductile iron pipes may require plastic sheeting protection in adverse ground conditions in accordance with BS 6076;

3.14.2 ***Polyethylene;*** Polyethylene pipe and fittings for Wastewater shall comply with the requirements of IS EN 12201. Polyethylene fittings, including fusion joints and electro-fusion fittings, shall comply with the provisions of IS EN 12201 – Part 3

Polyethylene pipes shall also conform to the following UK Water Industry Specification documents

- WIS 4-32-08 – Specification for the Fusion Jointing of Polyethylene Pressure Pipeline Systems Using PE80 and PE100 materials;
- WIS 4-32-16 – Specification for Butt Fusion Jointing Machines;
- WIS 4-32-18 – The Choice of Pressure Rating for Polyethylene Pipe Systems for Water Supply and Sewerage Duties;
- IGN 4-01-03 – Pressure Testing of Pressure Pipes and Fittings for use by Public Water Supplies.

3.15 Rising Main Discharge (Header) Manhole

A Rising Main discharge manhole, or a header manhole, shall be provided at the discharge point of a Rising Main. This manhole shall be set off from the Network and it shall be linked to the Network by a length of Gravity Sewer of appropriate size to carry the Rising Main maximum pumped flow. The Gravity Sewer shall be connected into the Network at a manhole when the Rising Main flow is from a Type 1, 2 or 3 Pumping Station (See Part 5). In the case of low flow discharge volumes, the connection of the Gravity Sewer to the Network may be provided by a saddle connection.

The header manhole shall be constructed in either cast in-situ concrete or pre-cast concrete rings, both as described above in **Section 3.12** above. The header manhole shall be provided complete with base, roof slab, roof access opening and cover/frame. The rising main pipe shall terminate outside the wall of the header manhole. It shall be connected by a flexible coupling to a length of plain/flanged ductile iron pipe, which shall be built into the wall of the manhole, complete with a puddle flange. The flanged end of this flanged/plain pipe, located within the manhole, shall be fitted with a 90 degree all

flanged bend and a flanged bell-mouth to allow the rising main to discharge vertically within the manhole.

The invert of the manhole shall be provided with internal benching formed to allow the Rising Main discharge volume to be directed to the outlet gravity discharge Sewer. The benching shall be formed to ensure a smooth flow transition between the Rising Main bell-mouth discharge and the outlet Sewer. The manhole invert shall be formed with cast in situ concrete, C25/30, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, and finished with a 1:3 cement sand mortar, perfectly smooth. The benching shall slope at a gradient of 1:10 from the bell-mouth.

In odour sensitive areas, the header manhole shall be provided with a 100mm diameter vent pipe linked to a vent stack. The vent pipe shall be built into the wall of the manhole at a high level and sealed watertight within the wall. It shall be connected to a free-standing vent columns or vent stacks. A passive activated carbon filters may be required to the vent column/stack. The Water Service Activated carbon filters shall be of robust proprietary manufacture and sized to have a minimum retention time of 3 seconds at maximum flow-rate.

3.16 Pipe Joints

Pipe joints shall be in accordance with the manufacturer's instructions for the pipe material. Pipe joints will generally be one of the following:

3.16.1 Push in rubber ring joint;
3.16.2 Bolted flanged joint;
3.16.3 Flexible mechanical coupling with protective coating;
3.16.4 Fusion welded joints, site fusion jointing shall be strictly in accordance with UK WIS 4-32-08 (Specification for Fusion Jointing of Polyethylene Pressure Pipeline Systems Using PE80 and PE100 Materials. Equipment used for butt fusion welding shall be in accordance with UK WIS 4-32-16 (Butt Fusion Joining Machines).

Bolted flanged joint shall have raised face flanges complete with nuts and bolts to IS EN ISO 898 and metal washers to BS 4320. Nuts, bolts and washers to be protected against corrosion in accordance with WIS 4-52-03. Flange assemblies, including nuts, bolts, washers and gaskets to be designed to meet a working and test pressure of 16 bar and 25 bar respectively.

Butt fusion welding and electro fusion jointing of pipes shall only be carried out by trained operatives in possession of a current relevant Training Certificate, using fully automatic approved jointing machine/rigs in accordance with the manufacturer's instructions. In relation to electro fusion jointing, the jointing machine shall incorporate a remote inspection/monitoring system, which allows for real time inspection of the weld integrity. The identity of the MDPE/HDPE/HPPE pipeline manufacturer shall be made known to Irish Water prior to commencement of the installation. Certification and testing

(including independent third party certification) shall be provided to confirm quality assurance compliance. Each joint shall be clearly marked with the joint logged automatically on the jointing machine. A printout of the joint details, with a GPS location of each joint, shall be provided and retained for quality assurance purposes.

Prior to the commencement of pipe laying works a short term burst test (in accordance with Appendix A of WIS 4-32-08) and a joint toughness test (in accordance with Appendix C of WIS 4-32-08) shall be carried out for each pipe diameter containing electro fusion welds used by the Customer contractor's personnel and welded by the equipment to be used for Works. Similarly, a joint ductility tensile test (in accordance with Appendix B of WIS 4-32-08) shall be carried out for each pipe diameter containing butt fusion welds used by the Contractor's personnel and welded by the equipment to be used for Works. The tests shall be undertaken by an independent laboratory accredited by the Irish National Accreditation Board or equivalent.

Auditing and testing of welded joints in polyethylene pipelines shall be carried out as follows:

- Each installation team and welder will be audited by the Irish Water Field Engineer on a regular basis. The audit will use a standard checklist to ensure that all the correct equipment and working practices are being utilised.
- All butt fusion joints shall be de-beaded and the bead referenced and kept for inspection. Beads shall be examined upon removal for signs of defects or splitting along the length of the bead joint.
- Butt fusion welds and electro-fusion welds shall be cut out from the works completed and subjected to a destructive test, as indicated by the Irish water Field Engineer. All sample welds shall be clearly labelled and referenced. One butt-fusion weld per butt-fusion crew per week and one electrofusion weld per electrofusion crew per week shall be cut out and taken for testing by the Developer's contractor. This minimum frequency of destructive testing shall be increased as specified by the Field Engineer if significant failure rates occur.
- For butt welding, completed welds shall be de-beaded and the weld bead shall be inspected on site by the welding crew. Beads shall be labelled, bagged and stored by the Developer's contractor and access shall be provided to the Field Engineer to inspect the weld beads when requested.

Weekly equipment checks and supervision of the pressure tests shall be carried out by the Developer and these will be inspected by the Field Engineer. However the destructive weld testing and analysis shall be carried out by a specialist and accredited testing organisation. The Developer's contractor shall provide details of his proposed testing organisation to the Field Engineer for review and approval prior to any testing being undertaken.

The Contractor shall arrange for the selected samples to be tested in accordance with WIS 4-32-08 Appendix B, C and D by an accredited laboratory (by the Irish national Accreditation Board or equivalent) and a test report in accordance with WIS 4-32-08

provided to the Employers Representative within 1 week of the sample joint being taken. The report should indicate the failure mode (above or below 75% and ductile or not), K value MNm, Classification (pass, non-critical failure, failure etc), recommended action. Where welds exhibit <75% Ductility and 1.2<K<1.7, the Contractor shall excavate, cut out, and provide the welds carried out immediately before and immediately after failed sample for testing. The provision of the sample and all costs associated with their provision including restoring the rising main to service and reinstatement will be borne by the Contractor. Untested sample welds shall be properly catalogued and stored by the Contractor until the end of the Defect Period. Welds shall remain the property of the Employer and be made available to the Employer's Representative at any for testing should he so direct.

The test shall be carried out at the expense of the Customer and this shall include for all costs associated with the taking of, testing, analysis of and transportation of samples. The frequency of testing shall be one test per 30 joints made on site. The test joint shall be chosen at random by the Irish Water Field Engineer.

The Contractor shall note that if the results of any of the weld tests (joint toughness or ductility tests) indicate that a weld is not in compliance with WIS 4-32-08, i.e. a weld failure, then the Developer shall be required, at his/her own expense, to remove and replace all welds, since the last weld found to be in compliance with WIS 4-32-08, performed by the particular welding machine and operator who completed the weld that failed. The welding machine and operator shall be prohibited from performing further welds until they have passed a second site audit.

Pipe coils will only be permitted to be used for pipe diameters of 125mm and below. Where pipe coils are used, suitable re-rounding clamps and steel re-rounding inserts must be used.

3.17 Rising Main Fittings

3.17.1 General

All fittings to Wastewater Rising Mains, including sluice valves, scour valves, air valves and meters shall be operable without the need to enter chambers or other confined spaces. The fittings shall be suitable for use with untreated Wastewater flows.

3.17.2 Sluice Valves

Sluice valves shall be double flanged ductile iron resilient seated valves, suitable for use in Wastewater pipework and Rising Mains. They shall comply with the requirements of BS 5163-Parts 1 and 2, IS EN 1074, Parts 1 and 2, and they shall have the CE marking in accordance with the EU Construction Products Regulations (No. 305/2011 –CPR). Sluice valves shall be suitable to be buried in the ground and shall have a minimum design life of 50 years. All flanges shall be drilled to PN 16 and shall have ductile iron flanges in accordance with IS EN 1092 Parts 1 and 2. Sluice valves shall be capable of

accommodating a maximum differential pressure during operation of 16bar. Telescopic spindles shall be fitted with a cast iron false cap (complete with grub screw). Valves in pumping station valve chambers shall be fixed to flanged pipework and shall be wheel operated.

The fittings associated with the sluice valve will be dependent on the pipe material of the Rising Main. In ductile iron mains, the valve shall be fitted with an appropriate dismantling joint and a flanged to plain ended pipe with a flexible coupling at one end, a flanged to plain ended pipe and a flexible coupling at the other end to allow the valve's disconnection from the Rising Main pipework for maintenance if desired. Puddle flanges shall be fixed to the flanged to plain ended pipe, as appropriate, to allow it to be secured to a thrust block. One of the proprietary flexible couplers may not be required on spigot/socket ductile iron pipes. In polyethylene pipes the valve shall be fitted to an appropriate dismantling joint and a stub flange with backing ring at one end and an appropriate dismantling joint, a stub flange with backing ring at the other end to allow the valve's disconnection from the Rising Main pipework for maintenance if desired. The stub flanges shall be fusion welded to the polyethylene main at both sides of the valve arrangement. Alternative pipe fitting pieces will be required for other pipe material types.

The depth of the sluice valve cap shall be within 350mm of the finished ground level and no valve spindle shall be greater than 600mm below ground level.

All sluice valves shall be CLOCKWISE CLOSING. The direction of closing shall be imprinted on the valve casing. The number of turns (n) to open/close the valve shall be: n = 2N+1 where N is diameter in inches. The operating torque must not exceed the max allowed in BS 5163-1, Type B. Valves in deep chambers shall be provided with extended spindles, completed with associated tube, adequately fixed/braced within the chamber.

The sluice valve shall be protected from corrosion by a coating in accordance with

A) WIS 4-52-01; or
B) IS EN 14901

For coatings in accordance with WIS 4-52-01, the internal water-wetted surface shall be coated to Class A standard while all other surfaces shall be coated to Class B standard.

3.17.3 Scour Valve Arrangements

Scour valves shall be double flanged ductile iron resilient seated valves as outlined in **Section 3.17.2** above. Sluice valves shall be provided on the Rising Main at either side of the take-off point of the scour pipe, complete with dismantling joint arrangement as outlined above. The scour pipe and scour valve shall have the following minimum diameters:

Diameter of Rising Main (mm)	Diameter of Scour (mm)
80	80
100 to 200	100
200 to 300	100 - 200

Scour valves and outlet pipes shall be sized for gradual emptying time and based on the capacity of the scour chamber and the vacuum tanker used for emptying the chamber. Each specific location will require the approval of Irish Water and the relevant Local Authority.

The scour valve should be located off of the line of the Rising Main in a separate scour chamber. The scour take-off from the Rising Main shall be provided by a flanged tee piece fitting with a level invert outlet of appropriate size. The connection pipe between tee piece at the take-off point on the Rising Main and the scour chamber shall be of ductile iron material. A scour chamber, as described below, shall be provided downstream of the take-off point and the discharge point to balance the scour discharge and to allow collection and pumping out of scour discharge and debris.

Pipe fittings for the tee piece at the take-off point will be dependent on the pipe material of the Rising Main. In ductile iron mains, the tee piece shall be fitted with a flange to plain ended pipe, dismantling joints and flexible coupling at both ends. One of the proprietary flexible couplers may not be required on spigot/socket ductile iron pipes. In polyethylene pipes the tee piece shall be fitted to a stub flange with backing ring at both ends. The stub flanges shall be fusion welded to the polyethylene main at both sides of the tee piece arrangement. Alternative pipe fitting pieces will be required for other pipe material types.

3.17.4 Air Valves

Air valves shall be of Wastewater air valve type with isolating valve in accordance with the requirements of BS ISO 7121. The Air valves shall have bodies and covers of cast iron to BS EN 1561 with flanges drilled to PN 16 in accordance with IS EN 1092. Each valve shall have a large and a small air escape orifice with an isolating valve. The isolating valve shall be either a resilient seated gate valve to BS 5163 and BS EN 1074, Part 2 and shall be of a boltless bonnet design, or a butterfly valve to IS EN 1074 Part 2. The inlet diameter shall be 80mm for Rising Mains of 250mm and below.

The location of the air valve shall be the subject of particular agreement with Irish Water to ensure that the risk of odour is eliminated. The valve shall be generally located at the high points of a Rising Main. The air valve shall have a flanged inlet and it shall be fitted on a flanged tee-piece branch off of the Rising Main. The tee piece shall be supported on a concrete cradle supported on the floor of the valve chamber.

The flanged tee piece shall be fitted at one end with a flange to spigot connection piece of ductile iron material. This fitting shall be built into the wall of the air valve chamber and fitted with a puddle flange. It shall extend outside the wall by 400mm to allow its connection to the Rising Main pipework. The other flanged end of the tee piece shall be fitted to a dismantling joint, which in turn shall be attached to a plain ended pipe. This plain ended fitting shall be built into the wall of the air valve chamber and fitted with a puddle flange. It shall extend outside the wall by 400mm to allow its connection to the Rising Main pipework. Rocker pipes shall be provided at either side of the air valve chamber in the case of ductile iron Rising Mains. Proprietary couplers shall be provided to connect the pipework that extends outside the chamber to the rocker pipes and to the Rising Main. In the case of polyethylene Rising Mains, the built in pipe fitting in the walls of the chamber shall be double flanged ductile iron. Stub flange with backing ring shall be fitted at either end of the Rising Main pipework.

3.17.5 Other Fitting Materials

Joint gaskets for flexible and flanged joints shall be Ethylene Propylene Diene Monimer (EPDM). Gasket material shall comply with the requirements of EN 681-1, Type WA with a hardness range of 76 – 84. Gaskets shall be tested in accordance with BS 7874. Gaskets for flanged joints shall be full face type. Gaskets shall be designed to meet a working and test pressure of 16bar and 24 bar respectively, when installed as intended in flanged and flexible joints.

All lubricants to be used in joints shall be provided by and recommended by the pipe and fitting manufacturer and shall have no deleterious effects on either the joint rings or pipes and shall be unaffected by the liquid to be conveyed.

Nuts and bolts used in flanges joints shall be provided by the pipes and fittings manufacturer and shall be made of steel in accordance with IS EN ISI 898. Metal washers shall comply with BS 4320. All nuts, bolts and washers shall be protected against corrosion in accordance with WIS 5-52-03 for a barrier and galvanic coating system. Flange assemblies, including nuts, bolts, washers and gaskets shall be designed to a working and test pressure of 16 bar and 24 bar respectively, when installed.

Manufacturers shall supply tape wrapping to be used for wrapping joints where required. The wrapping required shall be a high performance polyethylene wrap with a minimum thickness of 6mm.

Flange adopters shall comply with IS EN 14525 and shall have an allowable operating pressure of 16 bar. Flanges shall be PN16 rated and shall be drilled in accordance with IS EN 1092. The body of the end wring shall be ductile iron in accordance with IS EN 1563. Flange adaptors shall be suitable for use with ductile iron, cast iron, steel, PVC, asbestos cement and polyethylene. Flange adaptors for polyethylene pipes shall be designed for Type 1 end restraint to WIS 4-24-01. The manufacturer shall supply any

liners required to stiffen polyethylene or other types pipes in accordance with his recommendations.

Couplings shall comply with IS EN 14525. Couplings shall have an allowable operating pressure of 16 bar. The body and end ring shall be either, stainless steel minimum Grade 304 or ductile iron in accordance with IS EN 1563. Couplings shall be suitable for use with ductile iron, cast iron, steel, PVC, asbestos cement, polyethylene. Flange adaptors for polyethylene pipes shall be designed for Type 1 end restraint to WIS 4-24-01. The manufacturer shall supply any liners required to stiffen polyethylene or other pipe types in accordance with his recommendations.

Dismantling joints shall be designed for a working pressure of 16 bar and be tested to comply with the performance requirements of WIS 4-21-02. The body shall be either, ductile iron in accordance with IS EN 1563 with a minimum tensile strength of 420 N/mm^2 or steel in accordance with BS EN 10025 with minimum grade S275. Dismantling joint flanges shall be minimum PN16 rated and flanges shall be drilled in accordance with IS EN 1092. All bolts shall be a minimum, either steel Property Class 4.6 in accordance with BS EN ISO 898-1 or stainless steel, with a minimum chromium content of 13%, in accordance with BS EN ISO 3506-1. All nuts shall be minimum, either steel Property Class 4 in accordance with BS EN ISO 898-2 or stainless steel, with a minimum chromium content of 13%, in accordance with BS EN ISO 3506-2. Couplings shall be suitable for use with the following groups of pipe material:
Ductile iron, cast iron, steel, PVC

3.18 Sluice Valve, Scour Valves and Air Valves Chambers

3.18.1 Sluice Valve Chamber

Sluice valve chamber for Rising Mains shall have a minimum plan area of 600mm by 600mm for pipes up to 350mm in diameter. Alternative dimensions for sluice valve chambers of 450mm by 600mm or 450mm by 450mm may be allowed subject to irish Water review. Valve chambers for pipe diameters in excess of 350mm shall be varied to suit the size of the appliance being housed. Chambers can be constructed of pre-cast concrete or of high density blockwork. Alternatively, proprietary prefabricated chamber units may also be used, but only subject to the approval of Irish Water.

The walls of blockwork chambers shall be constructed with 215mm 20N/mm² high density solid concrete block work, laid on flat, bedded in mortar and flush pointed, without internal plaster, complying with the requirements of IS EN 771. The walls of the chamber can alternatively be formed with reinforced pre-cast concrete units formed with C28/35 concrete, 20mm aggregate size, with mild steel reinforcement. The units shall be square, composite units, with a minimum wall thickness of 100mm, thickened at each corner. Single height precast units will be acceptable. If modular units are proposed, the pre-cast concrete units shall be bedded in mortar and flush pointed.

The valve chamber floors shall be formed with C25/30 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, with a minimum thickness of 100mm complete with mild steel reinforcement. Alternatively, pre-cast concrete bearing slabs of similar depth may be allowed, subject to Irish Water approval. The floor slab shall be founded on the granular pipe surround material or on Clause 804 backfill material above the granular surround. The floor slab of valve chambers shall not be cast against the body of the sluice valve. A Drain hole shall be allowed in the base slab to allow free drainage of liquid from the chamber to the granular material below.

The chamber shall be complete with a reinforced concrete roof formed with C30/37 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, of minimum thickness of 150mm, reinforced with high tensile reinforcement to BS 4449.

The sluice valve chambers shall be surrounded with Clause 804 granular backfill material, in accordance with the National Roads Authority Specification for Road Works, compacted in 150mm layers, to the underside of the road/footpath structure.

Sluice valve chambers shall be covered with approved heavy duty cast iron surface box covers and frames, 445mm by 280mm plan area, to IS 261 or BS 5834, subject to the minimum mass of the cover per m^2 for Grade A being 250kg/m^2 and Grade B being 200kg/m^2. The covers and frames shall be suitable for road and traffic conditions. Third Party Certification shall be provided for all cast iron surface box covers and frames.

The sluice valve cover frames shall be supported on Class B engineering brick to IS EN 771, minimum of one course with a maximum of three courses. The brickwork shall be bedded in C50/60 mortar. The covers shall be set on the brick in accordance with the manufacturer's instructions to finish in alignment with the final road or footway surface. The finish of the road surface around the Chamber cover and frame shall be to the requirements of the relevant Roads Authority for the area.

The metal covers shall have appropriate identification marks on the cover. Covers for surface boxes on Rising Mains shall have either the word "WASTEWATER" or the letters "WW" cast on the top surface in 75mm letters. Covers shall have "SV" (sluice valve) imprinted on them. Covers shall be level with the finished ground level after permanent restoration.

The valve covers, where located in grass areas, shall be surrounded by a concrete plinth, 200mm all round and 100mm deep formed with C20/25 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, bedded in Clause 804 material. The plinth shall be complete with bull-nose finish to its perimeter and shall be provided with a mild steel reinforcement link.

Proprietary prefabricated spindle tube units may be used only in special situations. Their use shall be subject to specific Irish Water requirements and written approval.

Concrete in all chambers, etc., shall comply with the requirements of IS EN 206, and granular material in the concrete shall comply with the requirements of IS EN 12620 (See also SR 16). (This provision shall apply to all situations within this Code of Practice Document where in-situ and structural concrete is required.)

3.18.2 Scour Chamber

The scour chamber shall be constructed off of the line of the rising main with suitable access for a vacuum tanker. Scour chambers shall be provided to balance the scour discharge from the Rising Main and to collect the contents of the Rising Main during the scouring operation for separate disposal. Where possible, scour chambers should be located off carriageways and generally in areas only subject to foot traffic.

The scour chamber shall be constructed with precast concrete manhole wall units completed with rubber sealing ring gasket between units, complying with the requirements of IS EN 1917 and BS 5911 – Part 3, complete with a 150mm minimum thickness of cast in situ concrete surround, C16/20, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, with either pre-cast or cast in-situ concrete base of C30/37 concrete, in accordance with IS EN 206, 20mm aggregate, in accordance with IS EN 12620, (300mm minimum thick) with a 400mm x 400mm x 200mm deep floor sump located beneath the roof opening.

The scour chamber shall have pre-cast or cast in-situ concrete roof slab (225mm minimum thickness), constructed of C30/37, 20mm aggregate size, reinforced with high tensile steel bar reinforcement, with a minimum 40mm concrete cover. Alternatively, approved precast concrete roof slabs may be used subject to Irish Water approval and compliance with IS EN 1917 and BS 5911 - Part 4. This approach would be the preferable option where pre-cast concrete ring units are used as scour chamber walls. An access opening shall be formed in the manhole roof slabs. The minimum dimensions of the roof opening shall be 600mm by 600mm. Circular manhole openings of 600mm diameter may be used if the scour chamber cover is circular.

The scour chamber shall have a minimum internal clear dimension of 1,350mm. Confined space access requirements will apply with planned safe access procedures.

The roof slab opening shall be provided with a cover and frame to comply with IS EN 124, Class D400, and BS 7903. Frames should be square with a square or circular insert with a minimum clear diameter/dimension of 600mm and a minimum depth of 100mm, if located in light traffic roads. Class D400 and Class E600 covers on heavily trafficked roads will require a 150mm deep frame. All covers shall be of non-rock design. Two closed keyways shall be provided in each cover. Where square covers are provided, they shall be double leafed covers and secured to prevent the cover section from falling into the chamber. Circular covers shall be single leafed. The covers shall be set in position flush with the finished ground surface, whether, road, pavement or open ground. Covers shall be level with the finished ground level after permanent restoration. The frame cover should be supported on solid engineering brick to IS EN 771, one

course minimum and no more than a maximum of three courses in height, bedded and pointed in C50/60 mortar. Standard concrete blocks or bricks shall not be permitted. The cover frame should be installed and bedded to the manufacturer's instructions. The finish of the road surface around the Chamber cover and frame shall be to the requirements of the relevant Roads Authority for the area.

The metal covers shall have appropriate identification marks on the cover. Covers for surface boxes on Rising Mains shall have either the word "WASTEWATER" or the letters "WW" cast on the top surface in 75mm letters. The cover shall also have "ScV" (scour valve) imprinted on it.

The scour chamber shall be provided with ductile iron inlet pipework, built into the walls of the chamber and fully sealed, complete with puddle flanges. The inlet pipe shall be fitted with a Wastewater sluice valve, complete with extended spindle to allow its opening from ground level. A surface box to IS 261 or BS 5834, subject to the minimum mass of the cover per m^2 for Grade A being 250kg/m^2 and Grade B being 200kg/m^2, shall be provided to over a roof opening to allow access to the extended spindle for the chamber sluice valve.

Scour valves, scour chambers and outlet pipes for large diameter mains shall be sized for an emptying time appropriate for a vacuum tanker identified by Irish Water. Each specific location for the scour valve chamber will require the approval of Irish Water and the relevant Local Authority.

The chamber shall be fitted with manhole steps to comply with IS EN 13101, Type D, Class 1, galvanised mild steel and plastic encapsulated. Access to the confined space within the chamber shall not generally be required but when needed this access shall be by way of a safe access plan.

3.18.3 Air Valve Chamber

Air valves shall be installed in chambers and these shall be suitably sized to accommodate the air valve and allow access for maintenance. The chamber should be located to allow ease of access and maintenance of the air valve. The base and walls of the chamber shall be constructed in C30/37 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, with a minimum thickness of 300mm and 250mm respectively. The chamber shall be complete with a reinforced concrete roof of minimum thickness of 225mm, formed with C30/37 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, reinforced with high tensile reinforcement to BS 4449.

The roof slab shall incorporate a 900mm x 900mm opening to allow the visual inspection of the air valve and to allow access to the associated isolating valve. Cast-in recessed lifting lugs shall be provided in each corner of the concrete roof slab to allow its positioning in place. In addition, these lifting lugs shall be used to remove the roof slab for access to the chamber to allow maintenance of the air valve and its removal

and replacement if necessary. Access to the air valve chamber will be by way of an approved safety plan during the operational life of the unit.

The internal dimensions of the chamber shall be sufficient to contain the air valve and any associated pipework. The bolts and joints shall be visible and accessible in order to allow for maintenance and for the possible future replacement of the air valve without the need for excavation. The depth of the meter chamber shall provide a minimum of 300mm clearance beneath the air valve fitting. Sufficient clearance shall be provided between the walls and the air valve equipment to allow maintenance activities to be carried out.

The air valve chambers roof slab opening shall be provided with approved ventilated heavy duty metal surface covers to IS EN 124 & BS 7903, rating D400, if located on roadways or footways. Lower load capacity rated covers may be used if the chamber is located off road in green areas.

The cover frames shall be supported on Class B engineering brick to IS EN 771. The brickwork shall be bedded in C50/60 mortar. The covers shall be set on the brick in accordance with the manufacturer's instructions to finish in alignment with the road or footway surface. The finish of the road surface around the Chamber cover and frame shall be to the requirements of the relevant Roads Authority for the area. Air valve chamber covers, where located in grass areas, shall be surrounded by a concrete plinth, 200mm all round and 100mm deep formed with C20/25 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, bedded in Clause 804 material. The plinth shall incorporate mild steel reinforcement links and shall have a bull-nose finish around its external perimeter.

The metal covers shall have appropriate identification marks on the cover. The covers for surface boxes on Rising Mains shall have either the word "WASTEWATER" or the letters "WW" cast on the top surface in 75mm letters. The cover shall also have "AV" (air valve) imprinted on it. Covers shall be level with the finished ground level after permanent restoration.

Access to the air valve chamber confined space shall be subject to a safety access plan. Access to the air valve chamber for maintenance of the air valve shall be achieved by removal of the roof slab unit.

3.19 Existing Utilities

It is the responsibility of the Customer and/or designer to obtain all current information on the location of other existing utility providers' apparatus prior to the design being carried out. During installation, due diligence should be used when making excavations for Sewers and services and care shall be taken to protect and support all existing services (water, gas, telecommunications, drainage, electricity, etc.) and other works so as not to interfere with the working arrangements and integrity of such utilities.

3.20 Notifications

Detailed proposals, including work method statements, insurance confirmation and details of work completed of a similar nature must be submitted to Irish Water for its consideration before approval will issue to undertaking work in close proximity to Irish Water assets. All such works in the vicinity of Water Mains or Sewers greater than 400mm shall be subject to written agreement with Irish Water **before construction commences on site**. This agreement shall also include any necessary protection for Water Mains and Sewers. The placing of concrete over or around Water Mains is expressly forbidden.

In the case of installations in close proximity to **existing** Water Mains and Sewers, the following minimum horizontal distances shall be maintained between pipes/ducts, cabinets, poles, manholes, junction boxes, chambers, etc.:

3.20.1 500mm at either side of pressure mains up to and including 200mm diameter;
3.20.2 1m at either side of pressure mains of 225mm to 250mm diameter;
3.20.3 2m at either side of pressure mains of 300mm and 375mm diameter;
3.20.4 5m at either side of pressure mains of 400mm and 450mm diameter;
3.20.5 Specific Irish Water advised distances for pressure mains in excess of 475mm;
3.20.6 500mm at either side of gravity sewer up to and including 225mm diameter;
3.20.7 1m at either side of gravity sewer up to and including 450 mm diameter;
3.20.8 1.5m at either side of gravity sewers of 600mm diameter and greater.

Specific written permission will be required from Irish Water for installing infrastructure closer to the Irish Water asset than the limits outlined above. For strategic fibre optic or oil filled cables, Irish Water may require increased clearance separation distances in excess of the specific utility providers requirements.

Where pipes or ducts are to be laid close to an existing Water Main or Sewer in the ownership of Irish Water, notification in writing shall be provided a minimum of 10 working days ahead of the commencement of the work. This requirement shall also apply to the carrying out of trial holes or slit trenches to locate the main or to gather ground investigation data. In the case of large diameter (350mm or greater) distribution and trunk Water Mains, Irish Water must be notified at least one month before the work is commenced. This notification is in addition to any formal procedures detailed elsewhere in this document. The notifications shall apply where work is proposed within the following proximities of Irish Water infrastructure:

3.20.9 1m at either side of an existing main less than 200mm diameter;
3.20.10 2m at either side of an existing main of 200mm to 350mm diameter; and
3.20.11 5m at either side of an existing main of 350mm or greater.

Customers shall also comply with any notification requirements associated with other utility providers' infrastructure (ESB Networks, Gas Networks Ireland, telecommunications providers, etc.) that these Utility Companies might have.

Any costs arising from the Customer work associated with locating pipework or any costs due to work undertaken by Irish Water or its agents to assist the Customer in identifying and locating the infrastructure shall be fully covered by the Customer. The Customer will be notified of these costs in advance.

Irish Water reserves the right to revert to the Customer with specific requirements in relation to protection of its Water Mains and/or Sewer. Care shall be taken while laying pipes so as not to damage any Water Main or Sewer or any accessories. Any damage shall be notified immediately to Irish Water on the Irish Water website, www.water.ie. The person who causes the damage to a Water Main or Sewer or any accessories will be deemed to have committed an offence under Section 45 of the Water Services Act 2007.

3.21 Environmental Considerations

The design should take into account the impact of the Works on the environment and the impact of the environment on the Works. Cognisance should be taken of amenity conservation, preservation of access to the public and facilitation of recreation when designing infrastructure. Consideration should also be taken of areas of specific ecological interest such as SACs, NHAs, etc.

The design of landscaping works shall be undertaken concurrently and in conjunction with the design of the Works. The collaborative design process shall incorporate and take account of any likely assessed negative impact(s) on the root zones and root protection areas of trees and/or large shrubs on the Works. The design process shall seek to minimise risk to roots and of root ingress to the Works by appropriate separation distances or by the provision of root protection barriers.

The design, procurement and supervision of the landscaping works next to and over the Works shall be undertaken by the Customer using a fully qualified and competent landscape architect, working in collaboration with a fully qualified and competent arboriculturists, both in consultation with Irish Water. Any part of Works which does not have special tree root protection measures shall be positioned with adequate separation from new trees/shrubs to ensure that their root systems will not cause damage to the infrastructure. These separation distances will vary from (tree and shrub) species to species and specialist advice shall be obtained by the Customer from his/her landscape architect and arboricultural advisers in this regard, as outlined above, and provided in the Design Submission.

Special tree root protection measures may be provided to reduce the separation distances between the Works and the new planting. The design of the tree planting and species selection will need to be decided in relation to the depth of the pipe and the

distance from the Works. Where tree planting is proposed within the distances where tree roots could directly damage the Works, as referenced in Table A1 of BS 5837, special protection measures shall be provided. These measures might be achieved in the pipe system by the provision of high performance joints or the use of polyethylene pipes with welded joints. Alternatively, proprietary protection systems, such as vertical barriers, geotextile pipe wrap, tree planting pits, etc. may be used to prevent the tree roots systems from reaching the Works.

Tree planting will not normally be allowed directly over the Works or within the distances referred to in Table A1 of BS 5837, but this may be increased depending on the species type or relaxed where it can be shown that appropriate species selection and protection measures can be provided to prevent root ingress damage to the satisfaction of Irish Water. Such protection measures may include root barriers, root directors and by avoiding planting next to joints, valves or other sensitive parts of the pipe system.

Where such planting is carried out directly over the Works and where excavation is required to subsequently access the infrastructure, there may be a requirement to remove the trees/shrubs, but this will be assessed on a case by case basis and any possible mitigation measures to reduce impact on tree vegetation should be investigated before a final decision to remove the tree vegetation is taken. Only shallow rooting shrubs shall be planted close to or over the Works.

Where new pipe installation works are to be carried out near existing tree vegetation, these shall be in accordance with the provisions of BS 5837 (Trees in Relation to Design, Demolition and Construction – Recommendations) and the National Joint Utilities Group (NJUG), Guidelines for Planting, Installation and Maintenance of Utility Apparatus in Proximity to Trees, Volume 4, which outline the following zones:

Prohibited Zone (1m from tree trunk): Excavation of any kind shall not be undertaken within this zone unless, after full consultation with an arboriculturist or landscape consultant, it is deemed acceptable. No material, plant and spoil shall be stored within this area.

Precaution Zone (defined as a radius of four times the circumference of the tree at 1.5m above ground level): Where excavation is carried out within this zone, the use of mechanical excavation plant shall be prohibited. All such excavation works shall be carried out manually or with the aid of an air-spade or vacuum and precautions shall be undertaken to protect any exposed roots from damage. All such excavation works shall be supervised by a qualified arborist. No material, plant and spoil shall be stored within this area.

Permitted Zone (outside the Precaution Zone): Excavation works may be undertaken within this zone, but caution must be applied and the use of mechanical plant limited. Any exposed roots should be protected.

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The installation of any new pipework or the planting of new tree vegetation within the vicinity of existing pipe systems will need to take account of the provisions of BS 5837 and BS 8545.

3.22 Food Service Establishments

A Grease Recovery Unit (GRU) must be fitted on the outlet from all kitchen sinks within Food Service Establishments (FSE) and commercial buildings with food preparation or canteen facilities subject to the requirements of Irish Water. Cognisance shall be taken of the guidance provided in the Water Services Training Group Guidance Document for Control of Fat, Oil and Grease or any updated guidance as may be issued by Irish Water. GRUs must also be fitted on any commercial scale food preparation locations. The use of degreasing agents and enzymes for the breakdown of grease is permitted only with the agreement of Irish Water.

3.23 Grease Traps

All Wastewater from commercial food preparation areas is subject to Trade Effluent Licensing, in accordance with the provisions of the Water Pollution Act (1977 – 1990). Such discharges shall discharge to a suitably sized and manufactured grease trap, designed in accordance with IS EN 1825, prior to discharge of the Wastewater to the Works. Full details of the grease trap, including details of the proposed maintenance regime, shall be submitted to and agreed with Irish Water's Connection and Developer Services Team. These details shall include design loading of the grease trap, grease trap capacity, etc. Compliance with guidance as set out in the Water Services Training Group Fat, Oil and Grease (FOG) Guidance Document and Irish Water's policy is required in respect of FOG control.

3.24 Macerators

No under-sink or other type of food macerator/grinder for the processing, discharging or disposal of food waste to the drainage system shall be installed in developments.

3.25 Basements

Special provision shall be provided by the Customer where Works are required to collect Wastewater from basement areas. All Wastewater from basements shall be pumped to ground level to discharge by gravity to the Irish Water Network. The pumped Wastewater shall discharge initially to a standoff (Rising Main discharge (header)) manhole before discharging to a Gravity Sewer connection to a manhole on the public Sewer (See **Section 3.16**). Direct pumping to the Network shall not be permitted.

Storm Water from basement car parks shall not be discharged to the Network. Such discharge shall be directed to the existing Storm Water Sewer in accordance with the requirements of the Local Authority for the area. Specific requirements may be required

by the Local Authority for the prevention of Storm Water flows from basements via access points, provision of petrol/oil interceptors on Storm Drains, etc.

Part 4 – Construction Related Issues

4.1 Construction – General Requirements

The Customer shall be responsible for ensuring that the Works are properly constructed in accordance with this Code of Practice. The Customer shall give notice to Irish Water before construction of the Works commences and shall meet with the Irish Water Field Engineers to agree procedures and a programme of inspections for quality assurance of the infrastructure installation.

The Customer shall keep accurate site records of the installations during construction to allow for the preparation of accurate record drawings of the installed infrastructure. The Works shall be constructed strictly in accordance with a design which has been submitted by the Customer to Irish Water and which has been assessed and accepted by Irish Water.

Sewers, service connections, Rising Mains, pumping stations and ancillary works shall be constructed in a manner such that:

a) where relevant, materials are:
    i) adequately selected, mixed or prepared; and
    ii) installed, used, or fixed to perform adequately the functions for which they are intended;
b) no part of the Works is damaged or its function impaired by:
    i) the method of construction; or
    ii) runoff from the construction site entering the Sewer system;
c) damage to existing ecosystems and major trees in the development site is prevented;
d) soil erosion is minimised;
e) infrastructure installation is carried out in a safe, healthy and efficient manner.

All necessary precautions should be undertaken to avoid causing damage to or interference with flow in existing water supply systems, public Sewers, etc., and such precautions should ensure that debris, silt and mud, etc. do not enter the existing Sewer system or any new Sewer system being installed as part of the new development.

All necessary precautions should be taken to avoid misconnection of the new Works or service connections to other utilities, to existing Sewer systems or to water bodies that are not proposed as the disposal route for which the connection is approved. For clarity, Wastewater service connections shall only be connected to Wastewater collection infrastructure. Storm Water pipework shall not be connected to Wastewater collection infrastructure.

Surface Water from the construction site should not be allowed to enter the Works.

Construction operations should be carried out in such a manner as to avoid damage to or deterioration of the integrity of adjacent buildings or other infrastructure. Excavations in roads and streets should be carried out in accordance with the relevant Roads Authority and the Road Opening Licence requirements. The construction operations shall be carried out in accordance with the provisions outlined in the Guidance for Control and Management of Traffic at Road Works, as published by the Department of Transport, Tourism and Sport. All necessary precautions should be taken to avoid

- causing damage to, or interference with flow in, existing public Sewers, and should ensure that debris, silt and mud etc. do not enter the Sewer.
- misconnection of Wastewater drainage systems to Storm Water Drains or Sewers, or Storm Water drainage to Wastewater Drains or Sewers.
- misconnection of Wastewater collection Network to watercourses or other water bodies.

On completion of construction all internal surfaces of the Works and access points should be thoroughly cleansed of all deleterious matter to prevent it passing into the Network. The Works shall be tested and inspected to ensure that:

4.1.1 The Works is fit for all practical purpose, leak-tight;
4.1.2 No Storm Water sewer has been connected to the Works and vice versa;
4.1.3 Pipes have not been damaged, deformed or subject to settlements during construction.

Specific on-site surveys will be carried out to confirm that misconnection of services to Wastewater and to Storm Water Sewers has not occurred. This shall be achieved by the use of dye-testing of pipework in advance of putting these connections into service. These tests shall be carried out at the discretion of the Irish Water Field Engineers.

Gravity Sewers, pressure pipelines, manholes and inspection chambers should be leak tight when tested after backfilling.

4.2 Transportation, Storage, Handling and Use of Materials

Precautions shall be taken to prevent damage to pipes and fittings during transportation, storage, handling and use of materials.

Suitable pipe supports shall be used on vehicles transporting pipes to prevent damage to both internal and external coatings by impact, scratching, abrasion, etc.

Purpose made wide fabric slings or suitably designed machines for lifting pipes shall be used during offloading and/or laying of pipes (particularly flexible pipes with concrete or cement-mortar linings) to avoid damage and scratches to coatings as well as damage to pipe ends. Damaged pipes shall not be used in the Works.

All pipes and fittings shall be stored off the ground in a clean environment to prevent any contamination of the material prior to its use. Timber supports shall be used during transportation and stacking on site. Pressure pipes shall be capped at either end until they are used in the works to prevent vermin and debris entering them and contaminating the material before their use. All fittings shall be supplied in sealed bags and they shall remain in these bags until immediately prior to installation.

Materials and components shall be handled in such a manner as to avoid any damage or contamination and in accordance with the applicable recommendations of the manufacturers. Pipes and fittings, including coatings and linings, shall be examined for damage prior to installation in the works. Plastic pipes shall be carefully examined for flaws, in particular for signs of impact damage and scoring. No polyethylene pipe shall be installed with scores or cuts penetrating more than 10% of the wall section thickness. If, after installation, scores or cuts penetrating more than 10% of the wall section thickness are found, the affected pipe length(s) shall be removed and replaced with an undamaged pipe length.

4.3 Location of Other Utilities

All available records should be used to identify the location of utility ducts, cables, pipes, etc. Proprietary cable locators shall be used prior to excavation taking place to locate and mark these utilities. Precautions shall be taken when making excavations for pipes and services to ensure no damage is caused to existing services. Care shall also be taken to protect and support all existing services and other works so as not to interfere with the working arrangements of the services.

4.4 Trench Widths

The trench width shall be kept as narrow as possible but the width must allow adequate room for pipe jointing as well as placing and compaction of pipe bedding, haunch, surround and backfill material. Trench widths at the level of the top of the pipe should generally be as narrow as safe working conditions will allow, with a desirable minimum width of 300mm plus the external diameter of the pipe barrel, or a minimum trench width of 500mm. The trench width should not exceed the pipe diameter by more than 500mm.

Trench widths for pipe sizes up to 80mm diameter may be less than 500mm subject to consideration being given to the trench depth, health and safety consideration and access requirements.

In ground that contains ashes, chemicals or material that could accelerate corrosion or deterioration of the pipe, contact shall be made with the Environmental Protection Agency in relation to contaminated soil disposal requirements.

Edges of trenches in bituminous or concrete roads, footpaths and hard surfaces shall be cut using a concrete saw or other equivalent mechanical means in advance of breaking through the paved surface above the trench position. This shall be carried out in all

instances to reduce damage to the remaining hard surface and to restrict over-break of the trench.

4.5 Trench Base

The trench base shall be free of hard objects such as stones, rock projections, tree roots, etc. Where the trench base is through rock or shows recurrence of hard objects, the material shall be excavated and allowance should be made for an additional thickness of bedding of at least 150mm and the void backfilled with Clause 808 granular material in accordance with the National Roads Authority Specification for Road Works. Soft spots in the trench base shall be excavated out and replaced with Clause 808 material as outlined in **Section 4.7** below.

4.6 Cleaning Pipes

Before installation, all pipes for inclusion in the Works shall be examined internally for dirt, stones or any foreign matter and shall be thoroughly cleaned before installation in the final position. To prevent foreign matter or vermin from entering the Works, all open ends of laid pipes shall be plugged, if work is suspended, until the next pipe is ready for jointing. If proprietary pipe stops/plugs are supplied, they shall be left in place until just before jointing.

4.7 Pipe Bedding, Haunch and Surrounds

Pipe bedding, haunch side fill and surround material for buried pipelines shall comply with WIS 4-08-02 and its associated Guidance Note, IGN 4-08-01, UK Water Industry Specifications. Granular material shall be 14mm to 5mm graded aggregate or 10mm single sized aggregate, complying with the requirements of IS EN 13242 and should have a compaction factor value not greater than 0.2 when measured in accordance with IS EN 752. Such material is generally referred to as Type A Granular Material.

Pipes shall not be supported on stones or rock at any point along the pipe trench. Rock shall be excavated to a depth of 150mm below the Water Service Actual depth of the trench required and the void backfilled with Clause 808 granular material in accordance with the National Roads Authority Specification for Road Works. The granular bedding material shall be laid above this void backfill material.

All Sewer pipes and Rising Mains, either rigid or flexible, shall be laid on a bed of granular material. A minimum bed thickness of 100mm shall be provided for pipes up to 100mm diameter. A minimum bed thickness of 200mm shall be provided for pipe diameters between 150mm and 450mm. Rigid pipes, as a minimum, will be provided with a haunch of granular material to half the pipe diameter height. Flexible pipes shall have a haunch of granular material and an additional surround of granular material from the top of the granular haunch to a minimum depth of 150mm above the crown of the pipe.

Bedding and haunch side fill of granular material should be placed uniformly underneath and on either side of the pipe, in layers not exceeding 100mm, each layer being compacted by non-mechanical tamping until the required depth of bedding and side fill has been achieved. Where a full granular pipe surround is required, it should be placed above the side fill material in a similar fashion to bedding and side fill. Surround material shall be installed to the required depth above the pipe crown. The minimum depth of pipe surround material above the external crown of the pipe shall be 150mm at least. This depth shall be increased to 300mm where pipes are located adjacent to trafficked areas or where they are installed along roads and footpaths. Care should be taken that the process of placing of the bedding, side fill and surround material does not displace the pipe from its correct line and level.

Where the Sewer or Rising Main is installed along roads and footpaths the minimum cover of granular surround material shall be 300mm above the external crown of the pipe. The Sewer trench above the granular surround in this instance will be backfilled with Clause 804 or Clause 808 granular material as described below.

If a Sewer is installed in a green field area, selected backfill may be used above the haunch side fill granular material, in the case of a rigid pipe, and above the granular surround material in the case of a flexible pipe. This selected back fill, generally referred to as Type B, Fill, shall be a uniformly compactable material free from clay lumps greater than 75mm, stones greater than 40mm in size, building rubbish of any kind, tree roots, vegetable matter, etc. Rising Mains in green field areas should always have a minimum cover of 300mm of granular surround material.

Concrete beds and surrounds may be required to address impact from loading in heavily trafficked areas and to address minimum pipe cover situations. The detail shall be subject to submission to and assessment by Irish Water before advancing with the work. Concrete bed, haunch and surrounds of pipes shall be a minimum thickness of 150mm with an absolute minimum depth of cover above the external crown of the pipe of 750mm. The concrete should be C16/20, in accordance with IS EN 206, 20mm aggregate, in accordance with IS EN 12620, with a vertical haunch to the mid-point of the pipe, in the case of bed and haunch and vertical faces to the full surround. The haunch and surrounds shall be formed using formwork to provide a rough cast finish. Expansion joints in the concrete surround shall be provided at all joints to allow for pipe flexibility.

Where soft ground conditions (situations where a California Bearing Ration (CBR) less than 5 exists) are anticipated or encountered, the soft material should be excavated and disposed to an approved disposal area, in accordance with the Waste Management Act. Clause 808 granular material, in accordance with the National Roads Authority Specification for Road Works, shall replace the entire extent of the excavated material. Approved geo-textile wrapping shall be provided to this additional backfill. Alternatively, special pipe support arrangements, including piling, beam supports, etc., may be required where the depth of soft material is excessive. Such arrangements relating to

soft fill material replacement and/or pipe supports shall be subject to submission to and assessment by Irish Water before advancing with the work.

4.8 Backfill

Backfill material shall be placed above the granular surround material described in **Clause 4.7** up as far as the underside of the road construction.

The Backfill material shall comprise Clause 804 granular material, in accordance the TII "Specification for Road Works", and it shall be used where the Water Main is installed along proposed roadways and footpaths in the development. If the backfill material is within 500mm of a concrete pipe of structure, Clause 808 material shall be used instead of Clause 804 material. The use of Clause 804/808 Backfill material shall also apply where the trench is in green areas running near roadways and footways. The Backfill material shall be placed in layers not exceeding 200mm, each layer being compacted to the requirements of the Specification for Road Works. The first layer of backfill above the granular surround should be compacted in 150mm layers. Mechanical compaction equipment should not be used until there is a minimum of 450mm of compacted material above the crown of the pipe.

Alternative Backfill material to that described above (Clause 804 or Clause 808) of the pipe trench will only be allowed by Irish Water where the Roads Authority in whose functional area the development is located provides written approval to the Developer to the use such alternative material. Evidence of this written approval to use alternative Backfill material shall be provided to Irish Water in advance of the issue of the Connection Agreement. The relevant Roads Authority should specify this alternative Backfill material and this should require compliance with the definition of "acceptable material" as outlined in Clause 601 of the TII "Specification for Roadworks, Series 600 – Earthworks".

Backfill to the pipe trench above the pipe granular surround material and beneath the road surface in Public Roads shall be to the requirements of "Guidelines for the Opening, Backfilling and Reinstatement of Trenches in Public Road", Second Edition, or subsequent amendments published by Department of the Transport, Tourism and Sport, unless otherwise specified and to the requirements of the relevant Road's Authority's Road Opening Licence.

The opening, backfilling and reinstatement of trenches on National Roads shall be in accordance with the NRA "Specification for the Reinstatement of Openings in National Roads" July 2011, unless otherwise specified.

In the case of any discrepancy between this Code of Practice and the "Guidelines for the Opening, Backfilling and Reinstatement of Trenches in Public Roads" or the TII "Specification for Road Works" where pipes are located in Public Roads, this Code of Practice and their associated Standard Details shall take precedence.

Selected excavated material may be used as trench backfill in green-field areas above the granular pipe surround material with the approval of Irish Water. This selected back fill, generally referred to as Type B, Fill, shall be uniformly compactable material free from clay lumps greater than 75mm, stones greater than 40mm , tree roots, vegetable matter, any kind of building rubbish, etc. This material shall be placed in layers not exceeding 300mm in depth and compacted in accordance with the National Roads Authority Specification for Road Works.

Where Sewer pipelines are installed traversing a public road, the backfill material above the granular surround shall comprise cement bound granular material (CBGM), Category B, in accordance with the TII "Specification for Road Works", Series 800.

4.9 Anchor/Thrust/Support Blocks for Rising Mains

Gentle curves may be formed in the Rising Main pipeline by angular deflection of the pipe joint. The maximum angular deflection of each joint shall not exceed 2 degrees, or in accordance with the manufacturer's recommendation. At the locations detailed below, where pipes need to be restrained against movement under pressure, concrete thrust blocks shall be provided. Concrete thrust blocks shall be positioned symmetrically with respect to the connecting pipe or bend.

Appropriate thrust blocks shall be designed and installed on Rising Mains where required. Except where welded polyethylene pipes or self-anchoring joints are used, thrusts from bends and branches in Rising Main shall be resisted by concrete thrust blocks cast in contact with undisturbed ground. The thrust blocks shall be designed in accordance with CIRIA Report 128, "Guide to the Design of Thrust Blocks for Buried Pressure Pipelines". The requirements for thrust blocks for polyethylene pipes shall be based on the manufacturer's advice.

The blocks shall be constructed with concrete, C20/25, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620. The thrust blocks shall formed using formwork to provide a rough cast finish. Anchor/thrust blocks shall be provided on Rising Mains at bends of curvature greater than 11.5 degrees, at both sides of air valve chambers, at any abrupt change in vertical or horizontal direction, at scour fittings and at any location where liquid pressure is likely to distort the pipe line installation or cause disproportionate movement. Plastic and polyethylene pipes shall be wrapped in plastic sheeting having a composition in accordance with BS 6076 before being cast against or into anchor/thrust blocks.

Concrete support blocks shall be cast to scour valve tees and air valve fittings installed on plastic pipe lines in order to resist torque forces imposed on the fittings during operation. Support blocks shall be cast so as not to interfere with the operation and maintenance of the apparatus. In general support blocks shall not cover pipe or fitting joints. Where this is unavoidable, the fittings/bolts shall be wrapped in protective, non-biodegradable, tape.

All thrust/anchor/support blocks shall be allowed to develop adequate strength before any internal pressure is applied to the pipeline.

Support blocks of concrete grade C25/30, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, or special pipe support arrangements, including piling, beam supports, etc., are required where Rising Main pipes are laid in boggy or swampy conditions. Special support blocks are also required to anchor pipes where gradients are **1:6** or greater. Design of supports, piles, ground beams should be provided to Irish Water for assessment. Pipe joints should allow for longitudinal movement due to thermal effects and thrusts due to internal pressure.

The Developer shall advise and seek review by Irish Water's Connection and Developer Services where it is proposed to install rising mains with gradients that are steeper than 1:10. Alternative gradient proposals may be required in such instances.

Anchorage is not necessarily required at junctions or bends where a fully integrated fusion weld PE pipe system is in place. However, the provision of suitable anchors at bends in excess of 22.5 degrees on fully integrated fusion weld PE pipe systems shall be provided in accordance with the pipe manufacturer's recommendations and requirements. Compressible filler for protection between the concrete and the polyethylene pipe shall be provided. It shall be in accordance with the provisions of IS EN 622, Part 1 to Part 4. Bituminous material shall not be allowed come in contact with polyethylene pipes.

4.10 Testing of Gravity Sewers and Manholes

The Works shall be tested by the Customer as work progresses and on completion of construction of specific pipe lengths. The main pipeline shall be air or water tested in accordance with the requirements of IS EN 752. On completion of the construction works, all pipelines shall be thoroughly cleaned and all deleterious material removed. The test of Gravity Sewers and manholes shall be conducted in the presence of representatives of Irish Water or its agents. A Gravity Sewer condition survey (CCTV) shall be carried out by competent inspection contractor in accordance with **Section 1.9** above.

The pipe test shall be conducted after the Gravity Sewer is installed and jointed and before any concreting or backfilling commences. A further test will be carried out after the backfilling is completed and a further test may be requested after any connections have been made to the Sewer system.

The air test involves the pumping in of air to the gravity pipework until a pressure of 100mm of water is indicated on a U-tube connected to the system. The pipe is left to stand for 5 minutes to permit pressure stabilisation before commencement of the test. A drop of less than 25mm over a period of a further 5 minutes, without further pumping, will give rise to a positive test result. The air test shall be conducted in the presence of an Irish Water Field Engineer or an Irish Water agent's supervisor.

Failure of the air test is not conclusive when failure does occur, a CCTV survey shall be carried out to identify the defect in the Gravity Sewer indicates the repairs required. Following the rectification of the defect, a water test shall be carried out. Acceptance or rejection of the pipe shall be based on the results of the water test.

The water test involves the filling of the pipeline to a depth of 1.2m above the crown at the high end manhole of the pipe while ensuring that the water level above the crown of the pipe at the lower end does not exceeding a depth of 2.5m. The pipeline should stand for two hours after filling to allow absorption, topping up as necessary, before starting the test. The test shall be conducted for a period of 30 minutes. The rate of water loss shall not exceed one litre per hour, per meter diameter, per metre run of pipe. On that basis the maximum water loss for a 100m length of Sewer over the test period would be 7.5 litres for a 150mm pipe, 11.5 litres for a 225mm pipe, 15 litres for a 300mm pipe, etc. This threshold water loss may be interpolated from the above for the various length of the Sewer under test between manholes. The water test shall be conducted in the presence of an Irish Water Field Engineer or an Irish Water agent's supervisor.

Manholes shall be tested after construction by means of a water test for infiltration and exfiltration. The proportion of manholes to be tested in each development will depend on the number of manholes being provided. The number of manholes to be tested will be advised by the Irish Water Field Engineer to the Developer. Manholes shall be substantially watertight with no discernible water loss out of or infiltration into the structure.

The exfiltration test requirement for water tightness of manholes shall be carried out in accordance with IS EN 1610. The test comprises the following:

- Filling the manhole up to the ground level of the manhole (this is varied sometimes to the underside of the roof slab),
- Allowing the water to set for a period to allow for conditioning, usually 1 hour is sufficient, a longer period may be required in dry weather.
- Water test the manhole for a duration of 30 minutes (+/- I minute)
- Test requirement is satisfied if the amount of water added to bring the water level up to its original position is less than 0.4 l/sq. m of wetted internal surface area.

The exfiltration test shall be carried out before backfilling of the manhole and when the cast concrete manhole or the surround of pre-cast ring manholes is in place and cured.

The infiltration test shall to be carried out in accordance with Clause 7.8 of the Civil Engineering Specification for the Water Industry (CESWI). This test is to be carried out after backfilling around the manhole. The infiltration test may also be carried out on the manhole and the pipeline. Again the manhole and the pipeline shall be backfilled. The test is as follows.

- All inlets to the manhole (or the manhole and pipeline) are effectively closed off.
- For the infiltration test on the manhole only, the test requirement is satisfied if the amount of water leaking into the manhole in a 30 minute period does not exceed 0.1 litres per square meter of wetted internal surface area of the manhole.
- If the pipeline and the manhole are being checked for infiltration, the test requirement is satisfied if the amount of water leaking into the manhole and pipeline in a 30 minute period does not exceed 0.2 litres per square meter of wetted internal surface area of the pipeline and the manhole.

All visible leaks from or inflow into the manhole should be repaired. Remedial works will be required if these results are not achieved and the tests rerun.

Pipes not within the Attendant Grounds, which will be the responsibility of individual property owners, should also be tested to achieve a satisfactory air test result.

Pipes not within the Attendant Grounds will be the responsibility of individual owners shall be dye tested to trace the pipe and ensure proper connectivity to the appropriate Networks (Wastewater Drains to the Wastewater Sewer and storm Drains to the Storm Water Sewer). The Irish Water Field Engineer may carry out random inspections and dye surveys (and CCTV surveys, if necessary) to confirm the proper connection of the services to the Networks.

4.11 Pressure Testing of Rising Mains

4.11.1 General

The Rising Main shall be pressure tested following installation of the pressure main on site. The pressure tests shall be conducted by the Customer's contractor experienced in such testing procedures in the presence of a representative of Irish Water's Field Engineer or its agents.

Rising Mains shall be tested after they are jointed and before full backfilling commences in as far as practicable. During testing, sufficient backfilling material shall be provided above the pipe crown to resist uplift or buckling movement of the pipe and all joints shall be exposed.

Testing shall be carried out between suitably supported blank end pieces. Testing between 'live' shut valves will not be accepted. Before testing, valves should be checked and sealed, the section of Rising Main filled with water and the air released. Water used for testing should be obtained from the existing water supply system. This water will be provided, subject to availability, by Irish Water at the Customer's expense.

The following general requirements are relevant:

- To avoid airlocks there must be suitable air valves on the pipeline,
- Filling must proceed slowly, preferably from the lower side,

- The test must be hydrostatic and should take place between blank flanges; bolted or welded to pipe ends or end caps fully supported by anchor blocks,
- All pressure gauges used for the monitoring of tests must be plate sized pressure gauges or digital loggers with an appropriate pressure range consistent with the pressure being measured, properly calibrated with calibration records available for inspection, to ensure that any losses can be adequately monitored.

All the exposed parts of the pipeline, including the chambers, should be visually checked and any leaks or damp spots rectified.

Any water used for testing should be disposed of in a safe and environmentally suitable fashion. All water used for testing shall be clean and free from impurities. Discharge of the test water to Network shall not take place without Irish Water's express approval.

4.11.2 Testing of Ductile Iron Pressure Pipelines

Testing of Ductile Iron Rising mains shall be undertaken in accordance with IGN 4-01-03, Guide to Testing of Pressure Pipes and Fittings for Use by Public Water Suppliers, October 2015. A formal test report shall be submitted to Irish Water Field Engineers giving the complete details of the test that was carried out in accordance with Section 4 of IGN 4-01-03, regardless of the result of the test.

Test pressure on the Ductile Iron Rising Main shall be 1.5 times the maximum operating pressure at the lowest point of the Rising Main, or the maximum operating pressure plus the maximum calculated surge pressure, whichever is the greater. A preliminary test phase shall be carried when testing Ductile Iron pressure pipelines where the pressure is taken to the operating pressure (without exceeding specific test pressure (STP)) to:

A) Stabilise the part of the pipeline to be tested by allowing most of the time dependent movements.
B) Achieve an appropriate saturation with water when using water absorbing materials (e.g. cement linings on iron pipes).

For iron pipes with epoxy lining the settlement test should be completed in 15 minutes. Where Ductile Iron pipes have cement linings, the Rising Main should be allowed to 'settle' overnight.

The pressure in the pipeline shall then be raised steadily until the specified test pressure is reached in the lowest part of the section and the pressure shall be maintained at this level, by pumping if necessary, for a period of one hour. If there is less than 1% air in the main, the pressure should rise at a uniform rate.

The pump shall then be disconnected, and no further water shall be permitted to enter the pipeline for a further period of one hour. At the end of this period, a record of the pressure will be made by the testing contractor. The original pressure shall be then restored by pumping and the loss measured by drawing off water from the pipeline until

the pressure as recorded at the end of the test is again reached. The acceptance criteria for the pressure test shall be those outlined in Section 6.4, Table 2, of IGN 4-01-03.

If the pipe fails to meet the acceptance criteria, the test shall be stopped and the excess water bled carefully from the system until only static head remains. A search for the potential leak should be initiated. After leaks are found and repaired, the test should be repeated.

In addition to any tests on separate sections, the whole pipeline shall be tested on completion to the same pressure and by the same procedure as that outlined for individual sections.

4.11.3 Testing of Polyethylene Pipelines

It is not necessary to have any preliminary test for polyethylene (PE) pipes. The amount of exposed pipe shall be kept to a minimum to reduce the effect of temperature changes. The testing of PE Pressure Pipelines which are not coiled pipes or where all the joints are not visible during the test shall be carried out in accordance with the requirements of IGN 4-01-03, Guide to Testing of Pressure Pipes and Fittings for Use by Public Water Suppliers, October 2015. A formal test report shall be submitted to Irish Water Field Engineers giving the complete details of the test that was carried out in accordance with Section 4 of IGN 4-01-03, regardless of the result of the test.

For polyethylene pipelines, the recommended system test pressures (STP) shall be:

Rated Pressure	**Test Pressure**
Up top 10 bar	1.5 times the rated pressure
12 bar to 16 bar	1.5 times the working pressure
(or 5 bar plus working pressure, whichever is least)	

The maximum system test pressure should be 1.5 times the maximum rated pressure (maximum pressure that a component can withstand continuously in service) of the lowest rated component.

Mechanical fittings are usually only tested to 20 bar. If the onsite test pressure is to exceed this, a check shall be carried out to ensure that the fittings can withstand the pressure for the test duration.

The acceptance criteria for the pressure test shall be those outlined in Section 5.4.4 of IGN 4-01-03. If the pipe fails to meet the acceptance criteria, the test shall be stopped and the excess water bled carefully from the system. A search for the potential leak should be initiated. After leaks are found and repaired, the test should be repeated, but only after a time greater than four times the total original test time has elapsed to allow for complete creep deformation recovery.

All electro fusion jointing and testing shall be in accordance with WIS-4-32-08, Specification for the Fusion Jointing of Polyethylene Pressure Pipeline Systems Using PE80 and PE100 materials. For all saddle joints a 2 minute hydraulic test at 18 Bar shall be applied to the fused fitting prior to tapping in accordance with WIS-4-32-08.

4.12 Connections

The mode of connection and layout of any junctions or connections between pipes, whether at manholes, inspection chambers, access points or otherwise should be designed to minimise the risk of blockage. Where feasible, connections should be to manholes and not directly to the Works.

As far as practicable, junctions and connections should be built in for all planned users when Sewers are constructed to avoid damage to the Sewer by installing connections at a later date when the system is live. Where it is necessary to make a post-construction connection the upstream end of any unused connection should be sealed until required. Where there is a manhole adjacent, the connection should be made to the manhole. Where there is no manhole, it may be necessary to construct a new manhole.

The vertical angle between the service connecting pipe and the horizontal should be greater than 0 degrees and not more than 60°.

Where the connection is being made to a Sewer with a nominal internal diameter of 300mm diameter or less, connections should be made using 45° angle junctions. Connections made with junction fittings should be made by cutting the existing pipe, inserting the junction fitting, and jointing with flexible repair couplings or slip couplers.

For connection being made to a Sewer with a nominal internal diameter greater than 300 mm:

a) where the diameter of the connecting pipe is greater than half the diameter of the Sewer, an access manhole should be constructed to form the connection point; or,
b) where the diameter of the connecting pipe is less than or equal to half the diameter of the Sewer, then the connection should be made using a preformed saddle fitting with a slow bend between the saddle and the connecting The Works .

Connections made with saddle fittings to concrete pipes should be made by cutting and safely removing a core from the pipe and jointing the saddle fitting to the pipe in accordance with the manufacturer's instructions to ensure a watertight joint. The connecting pipe shall not protrude into the Sewer. Connections to PVC or structured wall pipes shall be achieved by installing junction connections pieces as the pipe is installed.

The connection pipe between the Sewer connection fitting and the property Curtilage boundary shall be installed as a straight length of Sewer without bends. It shall be tested to achieve a satisfactory air test result as outlined in **Section 4.10** above.

4.13 Protection against Flooding

The layout of the Works should minimise the risk of damage to property from flooding in the event of excessive flows, blockage, or failure of pumping stations on the system.

Flooding caused by blockages of Wastewater pipes should have identified flow paths and should not cause internal property flooding.

In designing the development's site layout and the Works, designers shall also demonstrate flow paths and the potential effects of flooding resulting from blockages, pumping station failure or surcharging in downstream combined Sewers, by checking the ground levels around the likely points that wastewater would flow from the system, to identify the flood routes.

Part 5 – Pumping Stations

5.1 Pumping Stations Provision

It may be necessary to incorporate pumping stations in the Works. This Section of the Code of Practice outlines Irish Water's requirements on such installations.

These requirements apply to small to medium sized pumping stations which will be designated as Type 1, Type 2 and Type 3 pump stations in the following Sections. Small pumping stations, and designated as Type 1, are those serving an incoming peak design flow of less than 0.25 litres per second (typically five dwellings or less). Pumping stations with typical incoming peak flows ranging from 0.25 litres per second to 1.0 litre per second (typically six to twenty dwellings) and designated as Type 2, will be regarded as mid-range sized pumping stations. Medium sized pumping facilities are designated as Type 3 and will have incoming peak flows in excess of 1.0 litre per second with an upper limit overall power capacity of less than 20kW installed power.

Pumping stations of large capacity are not normally required in developments that are the subject of this document. These higher capacity pumping stations also require the specific approval of Irish Water. The specific requirements associated with these types of pumping stations are not covered in this Code of Practice.

5.2 General Requirements

The design of the Works shall minimise the use of energy over the life of the system. However, there may be a necessity to collect Wastewater in low lying areas and lift it to a Gravity Sewer or to a pipe connected the ultimate treatment location.

Wastewater pumping stations or pumped systems should only be used where their whole life cost is less than the cost of conventional gravity systems over a period of 40 years, based on a Net Present Value (NPV) assessment, and where the proposed Wastewater system is consistent with Irish Water's technical design vetting assessment acceptance. Full gravity Works shall be provided unless the physical conditions of the site do not allow this. Pumping stations will only be Vested by Irish Water where the Customer can provide clear evidence that that pumping station is required as outlined above in the Design Submission, **Section 2.3**.

In all cases, the impact on the downstream infrastructure, existing Sewers, pumping stations and Wastewater treatment plants, should be taken into consideration when proposing and designing pumping stations. It may be necessary to curtail the discharge rate, provide balanced storage, etc. to limit the impact of the pump station operation on the downstream infrastructure.

Pumping stations should be fully automated with provisions for remote monitoring by telemetry. A dedicated, metered, power supply shall be provided to the pump station with a separate billing account. No other equipment, lighting system, etc., shall be served from this metered power supply.

All pumping station plant and equipment shall be fully tested to ensure adequacy and to establish that the pumping station as a whole is fit for purpose for its intended use. The testing shall be carried out with water before allowing Wastewater into the facility. A full operational test of all pumps, pump controls, pump protection devices, telemetry systems, etc. shall be demonstrated to Irish Water personnel prior to commissioning of the plant with Wastewater and the results of these tests shall be included in the Final Documentation.

All operation and maintenance manuals, As-Constructed Drawings, Control Panel Wiring Diagrams, Control Philosophies, etc. shall be provided as part of the Final Documentation to Irish Water personnel prior to commissioning in accordance with Part 2 of this Code of Practice. The document package shall include full pump details, including performance curves and power ratings, and all warranty documentation for the installed equipment.

The ownership of land on which the pumping station and associated plant is located shall be transferred to Irish Water. Arrangements for Vesting of the completed Pumping Station shall be in accordance with Irish Water requirements.

To ensure that Wastewater flooding does not occur at or upstream of the pumping station during normal operation or during plant or power failure, additional storage shall be provided at the pumping station site at all pumping stations. This storage shall be provided above the highest pump cut in level and should ensure that surcharging of the collection system does not impact any existing or possible future connections. The required emergency storage capacity will depend on the size of the development. Emergency storage capacity of 24-hour of Dry Weather Flow is required for smaller developments up to 275 units. The emergency storage requirement will be reduced for larger developments in accordance with specific advice from Irish Water's Connections and Developer Services. Storage capacity in the Sewer or manholes may be utilised and calculations should be provided at design stage. These storage tanks can give rise to septicity and odour. Therefore, the provision of such facilities shall ensure that these risks have been adequately and satisfactorily addressed.

Where the Customer makes provision for emergency overflow situations, these shall be agreed with Irish Water and with the Environmental Protection Agency (EPA) in advance as part of the approval of the Customer's proposal. Specific discharge licences and approvals shall be provided for such overflows under the Water Pollution Act (1977 – 1990).

5.3 Specific Minimum Requirements

Specific minimum requirements for pumping stations are as follows:

5.3.1 Pump stations to have a minimum of two submersible pumps;
5.3.2 Pumps to be provided on a duty/standby control arrangement or if more than two pumps required, the arrangement to be duty/assist/standby;
5.3.3 Plate to be provided near top of wet well chamber to allow nomination of the pumps (e.g. Pump No 1, Pump No 2, etc.);
5.3.4 Electrical and control equipment to be located in a vandal resistant kiosk or structure situated adjacent to but offset from the pumping station, complete with ammeter for each pump, hours run meter for each pump, socket to accept a power supply from a portable standby generator, etc.;
5.3.5 Emergency Wastewater storage capacity or emergency overflow facilities to be provided in all pumping stations and equipped with appropriate septicity and odour mitigation provisions;
5.3.6 Access for operation and maintenance vehicles to be provided;
5.3.7 Welfare facilities to be provided for plant operatives for Type 3 Pump Stations, including a small wash-hand basin within a separate kiosk or within the kiosk/structure for the plant control equipment subject to health and safety risk assessment;
5.3.8 Security fencing and access gates to be provided where deemed necessary, (fencing and access gates not required in all cases, see Section 5.6 below);
5.3.9 A dedicated, metered, power supply to be provided to the pump station serving only the pump station equipment and associated plant;
5.3.10 Telemetry outstation to be provided for data reporting to Irish Water central facility;
5.3.11 Alert system and call out emergency response to be provided in the event of plant breakdown or malfunction;
5.3.12 Flow metering facilities to be provided on the Rising Main as appropriate;
5.3.13 Odour control equipment to be provided where there is a risk of odour nuisance arising;
5.3.14 Lifting equipment to be provided for the removal of plant and equipment (See Section 5.20 below);
5.3.15 Safety equipment to be provided for controlled and planned safe access to the wet well, including gas monitors, tripod and lifting harness, etc.;
5.3.16 Pump stations wet well and valve chamber to be provided with pipework, to allow emptying of the Rising Main and wet well by a vacuum tanker.

5.4 Layout of Pumping Station

Subject to Planning Permission requirement, the layout of the pumping station site and access road should be arranged so that:

5.4.1 There is sufficient space to accommodate a tanker off road, and/or a large van and/or a mobile pump/generator within the site;
5.4.2 There is sufficient space between the various units on the site to enable maintenance operations to be carried out, especially between the pump station sump/valve chamber and control equipment kiosk or structure;
5.4.3 There is sufficient space to carry out the chosen method of pump maintenance and installation of temporary pumps;
5.4.4 The doors to control kiosk(s) open safely and provide sufficient room for operators to safely carry out maintenance or repairs;
5.4.5 The need for personnel entry to confined spaces is minimised;
5.4.6 The inlet pipe is above the highest cut in level of the pumping plant units;
5.4.7 The pump delivery pipework within the wet well is opposite or at right angles to the inlet Sewer with sufficient baffling facilities to protect the pumping plant;
5.4.8 The access is sufficiently wide to accommodate a tanker and/or a large van and /or a mobile pump/generator;
5.4.9 Exclusive access is provided to the pumping station site via the access road;
5.4.10 Sufficient separation is provided between the various units and the site security fencing, if such fencing is required/provided, as outlined in Section 5.6 below,
5.4.11 Adequate site security lighting is provided to achieve 100 lux at ground level, with intensity adjustment appropriate for the site location, complete with photoelectric cell controller and over-ride control switch;
5.4.12 No overhead obstructions or electrical cables are located at or near the site that could pose a risk of electrocution, as outlined by a safety risk assessment;
5.4.13 All pumping station units are accessible and surrounded by a concrete footpath, 900mm minimum width, with 750mm minimum width footpaths around smaller chambers;
5.4.14 The location of the pumping station is not susceptible to flooding;
5.4.15 Security fencing, 2.4m high apart from Type 1, small, pumping stations, with sufficient width lockable access gates, 4.0m wide (minimum) to accommodate maintenance vehicles.

The site of the pumping station and access road thereto shall be of sufficient width, gradient and suitably surfaced to ensure reasonable access for Irish Water vehicles, plant and operatives and to facilitate the various maintenance operations, including emptying of contents, provision of stand-by generation plant, etc.

Before the location of a pumping station is decided, the Customer should consult with the electricity and telecommunications providers on the availability and cost of providing the requisite power supply, the supply characteristics, the security of supply and Easement. The Customer should also carry out a radio survey to ensure that radio signals for the telemetry system at the station can be transmitted from the transmitter and received at the reception point. The electricity and telecommunications supply

arrangements and radio survey shall be the Customer's responsibility and cost and these shall be provided for the exclusive operation of the pumping station.

The last access manhole on the Gravity Sewer system upstream of the pumping station should be located adjacent to the wet well within the site of the pumping station compound. It should be designed to allow for over-pumping of the influent. The inlet manhole or the inlet pipe to the wet well should be fitted with a hand operated isolating penstock.

5.5 Location of Pumping Station

Small pumping stations (Type 1) should be located no closer than **5.0m** to a property boundary in order to minimise the risk of odour, noise and vibration nuisance. This distance should be increased to **10.0m** for mid-range sized pumping stations (Type 2) and to **15m** for medium sized pumping stations (Type 3). The distance should be measured from the pumping station site boundary to the boundary of the nearest habitable property. This distance may be subject to change depending on local circumstances and early discussions with the Planning Authority and Irish Water. Facilities for odour control shall be installed (passive and/or forced systems) if the pumping station is likely to create odour nuisance impact due to being located in close proximity to dwellings and public areas.

The pumping station should not be located within a public or private road, at the end of private driveways, in locations which may be used for vehicle parking, in places where maintenance work may obstruct rights or way, emergency vehicle access or where there is a risk of harm from moving vehicles to operatives carrying out maintenance activities. The location should be chosen so as to allow safe and reasonable vehicular access for the purpose of repair and maintenance. Long reversing access ways are not acceptable. Ideally, the access to a pumping station should be from a public road or by the provision of a dedicated access road from the public road. Shared access with domestic driveways is not deemed suitable. The access road gradient should be as level as possible or within acceptable road gradient appropriate for the maintenance vehicle(s) requiring access to the site.

Provision should be made for access by a tanker to empty the contents of the wet well and any storage facility in the event of failure. The tanker size will depend on that which is available to Irish Water or its agents for emptying of the facility but access for an 18 m^3 tanker should be provided as a minimum. Access for the provision of stand-by power generation plant should also be made available. The size of the standby power unit will be dependent on the pumping capacity of the station.

The pumping station should not be located in areas that are susceptible to flooding at a frequency of more than 1:30 year recurrence. The pumping station facility shall be designed for inundation. The finished slab level of the pumping station shall be positioned above the 1:100 year flood level. All electrical control equipment shall be water resistant and positioned above the 1:200 year flood level.

The size and/or location of a pumping station will determine if Irish Water will deem that security fencing and gates are required to provide a form of boundary or if a wall, fence or hedge is deemed adequate. Irish Water should be consulted in this regard.

5.6 Fencing and Boundary Security

It should be noted that the Local Authority Planning Department may determine the requirements for fencing, site layout, control plant kiosk/structure, etc. under the Planning Permission. The pumping station should be secure in its own right without having to rely on security fencing. Kiosks and access covers should be locked and secure in their own right.

A fenced compound is not always necessary for smaller pumping stations. Irish Water should be consulted in relation to the need or otherwise for the fencing of pumping station sites and its decision will be determined having considered public safety, the likelihood of vandalism, the depth of the pumping station structures, the extent and type of pedestrian traffic and whether special activities are taking place on the site. Type 2, mid-range, and Type 3, medium sized, pumping stations will generally require site fencing.

If security fencing is required, it should comprise 2.4m high, corrosion resistant mild steel mesh fencing, galvanised and plastic coated finish, with similar type access gates complete with v-beam reinforced profile and anti-climb features at the top of the fence. Anti-burrow features shall be provided for circumstances where Enhanced Security is required by the provision of a 125mmwide by 150mm deep concrete sill along the base of the fence line. The sill shall be formed using in-situ reinforced concrete, Grade C25/30 to IS EN 206. All fence material and workmanship shall be in accordance with IS EN 1722-14. The security rating shall be in accordance with Irish Water's security policy and the fence security rating is to be agreed with Irish Water in advance. The security rating of the site shall be in line with one of the options below:

Security Rating	**Mesh spacing (mm) (Vertical and Horizontal)**	**Bar Thickness**	**Height**	**Additional Features**
Basic +	150 x 50	5mm	2.4m	Anti-Climb
Enhanced	150 x 50	5mm	2.4m	Anti-Climb
Enhanced +	50 x 50	4mm	2.4m	Anti-Climb and Anti-Burrow

The fence panels shall be fixed to fence pillars. Corner pillars shall be braced in both directions. All fixing bolts shall be tamper resistant or burred over. The fence, pillars, bracing, runners, diagonals, gate posts and gates, etc. shall be in accordance with the manufacturer's instruction and the designs shall be provided to Irish Water for review and vetting. The gate posts, pillars and bracing shall be supported in concrete bases, Grade C30/37 to IS EN 206, of suitable size to resist imposed loadings.

The access gates should be of sufficient width to accommodate maintenance vehicles, tankers, etc. The access gates should be provided with slide bolts, shooting bolts and padlocks. If opening outwards, the access gates should be set back from parking and access areas by the width of the leaf of the gate. Gate hinges shall be designed so that it is impossible to remove the gate by lifting when it is closed and locked in position. Drop bolts shall be fitted to each gate leaf in such a way that they cannot be removed but that they allow the gate to be secured in both the open and closed position. In certain circumstances, a pedestrian gate shall be provided in the security fence if required by Irish Water.

The colour of the fence, access gates and Accessories shall be holly green 14C39 in accordance with BS 4800.

In certain circumstances, a 2.4m high security wall may be deemed adequate so as to match surrounding structures. In this circumstance, a steel access gate should be provided as outlined above.

5.7 On-Site Parking and Hard-Standing

It should be noted that the Local Authority Planning Department may determine the requirements for on-site parking under the Planning Permission. Small and mid-range sized pumping stations located off public roads with adequate parking will not require dedicated on-site parking. Where access is from a traffic-sensitive street or other major road or where parking is not available without obstructing the road, provision should be made for adequate parking (e.g. in a lay-by) for a tanker adjacent to the site. If access is from a public road, the entrance gate should be set back from the edge of the road for a distance of one vehicle length, based on the largest vehicle accessing the site. The access provision to and from the pumping station shall enable such access to be achieved without the need for reverse movements of the vehicle. The access provision shall also be provided to comply with the most up-to-date Local Authority Design Manuals particularly in respect of road curves and turning circles.

On-site parking should be provided by hard-standing areas surrounded by 125mm high pre-cast or slip formed concrete kerbing. Such hard-standing may comprise permeable or impermeable surfaces, depending on the Water Service Activities being carried out on the site and on the sub-surface ground conditions at the site. Impermeable surfaces should comprise a 300mm depth of compacted Clause 804 granular material, in accordance with the National Roads Authority Specification for Road Works, with a 75mm well compacted regulating course. Where tanker access is provided or where HGV access is required, the hard-standing should be 200mm thick reinforced concrete (Grade C28/35 to IS EN 206 -20mm aggregate to IS EN 1260) on 500mm of Clause 804 granular sub-base in accordance with the National Roads Authority Specification for Road Works. For lighter vehicles, tarmacadam surfaces, comprising 75mm wearing course on 500mm of Clause 804 granular sub-base, may be provided.

An impermeable surface of concrete construction should be provided around the wet well of the pumping station to provide a safe working area. This should be 900mm wide where the depth of the wet well is less than 1.5m and it should be 1.5m wide where the depth of the well exceeds 1.5m. A concrete area, 900mm in width, should be provided around other chambers where access is required. A concrete path, 750mm in width, should be provided in front of a kiosk.

5.8 Hydraulic Design of Pumping Stations

The design flow rate of a pumping station will depend on the Wastewater flow rate and volume arriving to it from the Gravity Sewer system. Generally, pumping stations are designed to limit the number of pump starts so that the pumping plant is not damaged by excessive start/stop activity, generally not exceeding 10 starts per hour. The pumping plant shall be fitted with direct on-line starters for motors sizes up to 5 kW. Motors rated 5kW and above should be provided with star delta starters or variable speed drives (VSDs). The pumping duration of a pump unit should not be less than 60 seconds. The pumping capacity should ensure that the Wastewater is passed from the wet well and the Rising Main without excessive residence time which might give rise to septic conditions. Generally the combined residence time in the wet well and the Rising Main should be less than six hours. A pumped flow rate should be chosen to achieve at least a minimum flow velocity in the Rising Main, as outlined in **Section 3.7** above.

Generally, pumping plant shall be sized to deliver a peak flow rate of six (6) times the incoming dry weather flow (DWF) but pump delivery of three (3) times the dry weather flow (DWF) may be appropriate if adequate balance storage of the Wastewater is provided. Balance storage may be required in association with the pumping station to provide a minimum 6-hour and up to a maximum 24-hour storage capacity. The required storage capacity will depend on the size of the development. Emergency storage capacity of 24-hour Dry Weather Flow is required for developments up to 275 units. The balance storage requirement capacity will reduced for larger developments in accordance with specific advice from Irish Water's Connections and Developer Services.

The pumping plant shall have 100% standby capacity. The plant shall be provided with a telemetry outstation to transfer data from the pumping station to an Irish Water control centre. The data to be transferred to Irish Water Control Centre shall include at least the following:

5.8.1 Available/Run/Trip status for all pumps;
5.8.2 Status for all float switches;
5.8.3 Sump level;
5.8.4 Instantaneous flow;
5.8.5 Totalised flow;
5.8.6 Mains Power Failure;
5.8.7 UPS Fault/Healthy Status.

For pumping stations where phased development is anticipated, the pump station structure shall be provided to facilitate the fully developed site. Pipework shall be provided for the ultimate flows. This might involve the installation of pipes within the wet well and provision within the valve chamber for future pump units which are initially not in use. The pumping plant should be provided to accommodate the likely medium term anticipated flow, provided this does not create a nuisance or septicity problem. In some instances, twin Rising Mains may be required to accommodate the phased flow increase over the life cycle of the pumping facility. Where pump station expansion is proposed for future phased development, the initial Design Submission (See Part 2 Design Requirements and Design Submissions of this Code of Practice) shall include the design calculations for the phasing of the Pumping Station.

The pumping plant should be designed to pump against a design head comprising a combination of the static head and the pipe friction head. The pumping station design static head for the design flow should be based on the difference in level between the mid-point of the duty pump start level in the wet well and the discharge point at the header manhole. The design pipe friction head will depend on the pipe size, the pipe fittings, velocity in the pipe as well as the friction factor of the pipe material. The pipework associated with the pumping plant shall be adequately restrained to resist vibration and impact arising from the operation of the pumping plant.

The pumping station should be provided with an ultrasonic level control system with operator adjustable set points for pump unit cut in and cut out as well as top level cut in and low level over-ride cut out. The cut-out level should be set such that it is above the top of the pump motors. Appropriate set points should be provided if duty and assist pumping plant is included in the pumping station. Duty and standby pumping plant should be provided at each pumping station. A standby pump unit should be provided if a duty/assist pumping arrangement is required. A hard wired low level float switch and high level float switch should be provided in each pumping station and these should be linked to the telemetry control system. Automatic duty/standby switch over should be incorporated into the pump control system. A manual override should be provided in the pump control system.

The pump units should operate safely and effectively in accordance with the pump manufacturer's instructions such that the pump units do not exhibit damaging cavitation, vibration, air locking or surface vortices.

5.9 Pumping Plant

Having regard for the provisions of **Section 5.8** above in relation to hydraulic design of pumping stations and taking cognisance of phased capacity allowance, the specific minimum requirements for pumping plant are as follows:

5.9.1 Pumping plant should be of failsafe design;
5.9.2 All plant and equipment to be suitably Ex-rated in accordance with the Hazardous Area Classification for the pumping station site;

5.9.3 Pumping plant to be duty and standby arrangement or duty/assist and standby arrangement;
5.9.4 Pumps to be submersible pumps with automatic decoupling arrangements complete with twin guide rails, easy lift, etc.;
5.9.5 Pumping plant to be of proven track record;
5.9.6 Automatic selection rotation of the duty/standby or duty/assist/stand-by pumps to be provided on an hours run basis with manual over-ride;
5.9.7 Pumps to be sized for a minimum of three (3) times DWF, if storage provided, and six (6) times DWF otherwise;
5.9.8 Pumps to be suitable for pumping unscreened Wastewater containing fibrous material and large solids. Pumps connected to small diameter Rising Mains to be fitted with an anti-blockage/anti-ragging system and additional anti blockage requirements will be required for Rising Mains less than 100mm diameter;
5.9.9 Pumps to have, in general, a minimum discharge size of 80mm;
5.9.10 Pump control to be via ultrasonic level transducers, located above liquid level, in an easily accessible location;
5.9.11 The pump guide system to be provided to allow the pump units to be automatically coupled to the outlet pipework and held in place by its own weight;
5.9.12 The guide system to allow the pump units to be lifted to the top of the wet well without the need to undo any fixing arrangements or to enter the wet well;
5.9.13 Anchor bolts shall be stainless steel, stainless steel and galvanised steel surfaces shall not come into contact with each other;
5.9.14 Pumps to be mounted on a cast iron coupling/duck-foot pedestal, with automatic decoupling arrangements;
5.9.15 Pump arrangement to be provided to allow easy installation and speedy removal from the sump without need for operator entry to the sump;
5.9.16 Pumps guide rails to be of galvanised mild steel or stainless steel (grade 316);
5.9.17 Pumps to be provided with certified, stainless steel lifting chain (designed to IS EN 818 – Part 7), suitably sized and fit for purpose, with 8mm thick links, at least, and large links at not more than 1m intervals;
5.9.18 Spare certified stainless steel chains, of similar capacity to the installed chain unit, shall be provided to facilitate regular inspection/replacement of the lifting chain;
5.9.19 Anchor bolts to be of stainless steel or galvanised steel suitable for the material being retained (no contact between stainless steel and galvanised steel);
5.9.20 Discharge pipework within the wet well to be complete with bends, radial tee-pieces, fittings, etc. to link the wet well pipework to the valve chamber pipework;
5.9.21 Pipework within the valve chamber to incorporate isolation valves (one per pump installed), non-return valves (one per pump installed), bends, radial tee-pieces, etc.;

5.9.22 Non-return valves to have removable covers, ductile iron body with resilient seated disc and stainless steel hinge pin, complete with either a ball weight or lever arm and weight;
5.9.23 Bends to be swept/slow bends to minimise blockages and pipe friction losses;
5.9.24 Sluice valves to be provided with removable hand-wheels;
5.9.25 Flange adaptors to be provided to permit ease of removal of valves from the pipework;
5.9.26 All pipework and valves to be of ductile iron to IS EN 598, suitable for use with sewage, with PN-16 flanges to BS EN 1092-1;
5.9.27 Pump motors to be high efficiency with Class F insulation and IP68 rating and must meet IE3 efficiency standards or better;
5.9.28 Pump efficiency shall be maintained within 15% of its maximum efficiency over the whole of the specified duty range;
5.9.29 Motor and motor housing to be bolted to the pump housing, shrink or press fit assemblies will not be accepted;
5.9.30 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 the temperature returns to normal;
5.9.31 Pumps shall have a maximum speed of 1500rpm. Pump characteristics shall be stable, non-overloading and shall be such that the pumps shall operate as close to maximum efficiency at the design point (Speeds in excess of this may be allowed in the case of non-clogging macerator pumps, where these are provided);
5.9.32 Pumps to be provided with indicator plates providing information for the pump, motor, etc. A duplicate stainless steel plate to be provided and mounted in the control panel.

It is the responsibility of the Plant Designer to ensure that Area Classification is applied to the design of the pump station and to identify the potential for flammable or explosive atmospheres to develop in or around the pump station. ATEX Directives 1999/92/EC and 1994/9/EC are to be adhered to. IS EN 60079 should also be adhered to in regard to Area Classification. The drawings submitted and the specification of the pump station should demonstrate the Area Classification of the pump station or otherwise the absence of zoning.

5.10 Wet Well

The wet-well of the pumping station can be of rectangular or circular plan section with a minimum 1,800mm square plan or 1,800mm diameter shape. The shape of the wet well shall be such that solid matter does not accumulate in dead spots within the well. The shape of the wet well and location of the inlet Sewer arrangement should ensure satisfactory flow conditions to the pump unit to avoid the formation of damaging vortices. This is best achieved by installing the incoming Sewer on the centreline between the submersible pump units at a depth between 0.15m and 1.15 m above the

pump highest cut in level. An inlet baffle may be provided for the Sewer inlet to prevent excessive aeration of the Wastewater or the interference with ultrasonic beams used for level sensing. There shall be a minimum capacity between the start and stop level controls to give a maximum of 10 starts per hour.

The depth of the wet well shall be suitable to accommodate the incoming Gravity Sewer, the pumping plant, the minimum pumping storage between cut-in and cut-out, etc.

A collection manhole shall be provided if there are multiple Sewers draining to the pumping station site so that flow enters the wet well in a single inlet pipe. Provision should be made for isolating the incoming flow by means of a hand-operated valve or penstock. This unit should be located in a chamber upstream of the wet well and not in the wet well itself.

Benching in the wet well should be provided to eliminate “dead zones” within the wet well to prevent siltation or accumulation of debris. The benching should start no more than 100mm from the pump unit volute or in accordance with the pump manufacturer’s recommendations. The slope of the benching should be a minimum of 45 degrees. The area under the pump should be as small as possible to ensure well cleansing and the flat floor area should be kept to a minimum. The wet well should be kept to a minimum to reduce the amount of benching that is required.

The wet well should be designed, as far as practicable, to eliminate the need for man-entry for maintenance. No permanent ladder or step irons should be located within the wet well. If the wet well is deeper than 4m, Irish Water may require additional safety measures to be installed within the well for maintenance purposes.

The wet well shall be constructed using in-situ reinforced concrete, Grade C30/37 to IS EN 206, or with pre-cast concrete units. The wet well shall be water tight for both ingress of groundwater and egress of Wastewater. The minimum factor of safety against flotation for the empty structure subject to groundwater pressure should be 1.2. This should only be used where the maximum groundwater level is accurately known or, if not reliably known, a groundwater level equivalent to the finished ground level should be used.

If constructed with in-situ reinforced concrete, the wet well structure should be designed to IS EN 1992 – Part 3. The surface finish of the internal surface of the wet well should be fair faced finish (F2 or better) obtained using forms to provide a hard surface with true, clean edges. Only minor surface blemishes are permitted. Fins and other projections shall be removed and the surface made good. The cover slab should be designed to withstand accidental vehicular wheel loads. Reinforcement used in the wet well structure should be high yield steel in accordance with BS EN 4449.

If precast concrete units are used for wet well construction, they shall conform to BS 5911-4 and to IS EN 1917. Joints between the precast components shall provide equivalent water resistance as required in IS EN 1992 – Part 3. The precast units should be surrounded with not less than 150mm thickness of C20/25 to IS EN 206, 20mm aggregate size to IS EN 12620.

The pipe manufacturer's recommendations should be followed where a Rising Main passes through the wall of a wet well to safeguard against the integrity of the main from differential settlement or movement. If pipes through the wall are installed in box-out openings, subsequent filling of the opening shall be carried out with grade C28/35 to IS EN 206, 20mm aggregate size to IS EN 12620, concrete to ensure a completely watertight structure.

The building in of pipes through walls, roofs and other concrete structures shall be carried out to prevent liquid leakage into or out of the structure. Puddle flanges shall be provided to prevent such leakage and to ensure watertight construction. Where necessary, thrust flanges shall be provided to resist imbalanced forces acting on the pipe.

The pump station wet well shall be provided with pipework, 100mm minimum diameter, terminating 100mm from the low side of the sump floor and extending through the wall of the valve chamber. Pipework sizes below 100mm diameter may be allowed in small capacity pumping station installations with the written approval of Irish Water. This pipe system shall be fitted within the valve chamber with a non-return valve and male Bauer coupling in the valve chamber, to allow emptying of the Rising Main by a vacuum tanker.

5.11 Emergency Overflow and Storage

Unless specified by Irish Water, emergency overflows are not required for Wastewater pumping stations. If an emergency overflow is not provided, a larger wet well, a separate specifically designed off-line storage tank or an enlarged Sewer may be needed in order to provide additional storage and thereby reduce the risk of localised flooding or pollution during plant or power failure. If the storage is provided within the wet well, the storage capacity should be accommodated above the highest cut in level pump setting and below the invert of the incoming connected inlet Sewer. If part of the incoming Sewer is used for a portion of the storage, it should be limited to ensure that surcharging of the collection system does not impact any existing or possible future connections. The plan area of the wet well below the high level alarm pump setting should not be increased to form any of the required storage.

Emergency storage capacity, based on dry weather flow, shall be provided at the pumping station. The required storage capacity will depend on the size of the development. Emergency storage capacity of 24-hour Dry Weather Flow will be required for developments up to 275 units. The emergency storage capacity

requirement will be reduced for larger developments in accordance with specific advice from Irish Water's Connections and Developer Services.

A 225mm diameter high-level overflow pipe, or a pipe to match the capacity of the incoming Sewer, shall be provided between the pump station wet well and the storage chamber if off line storage is provided. The return pipe feeding back to the pump station shall be a minimum of 225mm diameter and shall be fitted with a proprietary non-return valve at the wet well chamber.

In exceptional circumstances, if an emergency overflow is to be provided, the following legislative or written consents will at least be required:

5.11.1 Consent to discharge from the Environmental Protection Agency,
5.11.2 Consent from the appropriate Local Authority to place an outfall in a watercourse in accordance with the Water Pollution Act,
5.11.3 Planning Permission from the relevant Planning Authority,
5.11.4 Easement and right to discharge from affected land owners
5.11.5 Consent from Inland Fisheries Ireland and/or Waterways Ireland, if relevant,
5.11.6 A Foreshore Licence if the discharge is to a foreshore area.

Where emergency overflows to water bodies are allowed and installed, the overflow pipe or weir shall be fitted with mechanical self-cleaning screens and baffle plates to retain floating material, debris, etc. within the collection Network for subsequent forward pumping. The aperture size of the overflow screen will depend on the receiving water body and it shall comply with the requirements of the document available from the Environmental Protection Agency, Urban Wastewater Treatment Directive (91/271/EEC), Procedures and Criteria in relation to Storm water Overflows, as published by the Department of Environment.

5.12 Valve Chamber

The valve chamber is provided to house valves and fittings associated with the pumping plant. It should be separate from the wet well but it may be structurally attached to the wet well. The valve chamber shall be fully sealed from the wet well and it shall be provided with a manually operated Drain valve to allow the discharge of liquid from the valve chamber to the wet well.

The valve chamber should house the following:

5.12.1 Discharge pipework complete with bends, valves, fittings, etc. to link the wet well pipework to the Rising Main pipe;
5.12.2 A gate valve for each pump unit mounted horizontally in the pump outlet pipework and arranged to isolate the pump unit from the Rising Main;
5.12.3 A non-return valve for each pump unit mounted horizontally in the pump outlet pipework, upstream (wet well side) of the gate valve, and arranged

to prevent flow reversal under normal operating conditions in the Rising Main;

5.12.4 A gate valve and 100mm male Bauer coupling mounted vertically on a tee piece in the Rising Main, upstream of the Rising Main gate valve and check valve for pumping out of the Rising Main;

The valve chamber should be provided with a hand operated valve and gravity drain into the wet well. The valve should be installed in a drain sump at the corner of the valve chamber floor area. The floor of the valve chamber should slope to the sump to enable collection of any accumulated liquid in the valve chamber. The discharge drain should be protected to ensure that flows of noxious gas cannot enter the valve chamber from the wet well.

The valve chamber should have a maximum depth of 1.5m from soffit of the roof slab to the floor of the chamber. Appropriately sized covers should be provided to the openings in the roof slab of the chamber. Adequate clearance shall be provided beneath all pipework to allow safe access to flange bolts for maintenance operations to be carried out.

The valve chamber shall be constructed using in-situ reinforced concrete, Grade C30/37 to IS EN 206, or with pre-cast concrete units. The chamber shall be water tight for both ingress of groundwater and egress of Wastewater. The minimum factor of safety against flotation for the empty structure subject to groundwater pressure should be 1.2. This should only be used where the maximum groundwater level is accurately known or, if not reliably known, a groundwater level equivalent to the finished ground level should be used.

If constructed with in-situ reinforced concrete, the valve chamber structure should be designed to IS EN 1992 – Part 3. The surface finish of the internal surface of the chamber should be fair faced finish (F2 or better) obtained using forms to provide a hard surface with true, clean edges. Only minor surface blemishes are permitted. Fins and other projections shall be removed and the surface made good. The cover slab should be designed to withstand accidental vehicular wheel loads. Reinforcement used in the valve chamber structure should be high yield steel in accordance with BS EN 4449.

If precast concrete units are used for valve chamber construction, they shall conform to BS 5911-4 and to IS EN 1917. Joints between the precast components shall provide equivalent water resistance as required in IS EN 1992 – Part 3. The precast units should be surrounded with not less than 150mm thickness of Grade C20/25 to IS EN 206, 20mm aggregate size to IS EN 12620.

The chamber shall be fitted with manhole steps to comply with IS EN 13101, Type D, Class 1, galvanised mild steel and plastic encapsulated. Access to the confined space within the chamber shall be by way of a safe access plan.

Cable ducts into the valve chamber and between the valve chamber and the wet well should be sealed watertight. Gas tight sealing glands shall be provided between the valve chamber and the wet well and the valve chamber and the kiosk to prevent the migration of gas into the valve chamber and between the wet well and the control kiosk.

5.13 Flow Metering

Flow meters shall be provided to measure and record the Wastewater flow being pumped forward through the Rising Main. Magnetic flow meters shall be provided with flow recorders linked to converters in the MCC panel of the control kiosk, complete with a digital display showing instantaneous and accumulated flow records. Flow meter and associated equipment, including calibration test certification, will be required for all pumping stations. The flow meter should be provided in a separate flow meter chamber, located a sufficient distance from all fittings and bends, to ensure that interference of the measurement does not arise from flow turbulence associated with such fittings.

The flow meter chamber should have minimum plan dimensions of 1500mm x 1500mm. It should include a flow meter, positioned in accordance with the manufacturer's instructions. Sluice valves shall be provided adjacent to the meter chamber and valve chamber to allow isolation, removal or servicing of the meter. The pipework within the meter chamber shall incorporate a dismantling joint to allow removal of the flow meter.

5.14 Access to the Wet Wells, Valve Chambers and Other Chambers

The top of the wet well, valve chamber, meter chamber and other associated chambers shall be situated 150mm above the surrounding paved areas. A stainless steel nameplate shall be provided at each chamber designating the title of the chamber.

Access covers in the roofs of the wet well, valve chamber and other chambers should be large enough to allow for pump units, valves and flow meters to be removed easily and safely out of the well/chamber for above ground inspection, maintenance, etc. Openings in all other chambers shall not be smaller than 675mm x 675mm.

The opening and access covers should have the following features:

5.14.1 Covers to be secure and capable of providing safe and easy access to the chambers for inspection, maintenance and operation;

5.14.2 Covers to be lockable, fabricated from steel, galvanised to IS EN 1461 (2009) with non-slip surface and finished flush with the roof slab of the chamber(higher specification material or finishes may be required in aggressive environments, e.g. coastal sites);

5.14.3 The minimum allowable access for wet wells and valve chambers to be 1,400mm x 800mm, access openings to manholes and other infrequent access chambers may be 675mm x 675mm;

5.14.4 Chamber access covers with a clear opening exceeding 1000mm shall conform to BS 9124;
5.14.5 Hinged covers to be used in all openings exceeding 675mm x 675mm;
5.14.6 Hinged cover to incorporate a facility for securing a recessed padlock;
5.14.7 Each leaf of the cover to have assistance to ensure a lifting effort of less than 25kgF.;
5.14.8 Double, hinged access covers to be provided with inert gas charged or hydraulic operated springs (or equivalent) suitable for solo lift;
5.14.9 The location of the hinges and hydraulic sets should not impinge on the safe entry to the chamber;
5.14.10 For pumping stations with a depth in excess of 1.5m, a hinged safety grid in two sections to be provided below the cover and to be capable of withstanding a 250kg load. When lifted, the grid should be capable of being secured in the upright position;
5.14.11 In a closed position, the cover should be capable of withstanding a 5 tonne static wheel load. Where there is a risk of traffic loading on the cover, it should be capable of withstanding such loadings as a minimum;
5.14.12 Provision to be made within the covers and frames to allow the main cover to be closed while the pump unit and any associated cables are removed;
5.14.13 Closure of the cover to be possible with the pump unit at a minimum height above the frame to provide a safe working platform for maintenance, if so desired;
5.14.14 The cover frame to be provided with facilities for demountable hand railing which can be erected before any maintenance on the pump units is being undertaken. Chains shall not be used for such barriers;
5.14.15 The demountable hand rails should be capable of withstanding an impact load of 125kg from a height of 1.86m through a footprint of 400mm and a horizontal point load of 1.1kN;
5.14.16 Handrails to be capable of being released to allow access to the equipment from all sides;
5.14.17 Handrail stanchion sockets provided within the frame should be flush with the concrete slab and be sealed to prevent debris entering when not in use;

Access to the valve chamber, meter chamber and other chambers (excluding the wet well) should be by manhole proprietary rungs built into the walls. They shall comply with the requirements of IS EN 13101 (2002), Type D, Class 1. Galvanised mild steel step rungs, 20mm diameter, shall be provided with plastic encapsulated finish. Steps should be 300mm wide and located 230mm apart vertically. The vertical distance between the top of the chamber cover and the first step in the chamber shall not exceed 550mm. All step irons shall be centred under the access opening in the manhole roof slab. Alternatively, galvanised mild steel ladders may be provided, in accordance with Section 3.13 above, subject to the approval of Irish Water.

5.15 Venting of Wet Well and Chambers

The selection of the method of venting of the wet well shall take into account the risk of toxic fumes, dangerous gasses, odour nuisance, etc. Generally, the wet well should be vented via a duct extending from the 'high points' of the wet well and connected to free-standing vent columns or vent stacks. In odour sensitive areas, passive activated carbon filters shall be provided to vent column(s)/stack(s). The Water Service Activated carbon filters shall be of robust proprietary manufacture and sized to have a minimum retention time of 3 seconds at maximum flow-rate.

5.16 Electrical Requirements

Suitably rated electrical and plant control equipment shall be provided at the pumping station to ensure efficient and continuous operation of all plant and equipment. The plant shall incorporate telemetry equipment to allow remote monitoring of the plant/equipment and to allow call out facilities in the case of emergency, power outage or plant/equipment malfunction (See **Section 5.8** above for details of data to be relayed to Irish Water Control Centre). The electrical and control plant and equipment for the pumping station shall be located in a kiosk or kiosks within the pumping station site. The kiosk(s), including the electrical/control panels, shall be located at least 2m remote from the pumping plant.

The power supply to the pump installation shall be of three phase power rating with phase failure protection fitted to the pump motors to prevent motor burnout due to phase failure. All electrical work associated with pumping station shall be carried out to IEE Regulations. The electrical installation work shall be carried out by a Contractor who is included in an approved Register for Electrical Contractors (e.g. RECI, IREC, etc.). A dedicated and metered power supply shall be provided to the pump station serving only the pump station plant and associated equipment.

Pump power cables shall be multicore, flexible cord, vulcanised rubber insulated with tough rubber sheath and outer PCP sheath. All metal equipment at the pumping station (pump guide rails, covers, etc.) shall be bonded to earth, via earth rods located in inspection pits with removable covers, remote from the wet well location.

The control panel shall have provision for connection of an external standby generator. The power supplier shall be notified of this installation to allow for an isolation or 'kill' switch.

The pump control panel for pump plant exceeding 7.5 KW shall be Form 4 Type manufactured and fabricated to IEE Regulations. Otherwise, the pump panel shall be Form 2 or better. The control panel shall incorporate, at a minimum, the following:

5.16.1 Spare starter sections for any future pumps should the pump station be designed to be expandable at a future date;

5.16.2 Generator incomer section complete with generator changeover switch interlocked with mains supply incomer isolation switch;
5.16.3 A hand/off/reverse (with spring return) selector for each pump, subject to manufacturers approval;
5.16.4 Ammeter and hours run meter for each pump;
5.16.5 Run light and trip lights for each pump (one for temperature and one for seal failure);
5.16.6 Reset button for each pump;
5.16.7 Duty/Assist or Duty/Assist/Standby selector for each set of pumps;
5.16.8 Lockable mains incomer isolator;
5.16.9 Lockable door interlock isolators for all starter sections;
5.16.10 A sump level indicator for recording the Wastewater surface in the pump sump;
5.16.11 Flow Indication – both instantaneous and totalised;
5.16.12 Electrical heater, light 220v and 110v electrical weatherproof socket;
5.16.13 Spare indicator lamp bulbs,
5.16.14 A telemetry system with an UPS (uninterrupted power supply) capable of detecting alarm conditions and issuing pre-programmed messages to selected on-call mobile phones and/or control centres/programmable logic controllers (plc), as appropriate. (UPS health/fault status to be available at Irish Water control centre via the telemetry system),
5.16.15 Power meter with volts, power factor, Kw, Kwh, power outage for Kwh, etc. displays.

Ducts shall be provided between the control panels and the various units of the pumping station which require cable runs for power, telemetry and control. All power and control cable ducts between the pump chamber and the control panel shall be fully sealed to prevent ingress of gas from the pump sump and valve chamber to the kiosk containing the panels. This shall be achieved using non-degradable expandable foam or gas tight sealing glands. Spare draw wires shall be left in all ducts for future use.

Pump cables should have sufficient slack and shall be tidily wound and secured to a stainless steel hook or bracket under the pump sump cover where they can be easily accessed and will not interfere with the lifting of the pump or become weighed down with debris or rags.

Where the kiosk/structure housing the control equipment and wet well are located a convenient distance apart the cabling shall be wired directly from the wet well to the kiosk/structure control panel.

All cables shall be installed using a proprietary cable support system and installed in accordance with the manufacturers recommendations. Cable tray shall be fabricated from heavy duty PVC, GRP, heavy duty hot dipped galvanised steel or from stainless steel. Choice shall be made with regard to weight and number of cables. Only heavy duty PVC cable tray will be permitted within wet wells.

Cable junction boxes shall not be installed internal to wet wells irrespective of their hazardous area zoning. If junction boxes are to be installed for cabling between the wet well and kiosk/structure housing the control panel, they shall be installed on suitable up stands of galvanised mild steel or stainless steel (grade 316L) or other approved material subject to the site environment.

5.17 Pumping Station Control Panel Enclosure

A pump station control panel enclosure shall be provided to accommodate electrical supply and metering equipment, pump control panels, telemetry outstations, a heating and lighting system, a socket point for a standby generator, a 220V and 110 V external use socket, etc.

A kiosk shall be provided to house the control panel and associated equipment for Type 1 pump stations. A fully weathered structure shall be provided to house the control panel and associated equipment for Type 2 and Type 3 pump stations.

The minimum size of the control kiosk for Type 1 pump stations shall be 1,200mm (L) x 1,800mm (H) x 1,200mm (D). The minimum size of structure for the Type 2 and Type 3 pump stations shall be 1,800mm (L) x 2,400mm (H) x 1,800mm (D). In all instances there shall be a clear working space between the front of the panel and the plinth edge of 1,200mm. Standard warning notices shall be placed on the kiosk to warn of danger. The size of the power supplier's kiosk shall be to ESB Network's requirements.

The kiosk for Type 1 pump stations shall be a of a 'walk- in' design with open base and one piece roof that slopes to the rear. The kiosk shall be supported on a reinforced concrete plinth extending 150mm in each direction beyond the external plan dimensions of the kiosk. The plinth shall have a level finish, with 25mm chamfered edges, 150mm above the finished ground level. The kiosk shall be bolted to the plinth through a bottom flange with galvanised mild steel or stainless steel anchor bolts. The bottom flange shall be seated on a neoprene gasket and sealed with mastic to prevent ingress of water.

The plinth shall incorporate appropriate ducting to connect into the site power, telemetry and control ducts to facilitate cabling between the kiosk and the various chambers within the pumping station site. Long radius bends shall be incorporated in the ducting, sharp elbows shall not be used.

The walls, roof and doors of the kiosk should be constructed from either galvanised mild steel, 4mm minimum thick welded plate, with polyester coated finish, or in stainless steel in severe environments. Metallic kiosks shall be fully bonded and earthed. Non-metallic kiosks of GRP or GRP encapsulated, marine quality plywood panels with a minimum thickness of 18mm, may also be used. Alternative forms of kiosk construction other than galvanised mild steel, stainless steel, GRP or GRP encapsulated marine quality plywood will generally be required in areas subject to vandalism, e.g. enclosure of the kiosk(s) in a block-work or reinforced concrete enclosure with vandal proof doors.

In the case of GRP/marine plywood kiosk fabrications, the panels should be jointed together using stainless steel bolts and any gaps between panels should be sealed with non-biodegradable mastic sealer. The edges of the kiosk doors should be stiffened by encapsulated steel sections. The rear wall of the kiosk shall be reinforced with stainless steel sections to which a marine plywood board, 18mm thick, is fixed to support the electrical assemblies associated with the pumping plant.

The walls of the kiosk shall have turned bottom flanges, with suitably factory formed holes to accommodate the bolts securing the kiosk to the concrete plinth. The bottom holes shall be reinforced with 5mm thick steel plates, welded to the steel wall of steel fabricated kiosks or encapsulated within the bottom flanges of the GRP constructed kiosk. The holding down bolts shall be galvanised mild steel or stainless steel expanding anchor bolts complete with large washers to prevent damage to the GRP flange, in the case of GRP/marine plywood kiosk construction. The bolts should be located at suitable intervals to prevent bottom flange distortion.

The quality of the kiosk construction shall ensure that the following is achieved:

5.17.1 A thermal transmittance of 1.5W per m^2K;
5.17.2 A fire resistance (retention of stability, integrity and insulation) equivalent to Class 2 of BS 476, when tested in accordance with BS 476 for a period exceeding 30 minutes;
5.17.3 An IP rating of IP55 at least or equivalent.

The preferred exterior colour of the kiosk is dark green (to BS 4800 (2011) 14C 39). The preferred interior colour is white.

The doors of the kiosk shall be single or double leaf steel/GRP with multiple locks to LPS 1175, SR4 or IS EN 1627. There shall be a minimum double lock with bolts that engage into the sill and header as well as between the two leaves or leaf and frame. The leading edge of the leaves shall have rebated edges or fitted with astragals. The door leaves shall be fitted with vandal-resistant stainless steel hinges and self-latching stays to restrain the door in the fully opened position (minimum opening angle of 90 degrees). The doors shall not open towards the pump station chambers.

The kiosk shall be fitted with suitably sized weather resistant and vermin resistant ventilation grills, complete with fly screens. These grills should be fitted at low level at one side of the kiosk and at high level at the opposite side of the kiosk so that cross ventilation is achieved. Ventilation within the kiosk should be sufficient to restrict temperature in the kiosk, under all weather conditions, to a maximum of 40 degree Centigrade at any one time and to an average of 35 degree Centigrade over a 24 hour period.

The kiosk should be fitted with a small opening, complete with a lockable, hinged panel, lockable from the inside. It should be located opposite the electrical assembly to provide access for standby generator facilities.

The structure for the housing of the control panel and associated equipment for Type 2 and Type 3 pump stations shall be constructed of block work, 215mm solid block to IS EN 771, with smooth render finish internally and externally (or alternative agreed by Irish Water subject to the requirements of Planning). The block work shall be supported on a reinforced concrete support slab finished 150mm above general finished ground level. The structure shall have a 150mm reinforced concrete roof slab, projecting 150mm outside of the wall, with drip beading, complete with asphalt to provide a weatherproof roof. The structure shall have galvanised steel security doors, twin leaf, opening outward and fitted with furnishing as outlined above for the kiosk. Appropriate ventilation, openings, etc. as described above for the kiosk shall be provided to achieve the same environmental parameters as outlined. The structure shall also be equipped with lighting, ventilation, welfare facilities, etc. to allow maintenance and monitoring to be carried out.

An additional Kiosk, to the local ESB Network's requirements, should be provided within the pumping station site to house the panel, electricity supplier's meter, etc., complete with separate dedicated ducting for the power service provider electrical supply incoming feed. Separate security control arrangements, to the local ESB Network's requirements, shall be provided for the power supplier's access to this kiosk for meter reading.

5.18 Meter Chambers

Flow meters shall be installed in chambers and these shall be suitably sized to accommodate the meter and allow access for maintenance. The base and walls of the chamber shall be constructed in C30/37 concrete to IS EN 206, 20mm aggregate size to IS EN 12620, with a minimum thickness of 250mm. The chamber shall be complete with a reinforced concrete roof formed with C30/37 concrete, 20mm aggregate size concrete of minimum thickness of 225mm, reinforced with high tensile reinforcement to BS 4449.

The roof slab shall incorporate a 900mm x 900mm opening to allow the visual inspection of the meter and the removal of the meter vertically. Cast-in recessed lifting eyes shall be provided in each corner of the concrete roof slab to allow it positioning in place. In addition, these lifting eyes shall be used to remove the roof slab for access to the chamber to allow maintenance of the meter and its removal replacement if necessary.

The internal dimensions of the chamber shall be sufficient to contain the meter and any associated pipework. The bolts and joints shall be visible and accessible in order to allow for maintenance and for the possible future replacement of the meter without the need for excavation. The depth of the meter chamber shall provide a minimum of 300mm clearance beneath the meter fitting. Sufficient clearance shall be provided between the walls and the meter equipment to allow maintenance activities to be carried out.

The chamber shall be fitted with manhole steps to comply with IS EN 13101, Type D, Class 1, galvanised mild steel and plastic encapsulated. Access to the confined space within the chamber shall not generally be required but when needed this access shall be by way of a safe access plan.

The cover shall be sufficient for a 900mm by 900mm opening. It shall be capable of withstanding imposed loads and shall comply with IS EN 124, D400 if located on roadways or footways. Lower load capacity rated covers may be used if the chamber is located off road in green areas, subject to Irish Water approval.

The cover frames shall be supported on Class B engineering brick to IS EN 771. The brickwork shall be bedded in C50/60 mortar. The covers shall be set on the brick in accordance with the manufacturer's instructions to finish in alignment with the pump station hard standing surface. Meter chamber covers, where located in grass areas, shall be surrounded by a concrete plinth, 200mm all round and 100mm deep formed with C20/25 concrete to IS EN 206, 20mm aggregate size to IS EN 12620, bedded in Clause 804 material. The plinth shall be surrounded along its external perimeter by a stainless steel metal band.

5.19 Cable Ducts and Chambers

Kiosk plinth shall incorporate appropriate ducting to connect into the power, telemetry and control ducts to facilitate cabling between the kiosk and the various plant items associated with the kiosk. Long radius bends shall be incorporated in the ducting, sharp elbows shall not be used. The ducting shall be in accordance with BS 4660 and BS EN 1401. Ducts for ESB Networks use shall be in accordance with ESB Networks specification.

The ducting diameter and number shall be appropriate for the cables required and the minimum duct size shall be 100mm diameter. The ducts shall be red unless otherwise specified. All ducts shall have a minimum cover of 600mm. The duct pipes shall be bedded, haunched and surrounded in sand. Clause 808 backfill granular material, in accordance with the National Road's Authority Specification for Road Works, shall be provided above the sand surround. Long radius bends may be used for direction changes up to 45 degrees, duct chambers shall be provided for changes in direction above this. Marker tape shall be provided above the duct pipe runs and shall incorporate reinforced tracing wire. The ducting should be constructed watertight and built into the base of the kiosk and the walls of the miscellaneous chambers. All cable ducts shall be provided with draw cords/ropes to allow pull through of cables.

Duct chambers shall be installed at bends and these shall have a minimum 900mm by 900mm internal dimensions. The base and walls of the cable duct chambers shall be constructed in C30/37 concrete to IS EN 206, 20mm aggregate size to IS EN 12620, with a minimum thickness of 225mm. Chambers of the above dimensions will not require a roof. A concrete roof slab shall be provided if chambers of larger dimensions are required. The roof in this instance shall be constructed of reinforced concrete

formed with C30/37 concrete to IS EN 206, 20mm aggregate size to IS EN 12620, of 225mm minimum thickness, reinforced with high tensile reinforcement to BS 4449.

The opening shall be 900mm x 900mm to allow access to the cable chamber. The cover to the chamber opening shall be sufficient for a 900mm by 900mm opening. It shall be capable of withstanding imposed loads and shall comply with IS EN 124, D400 if located on roadways or footways. Lower load capacity rated covers may be used if the chamber is located off road in green areas, subject to Irish Water approval.

The cover frames shall be supported on the chamber walls, if the chamber dimension is 900mm by 900mm. It shall be supported on the chamber roof slab if such is provided. In this instance the cover frame shall be supported on Class B engineering brick to IS EN 771. The brickwork shall be bedded in C50/60 mortar. The covers shall be set on the brick in accordance with the manufacturer's instructions to finish in alignment with the pump station hard standing surface.

Duct chamber covers, where located in grass areas, shall be surrounded by a concrete plinth, 200mm all round and 100mm deep formed with C20/25 concrete to IS EN 206, 20mm aggregate size to IS EN 12620, bedded in Clause 804 material. The plinth shall be surrounded along its external perimeter by a stainless steel metal band.

5.20 Lifting Equipment

Lifting davits and lifting tackle, suitable for safe lifting of the pump installation, shall be provided at each pumping station. The minimum rating of the davit, lifting tackle, etc. shall be 500kg, safe working load (SWL). Lifting davits, tackle and sockets should be rated to lift twice the weight of each pump unit, subject to a safe working load of 500kg. Davit, lifting tackle and sockets should be load tested in situ and a test certificate, in accordance with Irish Water's requirements, shall be provided. The manufacturer's name and the SWL of the lifting equipment shall be stamped on a stainless steel plate attached to the equipment. Davits, lifting tackle, davit sockets shall be of stainless steel or galvanised mild steel in accordance with the safety certificate requirements and shall not weigh more than 35kg.

Suitable cast in davit sockets shall be provided in the roof slab of the pumping station. Davit sockets should be designed and positioned to provide lifting equipment with a vertical pull on the pump unit lifting attachments, to enable pump units to be readily raised or lowered on their guide rails. Cover plates, flush with the top of the surrounding concrete, should be provided to prevent the ingress of water and debris into the sockets.

In some instances, Irish Water may require a permanent lifting gantry instead of a davit arrangement. Such gantries shall be fabricated of galvanised structural steel and shall be permanently fixed on concrete support plinths, suitably sized, through base plates with anchor bolts. Such gantries shall be load tested and certified as outlined above. The manufacturer's name and the SWL of the lifting equipment shall be stamped on a

stainless steel plate attached to the equipment. The lifting gantry shall be provided with a block and tackle, which shall be load-tested and rated along with the gantry assembly.

5.21 Wash-Down Facilities

Pumping stations shall be provided with wash-down facilities for cleaning and washing mechanical plant following its removal for routine maintenance and repair. This shall comprise a cold water supply with an external lockable tap, suitably insulated to prevent freezing of the supply system. A 25mm water supply shall be provided to the pumping station site and this supply shall be fitted with a water usage meter. The supply pipe shall also be provided with an approved non-return valve to prevent backflow contamination of the public water supply system.

A hard-standing area shall be provided close to the pumping station wet well to allow the equipment to be washed down. The area shall comprise a slab, of 1.5m x 1.5m dimensions, with a 200mm thick reinforced concrete slab (Grade C28/35 -20mm aggregate) on a 500mm thickness of Clause 804 granular sub-base material in accordance with the National Roads Authority Specification for Road Works. The slab shall have a timber float finish with a 1:50 slope to a central gully trap. The gully trap shall comprise a u-PVC trapped gully with a 100mm pipe connected to the wet well chamber.

Appendix A

Standards Referenced in the Wastewater Code of Practice

Standard Type:

IS Irish Standard
BS British Standard
IS EN European Standard adopted as an Irish Standard
BS EN European Standard adopted as a British Standard
WIS UK Water Industry Specification

Standard Type	Standard Number	Title
IS EN	124	Gully Tops, Manhole Tops for Vehicular and Pedestrian Areas – Design Requirements, Type, Testing, Marking, Quality Levels (See also BS EN 124)
IS	261	Water Services Road Furniture – Requirements for Cast Iron Cover and Frames
BS	7903	Guide to Selection and Use of Gully Tops and Manholes for Installation within Highways.
IS EN	206	Concrete Specification, Performance, Production and Conformity (See also BS EN 206:2013)
BS	8500 -1	Concrete – Complementary British Standard to BS EN 206-1, Part 1 – Method of Specifying and Guidance for Specifier.
BS	8500 -2	Concrete – Complementary British Standard to BS EN 206-1, Part 2 – Specification for Constituent Materials and Concrete.
IS EN	197	Cement Part 1:- Composition, Specification and Conformity Criteria for Common Cements. Part 2:- Conformity Evaluation
IS EN	1996	Design of Masonry Structures – General Rules for Reinforced and Unreinforced Masonry Structures (Including Irish National Index)
IS EN	13242	Aggregates for Unbound and Hydraulically Bound Material for Use in Civil Engineering Works and Road Construction
BS EN	1092-1	Flanges and Their Joints – Circular Flanges for Pipes, Valves, Fittings and Accessories – PN Designations Part 1:- Steel Flanges.
BS	4449	Steel for Reinforcement of Concrete – Bar, Coil and De-coiled Product - Specification
BS	381C	Specification for Colour for Identification, Colour and Special Purposes
BS	6076	Specification for Polymeric Film for Use as a Protective Sleeving for Buried Pipes and Fittings (for Site and Factory Application)

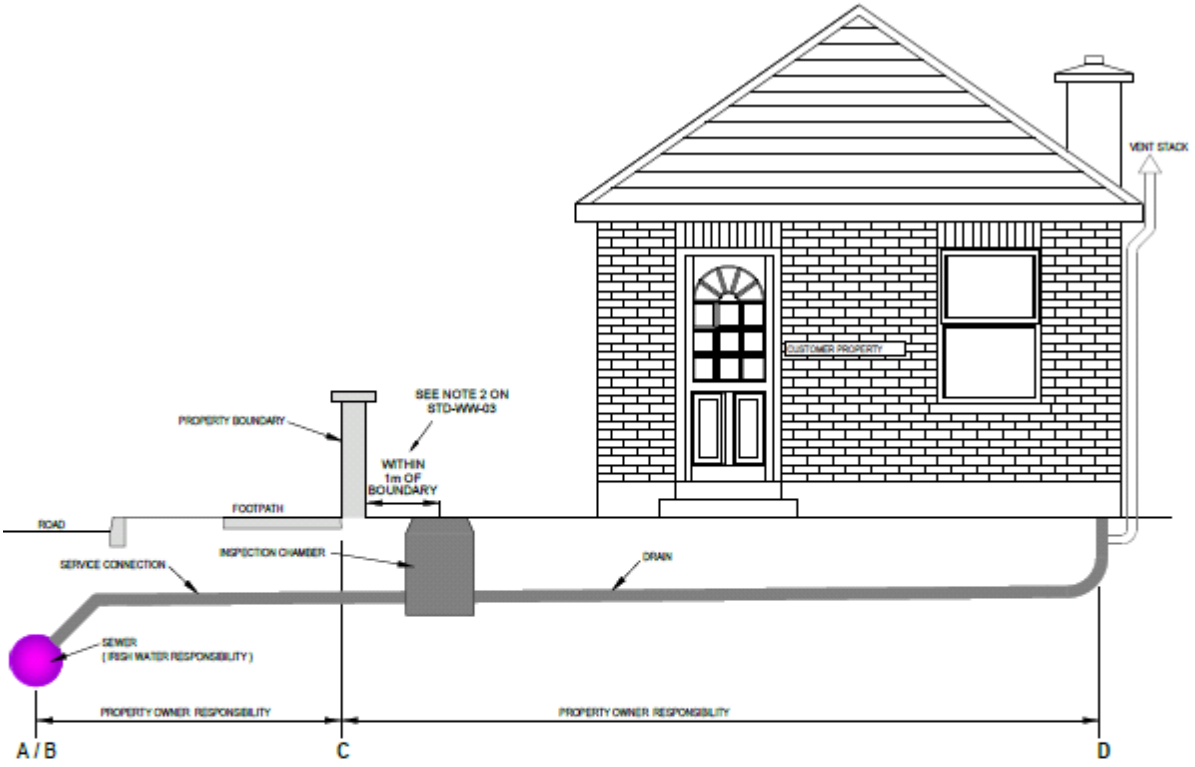
BS	9124	Specification for steel and aluminium access cover systems with over 1m clear opening
WIS	4-08-02	Specification for Pipe Bedding and Side-fill Materials for Buried Pipelines (IGN 4-08-01 Information and Guidance Note on Bedding and Side-fill Materials for Buried Pipelines.
IS EN	12620	Aggregate for Concrete (See also SR16 – Guidance for Use of IS EN 12620)
SR	16	Guidance for the Use of IS EN 12620:2002 (Aggregate for Concrete)
BS	5834	Surface Boxes, Guards and Underground Chambers for the Purposes of Utilities – Part 2 - Specification for Surface Boxes
BS	5834	Surface Boxes, Guards and Underground Chambers for the Purposes of Utilities – Part 4 - Specification for Utility Chambers
BS EN	1561	Grey Cast Iron
IS EN	771	Specification for Masonry Units Part 2:- Calcium Silicate masonry Units Part 3:- Aggregate Concrete masonry Units (Dense and Lightweight Aggregate)
BS EN	12613	Plastic Warning Devices for Underground Cables and Pipelines with Visual Characteristics
WIS	4-32-08	Specification for Fusion Jointing of Polyethylene Pressure Pipeline Systems Using PE80 and PE100 Materials
WIS	4-32-15	Specification for PE80 and PE100 Spigot Fittings and Drawn Bends for Nominal Sizes up to and including 1000.
WIS	4-32-16	Butt Fusion Jointing Machines
WIS	4-32-17	Specification for PE80 and PE100 Electro Fusion Fittings for Nominal Sizes up to and including 630.
WIS	4-32-18	The Choice of pressure rating for Polyethylene Pipe Systems for Water Supply and Sewerage Duties
IGN	4-01-03	Guide to Pressure Testing of Pressure Pipes and Fittings for use by Public Water Suppliers.
WIS	4-35-01	Specification for Thermoplastics Structured Wall Pipes, Joints and Couplers with Smooth Bore for Gravity Sewers for the Size Range 150 – 900 Inclusive
IS EN	752	Drain and Sewer Systems Outside Buildings (See also BS EN 752 2008 - Drain and Sewer Systems Outside Buildings)
IS EN	1671	Pressure Sewerage Systems Outside Buildings (See also BS EN 1671:1997, Pressure Sewerage Systems Outside Buildings)
IS	6	Concrete Sewer Pipes
IS EN	1916	Concrete Pipes and Fittings, Unreinforced, Steel Fibre and Reinforced (See also BS EN 1916)

IS EN	1917	Concrete Manholes and Inspection Chambers, Unreinforced, Steel Fibre and Reinforced (See also BS EN 1917)
BS	5911-1	Concrete Pipes and Ancillary Concrete Products – Part 1 Specification for Unreinforced Concrete Pipes (Including Pipe Jacking Pipes) and Fittings with Flexible Joints
BS	5911-3	Concrete Pipes and Ancillary Concrete Products – Part 3 Specification for Unreinforced and Reinforced Concrete manholes and Soakways Complimentary to BS EN 1917.
BS	5911-4	Concrete Pipes and Ancillary Concrete Products – Part 4 Specification for Unreinforced and Reinforced Concrete Inspection Chambers.
BS	5911-5	Concrete Pipes and Ancillary Concrete Products – Part 5 Specification for Prestressed Non-Pressure Pipes and Fittings with Flexible Joints.
IS EN	13101	Steps for Underground Man Entry Chambers – Requirements, Markings, Testing and Evaluation of Conformance
IS EN	14396	Fixed Ladders for Manholes (See also BS EN 14396 Fixed Ladders for Manholes)
BS	4211	Specification for Permanently Fixed ladders
IS EN	10025	Hot Rolled Products of Structural Steel (Part 1 – Part 6) (See also BS EN 10025:2004 Part 1 to Part 6)
IS EN	1461	Hot Dipped Galvanised Coatings on Fabricated Iron and Steel Articles – Specifications and Test Methods (See also BS EN ISO 1461)
IS EN	10088	Part 1 – List of Stainless Steels Part 2 – Part 5 – Technical Delivery Conditions
BS	4660	Thermoplastics Ancillary Fittings of Nominal Size 110 to 160 for Below Ground Gravity Drainage and Sewerage
BS EN	1401	Plastics Piping systems for Non-Pressure Underground Drainage and Sewerage – Unplasticized Poly Vinyl – Chloride (PVC-U) – Part 1 – Specification for Pipes, Fittings and the System
IS EN	12201	Plastic Piping Systems for Water Supply Systems and Drainage and Sewerage Under Pressure. Part 1:- General, Part 2:- Pipes, Part 3:- Fittings, Part 4:- Valves for Water Supply systems, Part 5: Fitness for Purpose of the System.
IS EN	13476	Plastic Piping Systems for Non-Pressure Underground Drainage and Sewerage – Structural Wall Piping Systems of Unplasticized Poly Vinyl Chloride (PVC-U), Polypropylene (PP) and Polyethylene (PE)

		Part 1 – General Requirements and Performance Characteristics Part 2 – Specification for Pipes and Fittings for Smooth Internal and External Surfaces and the System – Part A Part 3 - Specification for Pipes and Fittings for Smooth Internal and Profiled External Surface and the System – Part B
IS EN	598	Ductile Iron Pipes, Fittings, Accessories and their Joints for Sewerage Applications, Requirements and Test Methods.
BS EN	1074	Valves for Water Supply – Fitness for Purpose and Appropriate Specification Tests Part 1 – General Requirements Part 2 – Isolating Valves Part 3 – Check Valves Part 4 - Air Valves Part 5 - Control Valves Part 6 - Hydrants
BS ISO	7121	Steel Ball Valves for General Purposes – Industrial Application
IS EN	1825	Grease Separators Part 1 Principles of Design, Performance and Testing, Marking and Quality Control Part 2 Selection of Nominal Size, Installation, Operation and Maintenance.
IS EN	60079	Explosive Atmospheres (Part 0, Part 1, Part 2, Part 5, Part 6, Part 7, Part 10-1, Part 10-2, Part 11, Part 13, Part 14, Part 15, Part 17, Part 18, part 19, Part 20-1, Part 25, Part 26, Part 27)
IS EN	1992-3	Eurocode 2 – Design of Concrete Structures - Part 3: Liquid Retaining and Containment Structures.
IS EN	13101	Steps for Man Entry Chambers – Requirements, Marking, Testing and Evaluation of Conformity.
IS EN	818-7	Short Link Chain for Lifting Purposes – Safety Part 7: Fine Tolerance Hoist Chain, Grade T (Types T, DAT and DT).
BS	476	Fire Tests for Building Materials and Structures
BS	4800	Schedule of Paint Colours for Building Purposes
BS	9295	Guide to Structural Design for Buried Pipelines.
BS	5163	Valves for Waterworks Purposes Part 1 – Predominantly key operated cast iron gate valves – Code of Practice Part 2 – Stem caps for use on isolating valves and associated water control apparatus - Specification
BS	5837	Trees in Relation to Design, Demolition and Construction - Recommendations
IS EN	1610	Construction and Testing of Drains and Sewers

Appendix B

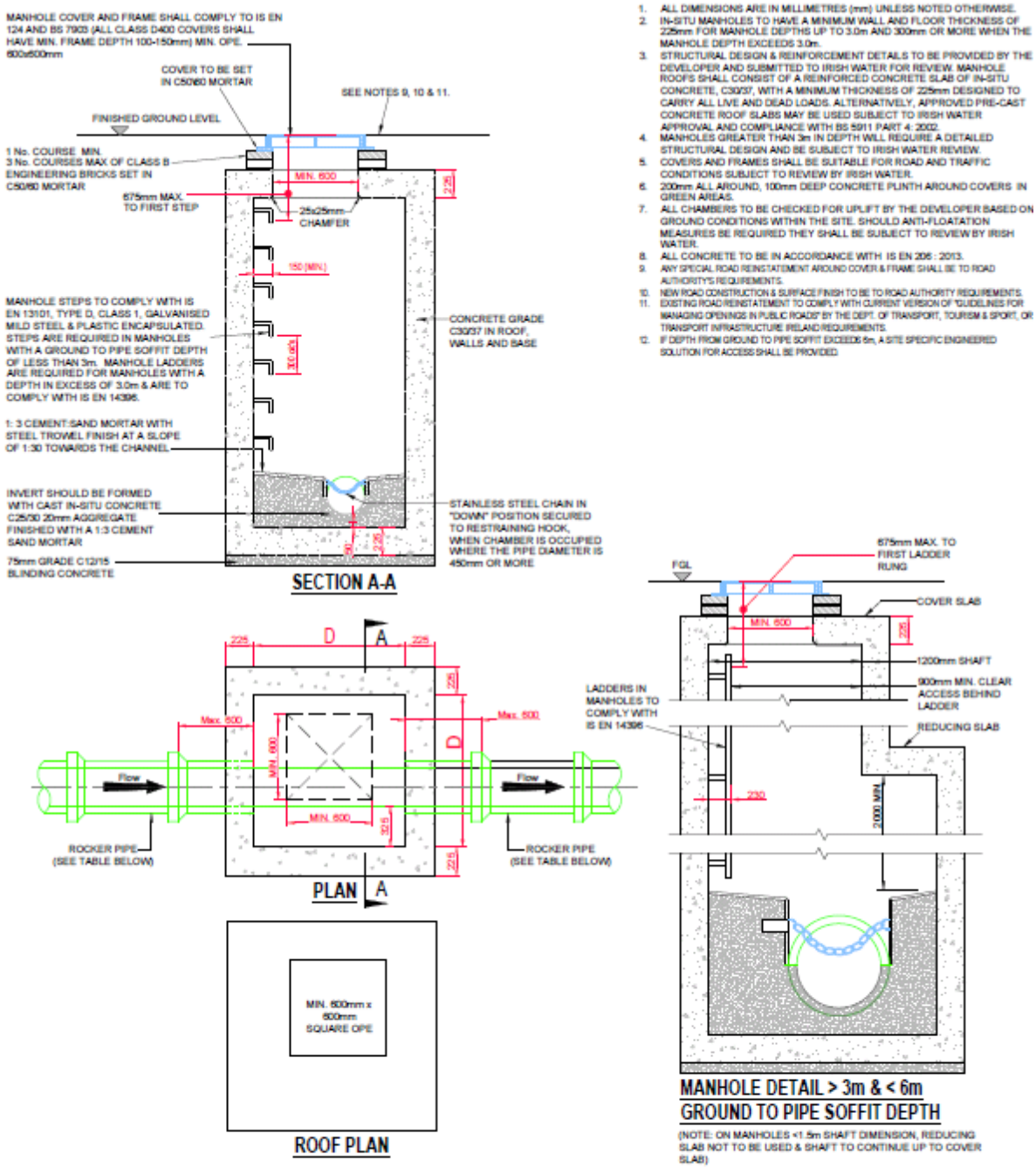
Selection of Typical Standard Details



	MAINTENANCE RESPONSIBILITY
(A) SEWER	IRISH WATER
(B-C) SERVICE CONNECTION (INCLUDING SADDLE)	PROPERTY OWNER
INSPECTION CHAMBER	PROPERTY OWNER
(C-D) DRAIN	PROPERTY OWNER
INTERNAL PLUMBING	PROPERTY OWNER

House Connection Standard Arrangement

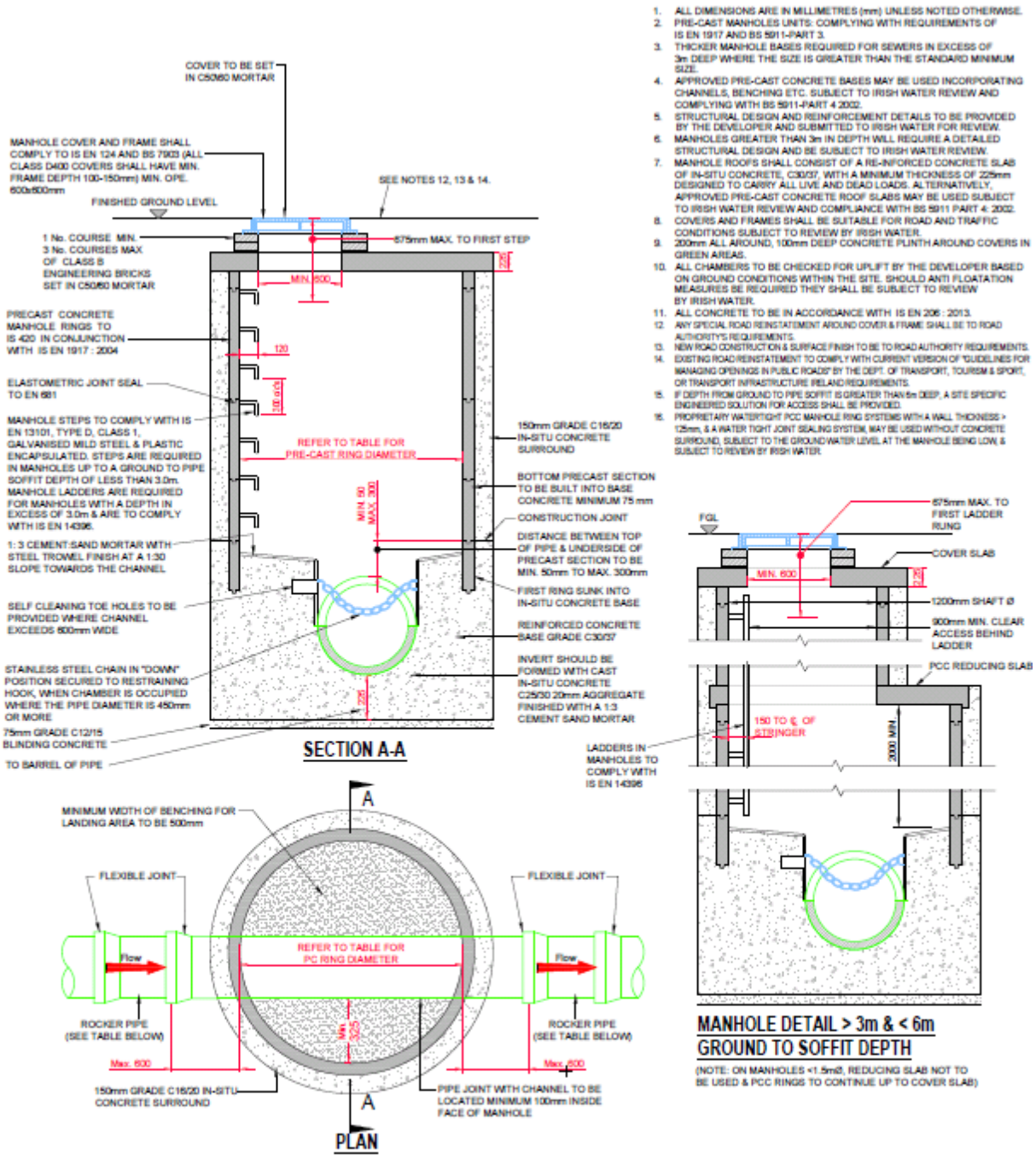
Housing Development Works Typical Layout



ROCKER PIPE LENGTH	
PIPE DIAMETER (mm)	ROCKER PIPE LENGTH (mm)
150 TO 600	600
GREATER THAN 600 TO 750	1000
GREATER THAN 750	1250

MINIMUM MANHOLE DIMENSION "D"	
DIAMETER OF LARGEST PIPE IN MANHOLE (mm)	INTERNAL DIMENSION OF MANHOLE (mm)
LESS THAN 375	1200
375 TO 450	1350
500 TO 750	1500

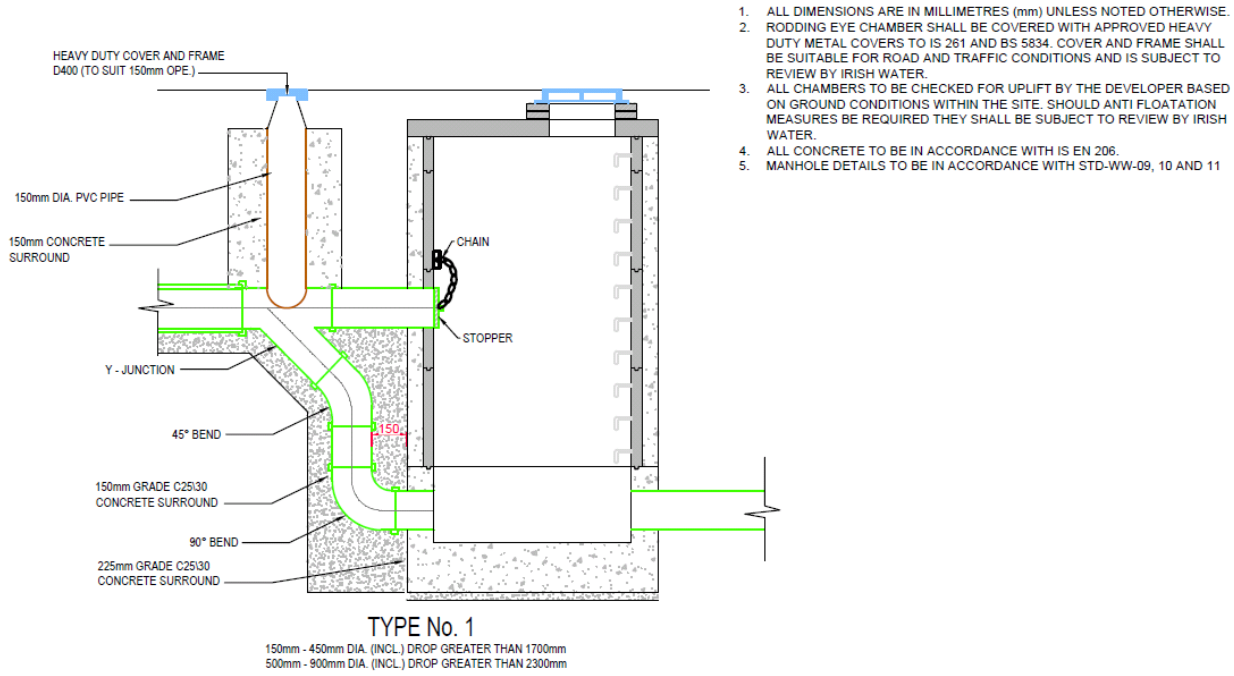
Cast-in-situ Concrete Manhole Typical Detail



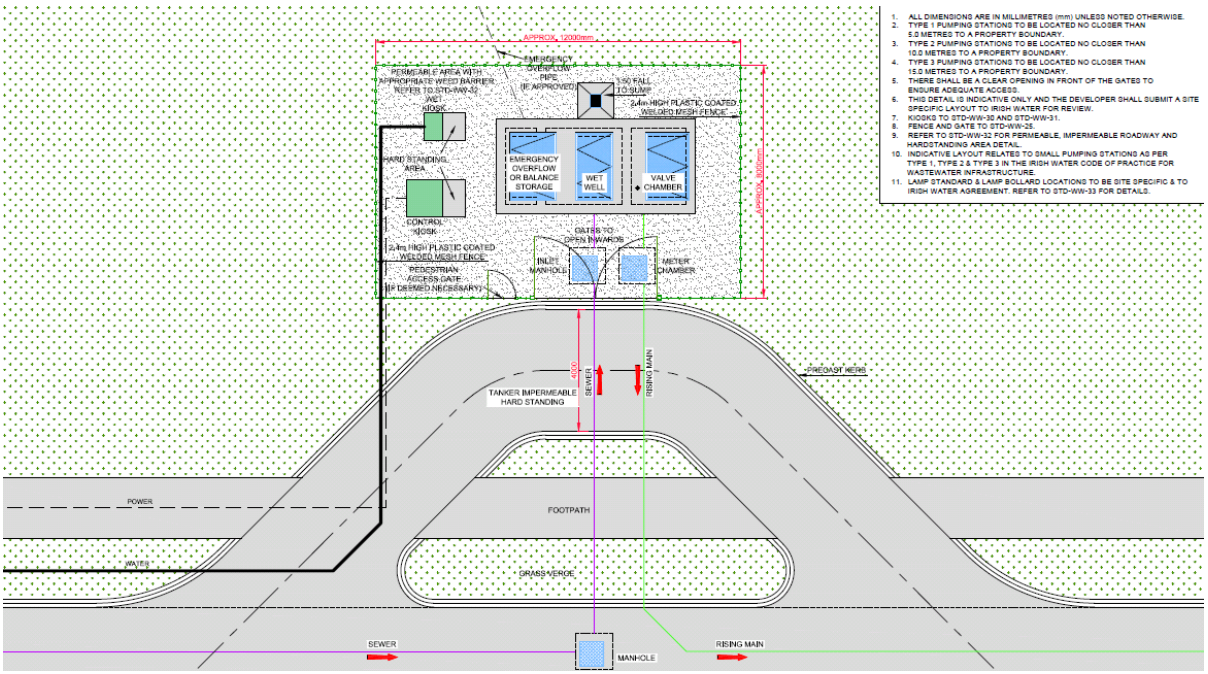
MINIMUM MANHOLE DIAMETERS	
DIAMETER OF LARGEST PIPE IN MANHOLE (mm)	INTERNAL DIAMETER OF MANHOLE (mm)
LESS THAN 375	1200
375 TO 450	1350
500 TO 750	1500

ROCKER PIPE LENGTH	
PIPE DIAMETER (mm)	ROCKER PIPE LENGTH (mm)
150 TO 600	600
GREATER THAN 600 TO 750	1000
GREATER THAN 750	1250

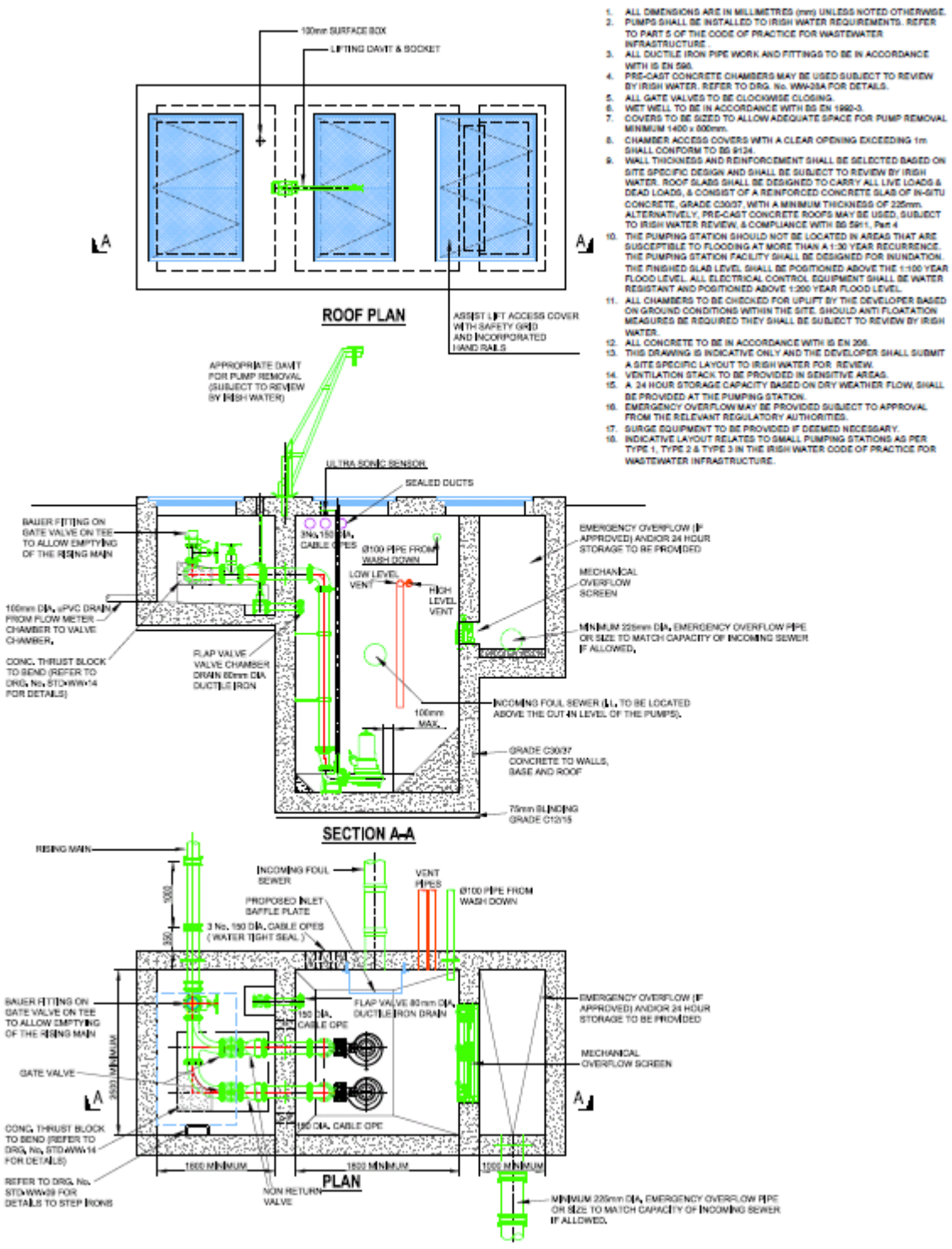
Pre-cast Concrete Manhole Typical Detail



Backdrop Manhole Typical Detail



Pumping Station Site Plan Typical Layout



Pumping Station Typical Detail

Appendix C

Gravity Sewer Design Requirements

GRAVITY SEWER DESIGN FLOWS

1.1 Existing Networks

The design of Existing Networks will be the responsibility of Irish Water or its Agents. The Developer's designer will not be required to be involved in the design of existing Networks.

1.2 Wastewater flows – New Networks

The design parameters that are outlined below set out the design flow requirements in terms of growth, infiltration, peaking factors and misconnection allowances to ensure performance is maintained over the design life of the new wastewater collection system. Wastewater sewer capacity shall be designed with allowance for some possible surface water connection (misconnections), even where separate wastewater and surface water sewer networks exist. Allowance for the delayed flow from slow response run off due to rainfall induced infiltration shall be ignored for the purpose of design of new wastewater sewers.

Dry Weather Flow = PG + I + E

Design Foul Flow = $[Pf_{Dom} \times PG] + [Pf_{Dom, Ind} \times P_E G_E] + I + [Pf_{Trade} \times E]$ (Eqn1)

Design Flow = Eqn 1 + $[SW + SW_E]$

DWF = Dry Weather Flow

P = Population

G = Water Consumption / Capita

P_E = Commercial/Industrial Population

G_E = Commercial / Industrial Water Consumption per Capita

I = Infiltration

E = Trade Flow

Pf_{Dom} = Peaking factor Domestic

$Pf_{Dom,Ind}$ = Peaking factor for Domestic element of Industrial

Pf_{Trade} = Peaking factor for Trade Flow

SW = Surface Water Allowance (Domestic)

SW_E = Surface Water Allowance (Commercial/Industrial)

1.2.1 Housing Density & Occupancy (P)

The following approach should be taken in determining Housing Density and Occupancy:

	Housing Density
New Domestic Housing (known)	Housing Densities as per Local Authority Development Plans or known Density for the development.
New Domestic Housing (unknown)	Use 30 units/ha
Existing Housing	Actual Housing Densities

Population estimate shall be based on **2.7 persons per unit**.

1.2.2 Water Consumption (G)/Return to Sewer Flow

For the basis of design the per capita (ca) water consumption shall be used to equate for general domestic wastewater flow contributions where site specific data is unavailable: Water Consumption (G) 0.15 m^3/ca/day (i.e. **150 l/ca/day**)

1.2.3 Growth Rates

Where applicable the design shall consider expected growth rates over the design horizon for the wastewater collection infrastructure. Growth rates may vary geographically depending on potential scale and location of future development that is anticipated.

The application of growth rates shall be agreed with Irish Water prior to solution development.

1.2.4 Infiltration (I)

Rates of infiltration vary greatly from agglomeration to sub-catchment level. Infiltration can be very high. This can be due to incorrect connection of land drainage to the wastewater sewerage system, high groundwater inflow into the sewerage system and deteriorated infrastructure giving rise to infiltration to the sewerage network from the surrounding water table.

Design solutions for the wastewater network and flow quantities to WWTP should take account of the specific nature of the catchment. At sites where infiltration (I) is recorded as greater than 200% of the domestic wastewater contribution (PG), the Designer should undertake a Cost Benefit Analysis to demonstrate the best way to balance capital spend between network flow management (infiltration reduction) , the provision of hydraulic capacity in the sewer network and/or at the WWTPs. This analysis should take into account the ability of biological treatment process at the WWTP to treat very weak wastewater as well as the implications of high hydraulic loading of the wastewater treatment plant units and processes.

The Table below should be used for infiltration design.

Development[1]	Rates obtained from measurement and/or evidenced by in-sewer survey
Existing Property[2] **[without measurement or survey data]**	20% of Unit Consumption
New Property	10% of Unit Consumption
Existing Industrial[3] **[without measurement or survey data]**	20% of Water Consumption
New Industrial	10% of Water Consumption of the Industry

1.2.5 Domestic Wastewater Peaking Factors

For the design of new or upgraded wastewater networks, the peaking factors applied to domestic wastewater flows (Pf_{Dom}) are to be in accordance with the Table below. Where the population overlaps two bands, a combination of the two peaking factors shall be used.

[1] Infiltration Rates may be higher with deeper sewers or sewers that are near to watercourses or tidal areas due to hydrostatic head.
[2, 3] Infiltration to be determined where possible based on flow surveys/measurements

Population	Peaking Factor (Pf_{Dom})
0 to 750	6
751 to 1,000	4.5
1001 to 5,000	3.0
5,001 to 10,000	2.5

1.2.6 Domestic Wastewater Element of Commercial & Industrial Flows (P_EG_E)

For the design of new wastewater networks, the rates for commercial wastewater flows are to be in accordance with the Table below:

Element	Flow Rates
Existing Premises	Based on flow rates on water consumption
Known Population	Flow rates per head from known data.
Unknown Population / Known Development Type	Flow rates as per Appendix D below.
Unknown Development Type	0.15 l/s/ha of Gross Land Area

1.2.7 Commercial Wastewater Peaking Factors

For the design of new wastewater networks, the peaking factors applied to commercial wastewater flows are to be in accordance with the Table below:

Area (ha)	Peaking Factor ($Pf_{Dom,Ind}$)
0 - 5.5	4.5
5.5 - 11	3.5
11 - 22	3.0
22 - 55	2.5
> 55	2.0

1.2.8 Trade Wastewater Flows (E)

Different wastewater flows will apply to industrial and commercial source contributions. In addition, tourist populations will have a varying effect. These loads can be obtained from **Appendix D**, below. In the absence of specific wastewater source contributions, the commercial/industrial trade wastewater flows may be taken from the Table below.

Trade Flow Data	Flow Derivation
Existing Trade Flows	From Trade (Section 16 Wastewater Licence or IPPC Licence) Discharge Licences Values
Proposed Trade Flows	Proposed Discharge Licences
No data available	Wet industry: 0.66 l/s/ha (57.6m^3/ha/day) General industry: 0.33 l/s/ha (28.8m^3/ha/day) Light Industry: 0.16 l/s/ha (14.4m^3/ha/day)

1.2.9 Trade Wastewater Flow Peaking Factor

For the design of new wastewater networks, the peaking factors applied to trade wastewater flows are to be in accordance with the Table below:

Data	Factor (Pf_{Trade})
Measured flow data or Peak Licenced Flow[4]	Most Onerous of Available Data
No measured data	3.0

1.2.10 Misconnection Allowance (SW) & Urban Creep

Urban Creep is the loss of permeable area within urban areas creating increased run-off from new impermeable areas which contributes to reduced sewer capacity, increased potential flooding and occurrence of pollution incidents due to overflows from SWOs or hydraulic overloading of WWTPs.

Urban creep principally impacts combined sewers, storm water sewers and the downstream natural drainage systems.The UKWIR Report: "Impact of Urban Creep on Sewerage Systems. Report Ref. No. 10/WM/07/14" provides guidance on allowances for urban creep.

Where there are separate wastewater and storm water sewer networks, the rainfall response in wastewater networks due to storm water inflow is principally caused by misconnections of storm water drains/sewers to the separate wastewater sewer, i.e. storm water drains being connected to the wastewater drain/sewer either unintentionally or intentionally as a convenient method of dealing with storm water runoff on Premises. However, rainfall response can also be due to direct inflow through defective covers, or indirectly via rainfall induced infiltration.

However, after the initial misconnection there can be further increased rainfall response due to urban creep, i.e. where pervious areas are converted to impervious areas and

[4] Licenced flow may be much greater than measured flow - a review of historic measured flow v licence flow limit may be required to confirm likelihood of the allowable maximum licenced flow being discharged.

the increased storm water runoff is directed to the separate wastewater sewer or to the combined sewer.

Misconnections can occur at the outset of a new development due to poor construction practice either within the building, around the curtilage of the building or in the public road due to the connection of the service pipe or gully to the incorrect public sewer system, i.e. a storm water source being connected to a wastewater sewer system..

The misconnection conveys storm surface water run-off from the impermeable area via the storm drain or sewer to the wastewater sewer. Rainfall response in wastewater sewers can be many multiples of orders of magnitude greater than wastewater flow. This increased inflow response can utilise significant capacity, can significantly reduce the design horizon and can cause pollution incidents and sewer flooding.

Most public wastewater sewers have misconnections and over time some wastewater sewers will become partially separate sewers, i.e. a wastewater sewer which also carries some storm water flow. While removing the misconnection is preferred, finding and addressing the problem is not always feasible, even with extensive intrusive sewer surveys, CCTV surveys, flow & load surveys, which will employ substantial resources and result in significant expenditure outlay. It is considered, therefore, far more cost-effective to minimise its occurrence in the first place.

It should be noted that misconnections tend to increase over time and may be negligible early on in the asset life. To preserve capacity in public wastewater sewers an increased flow allowance for misconnections should be provided in the design of public sewers. This would also apply to new wastewater sewerage system in new developments that will be connected to public sewerage systems.

In areas served by combined sewer systems, the growth in impermeable area, or ‘ urban creep’, causes increases in surface water run-off being conveyed to the combined sewers and storm water sewers, thus reducing capacity, increasing frequency of storm water overflow spills and increasing the risk of sewer flooding.

The increased allowance for residential areas is outlined in the Table hereunder:

	Allowance per Dwelling
Impermeable survey and /or flow survey data, existing development	Use areas derived from surveys
Where no data is available for existing areas and for new areas	1.5% of Gross Site Area
Existing Combined Sewer Areas	Use areas derived from surveys
Existing Storm Water Sewers	Use areas derived from surveys

1.2.11 Surface Water Allowance in Commercial & Industrial Foul Flows (SW_e)

The increased allowance for commercial/industrial areas is outlined in the Table hereunder:

	Allowance (SW_E)
Impermeable survey and /or flow survey data, existing areas	Use areas derived from survey
Where no data for existing areas and for new areas	1.5% of Gross Site Area

1.3 Storm Water Flows

As a general guide, the hydraulic flow load arising from storm water impacting on the capacity of the wastewater sewerage systems should be based on the Design Method outlined in the Table below as follows:

Pipe Size	Method of Design
Small Development	Modified Rational Method
Large New Development	Hydraulic Simulation
Existing Networks	Hydraulic Simulation

Where connections are to be made to an existing combined system, computer simulation using a hydraulic model shall be undertaken. Where a model is built in accordance with the IW Wastewater Network Hydraulic Model Build and Verification Standard (IW-TEC-200-001), the Fixed Percentage Runoff Model shall be used for Impermeable Surface Runoff and the New UK Runoff Model for pervious response. For further details on runoff processes and Irish Water's runoff philosophy reference should be made to IW-TEC-200-001 and *Guidance on Rainfall for Wastewater Modelling in Ireland, H.R. Wallingford, February 2017*'. These documents will be provided to the Designer if required for the design of the proposed wastewater collection system.

The Modified Rational Method is detailed in the Wallingford Procedure and a summary of it is outlined below.

The Modified Rational Method was developed as part of the Wallingford procedure. It is used to derive a peak flow rate and then this is used to select a pipe size based on pipe-full flow. The Modified Rational method equation to determine peak flow rates is provided below:

$Q = 2.78\ C\ i\ A$

Where:

Q = design event peak rate of runoff (l/s)

C = non-dimensional runoff coefficient which is dependent on the catchment characteristics

$C = C_V C_R$

where

C_V = volumetric runoff coefficient

C_R = dimensionless routing coefficient

i = rainfall intensity for the design return period (in mm/hr) and for a duration equal to the "time of concentration" of the network

A = total catchment area being drained (ha)

Note: 2.78 is a conversion factor to address the rainfall unit being in mm/hr.

The Wallingford procedure modified the single coefficient C by splitting it into two terms; the volumetric runoff coefficient, C_V (of the order of 0.6 for paved surfaces) and the routing coefficient, C_R, (of the order of 1.3). This aims to address the fact that not all the catchment need to contribute runoff to a point to result in the highest rate of runoff. This is due to the typical shape of catchments. In practice 0.6 × 1.3 approximates to 0.8 which would be a typical value used for surface water runoff from a paved site.

Normally users of the Rational Method ignore runoff from pervious surfaces, because the time of concentration in a small network is measured in minutes and runoff from previous area will be small and significantly slower than paved runoff. Guidance on runoff proportions from extreme events for different surfaces is provided in Flood Studies Supplementary Report (FSSR) 16 (Institute of Hydrology, 1985).

The Rational Method would normally not be used for storm sewerage modelling of large networks and would not be considered suitable practice for most studies.

The percentage impermeability shall be taken as specified in Irish Water's Model Build & Verification Standard (IW-TEC-200-001), provided in the Table below.

The Contributing Area (A):

Surface Type	**Impermeability (Modified Rational)**	**Impermeability (MBV IW Standard)**
Roads/ hardstandings (inc. verges) and paved areas	100%	60-95%
Roofs	100%	75 – 95%
Other Areas	Nil	

Rainfall Intensity (i):

Return Period	Sub-catchment [Less than 200m^2, Slope Greater than 3%] (mm/hr)	Sub-catchment [Greater than 400m^2, Slope Less than 2%] (mm/hr)
1 year	4	8
2 year	4	7
5 year	3	6
Greater than 5 years	3	3

Adjusted tables of rainfall intensity may be computed using the methodology in the Wallingford Procedure for different times of concentration.

Dimensionless Coefficient (C)[5]:

$C = C_V C_R$

C_V = Volumetric Run-off Coefficient

C_R = Routing Coefficient

Soil Type /Surface Quality	C_V	C_R
Rapid draining soils /low quality surface	0.6	1.3
Heavy soils / high quality surface	0.9	1.3

1.4 Design Rainfall

The design rainfall storm used in the modelling process shall be in accordance with guidance provided in '*Guidance on Rainfall for Wastewater Modelling in Ireland, H.R. Wallingford, February 2017*'; this guidance addresses the following topics:

- Areal Reduction Factor
- Seasonal Correction Factor
- Parameters in the New UK Runoff Equation
- FSU Rainfall Data
- Time Series Rainfall
- Climate Change

[5] A value of C= 1.0 is suggested for most circumstances but where there are large areas of connected impervious area and soil type and/or condition of the surface is considered to be a factor C_v may be adjusted as indicated to calculate C.

1.5 Land Drainage, Run-Off from Permeable Areas & Derelict Land

Land drainage flows shall not be connected into wastewater, or combined drains or sewers.

It is a matter for the Local Authority of the area as to whether it would allow land drainage flows to be discharged into the storm water sewerage that is under its control. The method of design, in that instance, will be dictated by the Local Authority.

The existence of flows in existing sewers that convey land drainage shall be assessed in terms of available head and governing topography. When assessing the capacity of the connected existing land drainage systems care shall be taken to use appropriate roughness values. For small streams and ditches flow estimation shall be in accordance with the Flood Studies Update (FSU) by the Office of Public Works (OPW).

Appendix D

Wastewater Flow Rates for Design

Flow Rates for Design

Per person / activity / day (unless otherwise specified)	FLOW (Litres)
DOMESTIC DWELLINGS	
Standard residential	**150**
Mobile home type caravans with full services	**150**
INDUSTRIAL	
Office / Factory without canteen	**50**
Office / Factory with canteen	**100**
Open industrial site, e.g. construction, quarry, without canteen	**60**
*Full-time Day Staff	**90**
*Part-time Staff (4 hr shift)	**45**
SCHOOLS	
Non-residential with canteen cooking on site	**90**
Non-residential without a canteen	**50**
Boarding school (i) residents	**175**
Boarding school (ii) day staff (including mid-day meal)	**90**
HOTELS, PUBS & CLUBS	
Hotel Guests	**250**
Residential Training/Conference Guest (inclusive all meals)	**350**
Non residential Conference Guest	**60**
Public House Patrons	**12**

Holiday Camp Chalet Residents	**227**
Resident Staff	**180**
Restaurants - Full Meals	**30**
Restaurants - pre-prepared catering	**25**
Restaurants - Snack Bars & bar meals	**15**
Restaurants - Function Rooms including buffets	**15**
Restaurants - Fast Food i.e. (roadside restaurants)	**12**
Restaurants - Fast Food Meal (burger chain and similar)	**12**
Students (Accommodation only)	**100**
AMENITY SITES	
Toilet Blocks (per use)	**10**
Toilet (WC) (per use)	**10**
Toilet (Urinal) (per use)	**5**
Toilet Blocks in long stay car parks/lorry parks (per use)	**10**
Shower (per use)	**40**
Golf Club	**20**
Local community sports club, e.g. squash, rugby & football	**40**
Swimming (where a separate pool exists without an associated sports centre)	**10**
Health Club/Sports Centre	**50**
Tent Sites	**75**
Caravan Sites (i) Touring not serviced	**100**
Caravan Sites (ii) Static not serviced	**100**
Caravan Sites (iii) Static fully serviced	**150**

HOSPITALS & RESIDENTIAL CARE HOMES	
Residential old people / nursing	**350**
Small Hospitals	**450**
Large Hospitals	**Assess Individually**
*Staff figures also apply to other applications	

Where the Table above does not include flow rates for the type of activity, the trade wastewater flow should be based on the EPA Wastewater Treatment Manuals – Treatment Systems for Small Communities, Business, Leisure Centres and Hotels (1999) or on a metered water supply from a Premises similar to that of the proposed development. If the trade wastewater flow is still unknown, appropriate flow rates should be chosen from **Section 1.2.8** of **Appendix C**.

Appendix E

Amendments Associated with change from Revision 0 (December 2016) to Revision 1 (December 2017)

Amendment Location	Description of Change for Revision 1
SCOPE	The SCOPE statement has been amended to indicate that the Code of Practice sets out Irish Water's requirements for wastewater infrastructure in Self-Lay Developments.
Background	Vesting included in 2nd paragraph instead of Taking in Charge
Table of Contents	Section 1.12 Vesting included Appendix B amended to "Selection of Typical Standard Details". Appendix C Gravity Sewer Design Flows included. Appendix D Wastewater Flow Rates for Design included. Appendix E List of Amendments Associated with Revision 1 included
Glossary of Terms and Definitions	Revision of the definition of "Backfill" is included. Definition for "Commission for Regulation of Utilities (CRU)" is included instead of "Commission for Energy Regulation (CER)". Definition included for "Deed of Grant of Easement". Definition of "Regulator" amended to refer to Commission for Regulation of Utilities (CRU). Definition of "Security" amended to include "Self-Lay-Surety" instead of "Service Connection Deposit". Revised Definition included for "Taking in Charge" Definition included for "Vesting"
Section 1.1	The 1st sentence has been amended to include "vesting" rather than "taking in charge". The 3rd paragraph has been amended accordingly also.
Section 1.4	Section 1.4.8 amended to "Vesting" from "Taking in Charge"
Section 1.8	Section 1.8.10 amended to "Provision of Deed of Grant of Easement"
Section 1.9	Reference to the "Service Connection Deposit" in the 2nd last paragraphs has been amended to "Self-Lay Surety"
Section 1.10	Reference to the "Service Connection Deposit" in the 2nd last paragraphs has been amended to "Self-Lay Surety". The last paragraph amended to include for "Vesting" rather than "Taking in Charge"
Section 1.12	This Section has been amended in full to reflect that the new infrastructure will vested in Irish Water under the Connection Agreement rather than the infrastructure being Taken in Charge.
Section 1.13	Reference to the "Service Connection Deposit" in the 4th and 5th paragraphs has been amended to "Self-Lay Surety"
Section 1.14	Reference to the "Service Connection Deposit" in the 1st paragraph has been amended to "Self-Lay Surety"
Section 1.20	This Section 1.20 has been amended to indicate that the Code of Practice has been developed using CESWI and the Irish Water Amendments to CESWI.

Section 2.3	The 1st paragraph has been amended to include an e-mail address for the provision by Developer's Design Submissions available to Irish Water (cdsdesignqa@water.ie). Section 2.3.24 has been included to require, if applicable, a written statement from the Road Authority in relation to the use of alternative Backfill material in the pipe trenches.
Section 3.1	Section 3.1.2 has been amended to indicate that the Code of Practice has been developed using CESWI and the Irish Water Amendments to CESWI.
Section 3.5	Section 3.5.20 has been amended to include Deed of Grant of Easement and Vesting
Section 3.6	Section 3.6 has been significantly amended in relation to the design of Gravity Sewers and it refers to Appendix C, Gravity Sewer Design.
Section 3.7	Section 3.3.7 has been included to require a continuous rise in the rising main, if possible. Section 3.3.7 been included in relation to rising mains with gradients steeper than 1:10.
Section 3.8	Amendments carried out to the 1st and 2nd paragraph clarifying that 225mm sewers and greater are required where more than 20 houses are being served in a development.
Section 3.10	Section 3.10 has been amended to indicate that the road construction in the development is to be provided to the requirements of the Roads Authority in whose functional area the development is located. Reinstatement of trenches in Public Roads are to be in accordance with Guidelines for the Opening, Backfilling and Reinstatement of Trenches in Public Road", 2nd Edition, or subsequent amendments published by Department of the Transport, Tourism and Sport.
Section 3.12	The 4th paragraph has been amended in relation to the provision of step rungs and ladders in manholes. Section 3.12.5 has been amended in respect of the requirements for pre-cast concrete manholes. The requirement for ***Manhole Walls*** has been amended in respect of precast concrete manholes. The requirement for ***Manhole Shafts*** has been amended. The requirement for ***Rocker Pipes*** has been amended in relation to the length of pipe protruding from the manhole wall and the omission for the need for rocker pipes with flexible pipes. The requirement for ***Manhole Covers and Frames*** has been clarified in relation to the thickness of D400 frames and the provision of closed keyways in the cover unit. In addition, the finish of the road around the Chamber cover is to be to the Road Authority for the functional area in which the development is located. The requirement for ***Manhole Steps*** has been amended. The requirement for ***Ladders*** has been amended in relation to the applicable Standard and the position of the ladder beneath the opening.

Section 3.13.2	The jetting resistance requirement of 4,000psi (280 Bar) has been reduced to 2,600psi (180 Bar). Reference to WIS 4-35-01 (2000) has been amended to WIS 4-35-01 (2008)
Section 3.13.3	The requirements for unplasticised PVC pipes and fittings has been amended to allow their use for sewer diameters 150mm up to 450mm as well as for service connections of 100mm diameter. They shall comply with the provisions IS EN 1401 2009/2012. Pipes to be application area code "UD", Stiffness Class 8kN/m^2. Provision for jetting shall be based on the WRc Sewer Jetting Code of Practice, June 1997. Pipes to be capable of resisting a maximum jetting pump pressure of 2,600psi (180 Bar) without damage.
Section 3.16	Clarification has been provided in relation to the measures to be adopted if a weld test is non-compliant with WIS 4-32-08.
Section 3.17.4	Amended to allow the use of either a gate valve or a butterfly valve as an isolation valve for the air valve.
Section 3.18.1	An amendment has been included to require the finish of the road around the Chamber cover to be to the Road Authority for the functional area in which the development is located. The 6th paragraph has been amended in relation to surface box requirements. In addition, the need for a stainless steel band around plinths to covers has been omitted.
Section 3.18.2	An amendment has been included to require the finish of the road around the Chamber cover to be to the Road Authority for the functional area in which the development is located.
Section 3.18.3	An amendment has been included to require the finish of the road around the Chamber cover to be to the Road Authority for the functional area in which the development is located. In addition, the need for a stainless steel band around plinths to covers has been omitted.
Section 3.21	The 5th paragraph has been amended to indicate that the requirements of Table A1 of BS 5837 may be increased depending on the species type or relaxed where protection measures are provided. The requirements relating to a "Precaution Zone" has been amended to indicate that the girth is measured at 1.5m and that excavations in this area are to be supervised by a qualified arborist.
Section 4.7	The 3rd paragraph has been amended to clarify the requirement in relation to bedding of sewer pipes. The 5th paragraph has been amended to include Clause 804 and Clause 808 material.
Section 4.8	Amendments have been included which allow alternative Backfill material, other than Clause 804 and Clause 808 granular material, to be used in pipe trenches within developments subject to a written statement from the Roads Authority of the functional area where the development is located being made available to Irish Water in the Design Submission. Reinstatement of trenches in Public Roads are to be in accordance with Guidelines for the Opening, Backfilling and Reinstatement of Trenches in Public

	Road", 2nd Edition, or subsequent amendments published by Department of the Transport, Tourism and Sport. Clarity on the use of Clause 804 and Clause 808 material in pipe trenches is also provided in respect of the Backfill material's proximity to concrete materials.
Clause 4.9	Two additional paragraphs have been include at the end of Section 4.9 in relation to steep gradient on rising mains and in relation to the provision of anchor blocks on rising mains using polyethylene material.
Section 4.10	Guidelines have been included for the carrying out of exfiltration and infiltration tests of manholes.
Section 4.11	Section 4.11.1 has been amended to include "general requirements" rather than "guidance".
Section 5.1	The 1st and 2nd paragraphs have been amended to indicate that Part 5 includes "requirements" rather than "guidance".
Section 5.2	The 2nd and 7th paragraphs have been amended to include Vesting rather than Taking in Charge. The 8th paragraph has been amended in relation to the requirement for emergency storage at a pump station. The need for 24 hour storage of DWF has been relaxed for developments more than 275 units.
Section 5.6	The Table of for fence security ratings has been amended for the mesh spacing for Enhanced and Enhanced+ Security Rating. .
Section 5.8	The 2nd paragraph has bene amended in relation to the requirement for emergency storage at a pump station. The need for 24 hour storage of DWF has been relaxed for developments more than 275 units.
Section 5.11	The 2nd paragraph has bene amended in relation to the requirement for emergency storage at a pump station. The need for 24 hour storage of DWF has been relaxed for developments more than 275 units. In addition, the requirement for 6mm aperture size overflow screens has been changed to require compliance with the requirements of the "Urban Wastewater Treatment Directive Procedures and Criteria in relation to Storm Water Overflows", as published by the Department of Environment.
Appendix A	Reference to IS EN 1610 is included.
Appendix B	The title of Appendix B has been amended to "Selection of Typical Details"
Appendix C	Appendix C – Gravity Sewer Design – has been included.
Appendix D	Appendix D – Wastewater Flow Rates for Design – has been included.
Appendix E	Appendix E - List of Amendments Associated with Revision 1 – has been included.