

Section W – DRAINAGE

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W.0 Compliance with Materials and workmanship with the Building regulations

In order to demonstrate conformity with the Building Regulations (Part D; Materials and Workmanship), and with the Construction Products Regulation (Regulation (EU) No.305/2011) as set in national rules for Ireland (S.I.No.225 of 2013), the Contractor shall provide proof (a declaration of Performance (DoP)) and (where applicable) a CE marking for all building products to be placed in the works.

The Contractor shall ensure that the product to be incorporated in the works, while complying with CPR, is fit for the use for which it is intended. The Contractor may be required to demonstrate this by means of manufacturer's confirmation, or independent testing certificate.

GENERALLY

W.1 Foul and Soil Sewers

This specification covers internal site drainage up to 150mm dia. Only, for details of larger drains and sewers are specified separately. Manhole covers and gully gratings shall be as this specification.

W.2 Installation generally

All drainage work shall generally be carried out in accordance with IS EN 752:2008.

All u.P.V.C. pipes and fittings shall be handled and installed in accordance with Manufacturer's instructions.

W.3 Inspections

The Contractor shall give written notice to the Architect for the purpose of inspection, testing where necessary and measurement, whenever sections of:-

- (i) Excavations are completed,
- (ii) Concrete and/or granular beds laid,
- (iii) Drains are completed,

and no further work shall be executed until each stage of the work has been inspected, tested where necessary and measured.

Contractor's attention is drawn to Fingal County council 'Water services department; Specifications and standards for taking in charge and testing regime.

W.4 Levels of Existing Drains

The Contractor shall check the invert levels of existing drains, sewers and manholes before laying new drains and shall notify the Architect immediately if the declared invert levels shown on the drawings are found to be inaccurate.

W.5 Organisation of Work

The Contractor shall take care not to dig out or disturb pipes, mains, etc., already installed as part of the contract. He shall arrange his working in such a way that granular surround to pipes is not disturbed, and remains in place to fulfill its purpose of supporting the pipes.

W.6 Surface load

The Contractor shall not permit the storage or stacking of equipment or materials, the passage of vehicles or the presence of any other load which may cause damage to pipes or settlement of the ground in the vicinity of sewers and drains.

No materials may be stacked higher than 0.5m within a horizontal distance from a pipeline equivalent to 1.5 times the depth to the top of the pipe without the prior written permission of the

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Architect following application stating the dimensions and loading of the proposed stack.

Any such permission shall not relieve the Contractor of his obligation to prevent settlement or remedy any damage caused by surface loads.

W.7

to Nil

W.8

MATERIALS

W.9 uP.V.C. Pipes and Fittings

Unless otherwise directed all underground sewer and drainage pipes and fittings shall be manufactured from Unplasticised Polyvinyl Chloride (u.P.V.C.) complying with IS EN 1401-1:2009.

W.10

to Nil

W.11

W.12 Gullies

Waste and rainwater gullies to units shall be u.P.V.C. back inlet gullies, complying with Clause W.16, fitted with cast aluminium, hinged lockable covers.

Road and yard gullies shall be constructed in concrete blockwork (plastered on both sides) or approved precast concrete units and fitted with gratings and frames as Clause W.16.

W.13 Armstrong Junctions

Armstrong junctions (AJ'S) to be moulded uPVC and fitted with cast iron screw down or lockable cover.

The AJ shall come complete, where necessary with standard riser pieces to adjust for depth of drain. The cover frame shall also tilt and rotate to allow for alignment with buildings and ground level.

W.14 Manhole Covers

Manhole covers and frames shall be ductile iron complying with IS EN 124:1994, ('NOROC EUR En124 D400 DÉCOR' supplied Ejco.com or equivalent). Covers and frames shall have the following requirements:-

- i. The covers must meet the loading requirements of class D400 of IS EN 752:2008 when tested with their frames.
- ii. Seatings shall be use neoprene seatings (unless stated otherwise).
- iii. Opening size shall be 600 x 600 min. and frame shall have a minimum depth of 100mm.
- iv. The cover shall be a single part and fitted tight in frame with opposed wedge seatings or other positive device and shall have 2 no. keyholes in accordance with IS 261:2013 (Large).

W.15 Manhole Step Irons

Manhole step irons shall comply with IS EN 13101:2002.

W.16 Gully Gratings

Gully gratings and frames for road and yard gullies shall be ductile iron complying with IS EN

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124:1994 ('LION' 75 LKD (Locked) C250, ref.: 710118 by Ejco.com. or equivalent).

Gratings and frames shall meet the following requirements.

- i. The gratings must meet the loading requirements of Class C250 of IS EN 124:1994 when tested with their frames.
- ii. Opening size shall be 350 x 280 min and frame shall have a minimum depth of 100mm.
- iii. Hinges shall be a minimum 15mm dia. full length through grating welded or riveted at both ends.
- iv. The grating shall have a dished surface and be lockable by means of a socket head bolt or other approved device.

W.17 Keys

Three sets of each type of key for locking or lifting of covers shall be provided and handed over to the Architect at completion.

W.18 Galvanised Work

Unless otherwise described galvanized coatings for iron and steelwork shall be as Clause Q.16.

W.19 Granular bedding material

Granular material for bedding and surrounds to pipes shall comprise of broken stone or gravel to pass 10mm sieve and be retained on 5mm sieve.

W.20 Granular and selected backfilling material

Granular and selected material for backfilling shall comprise of uniform readily compatible material free from tree roots, vegetable matter, building rubbish and frozen soil, and excluding clay lumps retained on 75mm sieve and stones retained on 25mm sieve.

All granular fill for work under buildings, paths and roads shall comply with approved standard IS EN 13242:2002 (+A1:2007). (See also section D; Excavations and Earthworks, clause D.22).

W.21

to Nil

W.25

WORKMANSHIP

W.26 Setting out and Tolerances

The Contractor shall set out the works to the correct positions, levels, dimensions, gradients and alignments and shall provide all necessary facilities and equipment for this purpose.

The invert levels shall be measured at the centre of the chambers and shall be constructed at the elevations shown on the drawings within a tolerance of + or - 20mm subject to the proviso that the fall between any two consecutive chambers shall be not less than 90% of that shown. Pipes shall be laid truly straight to the line and gradient between the chambers as set within the above level tolerances.

W.27 Testing

The Contractor is to test all drainage in the presence of the Architect or his representative. No drain is to be haunched or covered up until approved. The Contractor to provide all appliances and

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attendances for these tests.

All tests shall be carried out in accordance with SR 7:1981.

W.28

to Nil

W.29

W.30 **Excavation**

Excavate for all trenches for drains and sewers and consolidate and backfill in accordance with SR 7:1981.

Excavation for sewers and drains shall be in open cut unless otherwise instructed or unless previous permission has been given by the Architect who may lay down such conditions as he thinks fit without in anyway relieving the Contractor of his responsibilities.

Excess excavations below the required levels shall be filled up to the correct level with lean mix concrete, see Clause F.13, or as the Architect may require at the Contractor's expense.

The bottoms of excavations, trenches and headings must be inspected and approved by the Architect before any further works are commenced. The Contractor shall support the sides of excavations by sheeting, timbering, strutting or other means and where so directed by the Architect such supports shall be left in. Details of supports left in shall be agreed with the Architect before the work is covered up, otherwise no claim in this respect will be entertained.

Only where directed or approved by the Architect may the Contractor lay adjacent foul and surface water sewers in one trench and the Contractor shall provide such extra support and protection of the sewers as the Architect may consider necessary.

W.31 **Laying Pipelines - generally**

Each pipe before being laid shall be carefully brushed out and inspected for soundness and straightness.

Pipelines shall be constructed in a single operation between manholes and chambers, unless otherwise authorised by the Architect. Except as herein specified temporary or permanent supports to pipelines such as bricks, timber blocks, concrete blocks, etc., shall not be permitted.

W.32 **Concrete beds**

Drains shall be laid on concrete beds Class F-20. The minimum depth of bed shall be equal to the diameter of the pipe and the minimum width of the bed shall be equal to three times the diameter of the pipe. Form flexible joints in the bed using 25 expanded polystyrene sheets or fibre board extending the full width of the bed, the joints should be placed at every joint in the pipe in accordance with SR 7:1981. Laid PVCu pipes shall be wrapped in polyethene sheeting to protect the pipe from the concrete bed.

After placing and leveling the pipes and fittings shall be fully grouted underneath and haunched for the whole length in Class F-20 concrete excepting at the joints so as to maintain the flexible joint.

W.33 **Concrete surrounds**

Where drains pass under buildings or walls or where drains not under concrete paving have less than 450mm cover they are to be surrounded in 150mm minimum Class F-20 concrete. Flexible joints shall be formed in the surround in a similar manner to Clause W.32 in accordance with SR 7:1981 and wrapped in polythene sheet or other approved material. Backfilling over the concrete surrounds shall proceed only after a period of 36 hours has elapsed from final placing of concrete.

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No surrounds are to be formed until the drains affected are tested.

W.34 **Relieving Lintols**

Where drains pass through walls relieving lintols shall be placed over the drain to the satisfaction of the Architect.

W.35 **Filling excavations**

Backfilling material for trenches shall be granular backfill where the finished surface above the trench will be a road or other vehicular area, or any structure such as a bin store. In other positions, selected backfill material shall be used.

Backfilling shall be completed in a single operation between adjacent manholes and/or inspection chambers. The pipe surrounds shall first be carefully covered and compacted by hand to a level 300mm above the crown of the pipe. Backfill for the remaining depth of the trench shall be placed in layers not exceeding 150mm deep and fully compacted by mechanical plant. Supports to trenches shall not be removed until sufficient filling has been placed and compacted to allow the gradual withdrawal of supports without endangering the pipes and supports or the stability of the sides of the excavation.

W.36 **Manholes and Inspection Chambers - General Requirements**

Manholes and inspection chambers shall be watertight. Pipes passing through the chambers shall terminate flush with the interior wall except in the case of circular chambers where a cement and sand (1:3) fillet shall be formed over the projecting crown.

The laying of sewers and drains shall be so organised that a flexible joint is located 150mm from the exterior wall followed by another flexible joint between 0.5m and 1m from the first joint.

Irrespective of their sizes, incoming and outgoing pipes on the main through runs shall be laid with their soffits at the same level unless specifically detailed on the drawing. The invert levels of lateral connections shall be coincident with the centre line level of the outgoing pipe, unless otherwise detailed.

Channels shall be formed with the appropriate half round channel sections. The channels shall be extended vertically on both sides in concrete Class F-30 with 25mm thick cement mortar rendering and turned into the benchings at soffit level with a 25mm arris. Benchings shall be formed in concrete finished as for concrete channels, the top surface of the benchings being laid to a fall of 1 in 6 towards the channels.

Two rows of step irons shall be provided at 300mm staggered vertical pitch and 300mm centres horizontally. They shall be so fixed as to provide a direct landing onto the widest part of the benching and shall lead vertically up to the side of the cover with the first step iron located at a distance not greater than 600mm below the top of the cover opening.

All manholes to be rendered internally with 3:1 sand and cement 20mm thick in 2 coats.

Backdrop chambers shall be constructed in accordance with the detailed drawings, either with vertical or 45° ramped drops depending upon the size of pipe and difference in level. Backdrop pipework shall be encased with concrete to give a minimum cover of 150mm to the pipework and shall be monolithic with the surround to the chamber.

Chambers and manholes shall be completed in a continuous operation and cover frames shall be fixed if necessary as a temporary measure direct onto the cover slab. It will not be permitted for chambers and manholes to stand partially completed and open. The Contractor shall take such steps as are necessary to prevent the ingress of soil or rubbish into the chambers or pipes.

W.37 **Blockwork, Manholes and Inspection Chambers**

Bases shall be formed from 150mm concrete Class F-30 with 200mm projecting offset all round.

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Walls shall be 215mm solid blockwork constructed directly of the base and laid in 1:3 cement mortar with flush joints. Blockwork shall be plastered on both sides.

Step irons shall be built in as blockwork proceeds.

The cover slabs shall be formed of reinforced concrete Class F-30.

Unless otherwise shown sizes of manholes for foul and surface water drains for pipe sizes up to 150mm shall be:-

For man holes and inspection chambers with maximum depth to invert level of 900mm.	785 x 785 (Internal)
For manholes greater than 900mm and less than 2700mm deep.	1200 x 785 (Internal)
Manholes greater than 2700mm deep be as shown on drawings.	Are specified separately and be as shown on drawings.

W.38 Nil

W.39 **Work to Existing Manholes**

Carefully cut away benching in existing manhole. Form holes in walls for and build in ends of new connections. Set in new channels and complete as Clause W.36.

W.40 **Bedding and Fixing Manhole and Inspection Chamber Covers and Frames**

One or two courses of concrete blockwork in cement mortar (1:3) shall be constructed below the frames, which shall be set to the profile of the ground surface. The frames shall be laid in cement mortar (1:3) beds carried over the edge of the frames and splayed back to the frame upstands. Surfaces between the frames and covers shall be greased.

W.41 **Gullies and Gratings**

Gully pots shall be laid on a 150mm concrete bed with a concrete surround 150mm thick.

Road gully gratings and frames shall be laid in cement mortar (1:3). Where surfacing is to be delayed, the gratings shall be set to finished levels and a ramp of fine textured bitumen macadam shall be placed and maintained around the gratings until the surfacing is carried out.

W.42 **Bedding of Armstrong Junctions**

Armstrong junctions to be laid on 600 x 600 x 150 mm thick concrete Class F-20 bed and cradled up around same.

Ensure that covers are parallel to adjoining buildings.

W.43 Nil

W.44 **Abandoned Chambers, Sewers and Drains - Fill and Disposal**

Abandoned drains, sewers, inspection chambers and manholes less than 2m deep to invert shall be dug out and removed from the site.

Sewers and drains which due to their depth or size or for another reason are directed to be filled, shall be filled with lean mix concrete to the satisfaction of the Architect. Before filling commences pipelines shall be cleared by high pressure water jets and all branch connections between manholes and chambers located and plugged with concrete to a depth of 300mm. If the system is not connected to a live sewer system the Contractor shall make provision for removing any material contained within the pipeline.

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The Contractor shall be responsible for the method of filling and shall pay due regard to grout entering the sub-soil and the effect of such grout on adjacent structures and underground services.

The pipelines shall be completely filled to the soffits. Manholes and chambers shall be filled to within 600mm of the existing ground surface. The remaining walls, covers and frames, cover slabs, etc., shall be removed from the site or recovered as directed.

W.45

to Nil

W.49

W.50 **Clean and Flush all Sewers, Drains etc.**

Immediately prior to the issue of the certificate of practical completion, the Contractor shall clean out all debris from gullies, pipelines, manholes and chambers and flush by high pressure jetting.

W.51 **FCC water department; water service specification**

The contractor's attention is drawn to FCC water department; water service specification.

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Appendix A: List of References and Standards.

Item No.	Clause	Reference	Comment
1.	W.2	IS EN 752:2008	Drain and Sewer systems outside buildings. (to replace the following IS EN 752-1:1996, IS EN 752-2:1997, IS EN 752-3:1997, IS EN 752-4:1998)
2.	W.9	IS EN 1401-1:2009	Plastics piping systems for non-pressure underground drainage and sewerage – Unplasticised Poly (vinyl chloride) (PVC-U) – Part 1: Specifications for pipes, fittings and the system. (to replace IS EN 1401:1998)
3.	W.14	IS EN 124:1994	Gully tops and manhole tops for vehicular and pedestrian areas – Design requirements, type testing, marking, quality control.
4.	W.14	IS 261:2013	Water services road furniture – Requirements for cast iron covers and frames. (to replace IS 261:1994)
5.	W.15	IS EN 13101:2002	Steps for underground man entry chambers – Requirements, marking, testing and evaluation of conformity.
6.	W.20	IS EN 13242:2002 (+A1:2007)	Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.
7.	W.27	SR 7:1981	Recommendations for the handling and installation of uPVC buried drains and sewers.

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Appendix B: Amendments List	
Date of Amendments	Amendments
1/05/2014	This section was amended by Barry Sheils and approved by David Byrne, Senior Architect, Fingal County Council.