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Transport Infrastructure Ireland

## TII Publications



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# Specification for Road Works Series 2700 - Watermains, Utilities and Accommodation Works

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## About TII

Transport Infrastructure Ireland (TII) is responsible for managing and improving the country's national road and light rail networks.

## About TII Publications

TII maintains an online suite of technical publications, which is managed through the TII Publications website. The contents of TII Publications is clearly split into 'Standards' and 'Technical' documentation. All documentation for implementation on TII schemes is collectively referred to as TII Publications (Standards), and all other documentation within the system is collectively referred to as TII Publications (Technical). This system replaces the NRA Design Manual for Roads and Bridges (NRA DMRB) and the NRA Manual of Contract Documents for Road Works (NRA MCDRW).

## Document Attributes

Each document within TII Publications has a range of attributes associated with it, which allows for efficient access and retrieval of the document from the website. These attributes are also contained on the inside cover of each current document, for reference. For migration of documents from the NRA and RPA to the new system, each current document was assigned with new outer front and rear covers. Apart from the covers, and inside cover pages, the documents contain the same information as previously within the NRA or RPA systems, including historical references such as those contained within NRA DMRB and NRA MCDRW.

## Document Attributes

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## NRA DMRB and MCDRW References

For all documents that existed within the NRA DMRB or the NRA MCDRW prior to the launch of TII Publications, the NRA document reference used previously is listed above under 'historical reference'. The TII Publication Number also shown above now supersedes this historical reference. All historical references within this document are deemed to be replaced by the TII Publication Number. For the equivalent TII Publication Number for all other historical references contained within this document, please refer to the TII Publications website.

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# ***WATERMAINS, UTILITIES AND ACCOMMODATION WORKS***

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# Watermains, Utilities and Accommodation Works

## 2701 Watermains General

### General

- 1 Watermains shall be constructed in accordance with this Series, the requirements of Appendix 27/1 and the Road Construction Details listed in Appendix 27/2.
- 2 References in this Series to a Water Services Authority shall be deemed to include the relevant County Council, City Council or Group Water Scheme as appropriate.
- 3 Prior to commencing work the Contractor shall initiate liaison with the representative of Water Services Authority identified in Appendix 27/1 and shall satisfy himself as to the exact position of any existing watermains.
- 4 Works to be undertaken for the owners of other utilities and for accommodation works shall be constructed in accordance with the Series of the Specification relevant to those works.

## 2702 Liaison with the Water Services Authority

### Connections and Shutdowns

- 1 Connections to existing watermains shall only be completed with the prior permission of the Water Services Authority. Unless otherwise specified in Appendix 27/1 the Contractor shall apply for permission to the Water Services Authority one month in advance of making connections.
- 2 Where it is necessary for the Contractor to shut down a live watermain in order to complete the works the Contractor shall submit to the Water Services Authority, with a copy to the Employers Representative, a full schedule of the shutdowns which are necessary in order to carry out the Works. The proposed date and the work to be carried out shall be stated for each shutdown. Work shall not proceed until the relevant Water Services Authority has formally issued its approval or raised no objection to the proposals.

Applications shall include a method statement, drawings, programme and such other information which may be required by the relevant Water Services Authority in order to assess the application.

The method statement shall contain, as a minimum, the following information:-

- (i) Location of the watermain to be shut down;
  - (ii) Details of the existing watermain, including pipe size, materials, depth of cover, etc;
  - (iii) Proposed date and time for commencement of the shutdown;
  - (iv) Proposed date and time for completion of the shutdown;
  - (v) Details of any assistance required from the Water Services Authority;
  - (vi) Location(s) of proposed connections;
  - (vii) Resources to be utilised for proposed works (labour, plant and materials);
  - (viii) Detailed description of the method of carrying out the works, including testing, disinfection of affected mains, making network live, etc;
  - (ix) Description of new watermain to be brought into service;
  - (x) Expected duration of interruption to customers' supply.
- 3 Connections to an existing watermain will only be given when the relevant Water Services Authority is satisfied that:-
    - (i) the watermain has been installed in accordance with this specification;
    - (ii) pressure, chlorine and bacteriological tests have been successfully carried out and a copy of the Bacteriological Test report has been submitted to the relevant Water Services Authority.
  - 4 The Contractor shall ensure that no personnel involved in the watermain connections are carriers of pathogenic diseases.
  - 5 Unless otherwise stated in Appendix 27/1, all connections to existing watermains shall be undertaken by the Contractor in the presence of the Water Services Authority personnel.

### Inspection of the Works

- 6 The Contractor shall facilitate the periodic inspection of the works by a representative of the Water Services.

### 2703 Materials – Pipework

- 1 All pipework materials to be used in the works shall comply with the requirements of this clause and any other requirements specified in Appendix 27/1.

#### Materials in Contact with Potable Water

- 2 All materials which will be in contact with potable water must comply with the “List of Approved Products and Processes” published by the Drinking Water Inspectorate for England and approved by the UK Department of the Environment Committee on Products and Processes for Use in Public Water Supply (CPP).
- 3 The Contractor shall protect surfaces of watermains and water retaining structures from contamination with phenolic compounds such as oil, petrol and bituminous products, other than those approved for use in the works. The Contractor shall be responsible for decontaminating any area of accidental spillage and for any consequential costs of testing the effectiveness of remedial measures.

#### General Storage and Handling of Materials

- 4 The Contractor shall ensure that all materials, fittings, pipes and equipment to be used in the works which could come into contact with potable water, shall be transported to site or stored in vehicles which have not previously carried oils, diesel or fuels, in order to avoid potential contamination.
- 5 Polyethylene pipes, potable water hoses and fittings shall be transported on vehicles provided with a flat bed, free from nails and other projections which might damage the materials. Only non-metallic ropes or wide band webbing shall be used to secure loads.
- 6 The Contractor shall take all possible precautions to prevent contamination of the polyethylene pipes and fittings during transportation. All pipe materials brought to site shall be capped.

#### Materials to be used for pipe work

- 7 The materials to be used for pipework will be chosen from the sub – clauses 7 to 9 of this clause with reference to the required size and

working pressure and in accordance with the requirements of Appendix 27/1.

The following marks shall be cast, stamped or indelibly painted on each pipe and fitting as appropriate:

- (i) Manufacturer’s name, initials or identification mark;
- (ii) Nominal Diameter (DN);
- (iii) Nominal Pressure Rating (PN) of the flanges where relevant;
- (iv) Year of manufacture;
- (v) Class designation;
- (vi) The number of the relevant Standard;
- (vii) The length of the pipe, if non-standard;
- (viii) Angle of bends, in degrees.

Manufacturer’s certificates shall be supplied confirming that the pipes or fittings comply in all aspects with the provisions of the appropriate Irish, European or British Standard as defined in the following sub-Clauses.

#### Ductile Iron Pipes

- 8 Ductile iron pipework shall comply with the following:-
- (i) Ductile iron pipes, fittings and joints shall comply with IS EN 545 and ISO 2531 or equivalent.
  - (ii) Flanges for pipes and pipeline fittings shall comply with IS EN 1092-1 and IS EN 1092 -2 for ductile iron.
  - (iii) All flanges shall be drilled to IS EN 1092-2 PN-16.
  - (iv) Ductile Iron Pipework and fittings shall be coated internally with a centrifugal applied cement mortar lining in accordance with IS EN 545 to a minimum thickness of 3mm for pipes up to and including 300mm diameter, and 5mm for pipes above 300mm diameter.
  - (v) The cement mortar lining shall in turn be protected with a seal coat approved under Regulation 25(1)(a) of the U.K. Water Supply (Water Quality) Regulations 1989 as amended by the

Water Supply (Water Quality)  
Amendment Regulations 1991.

- (vi) External protection is to include a zinc coating to ISO 8179 under a bitumen based coating to BS 3416.
- (vii) On-site repairs to lining and coatings shall be in accordance with the pipe manufacturer's recommendations.

### Polyethylene Pipes

**9** Polyethylene (PE) Pipes shall comply with the following general requirements:-

- (i) PE pipes, fittings and valves shall comply with the requirements of IS EN 12201, IS EN 13244 and IS EN 13598-1.
- (ii) PE pipes shall be classified in accordance with IS EN ISO 12162.
- (iii) PE pipes shall form a fully end load bearing system using butt fusion or electrofusion joints.
- (iv) The butt fusion and electrofusion jointing of PE piping systems shall be carried out in accordance with WIS 4-32-08.
- (v) PE pipes for potable water shall be blue or black with blue stripes in accordance with IS EN 12201-2.
- (vi) Testing of butt fusion and electrofusion joints shall be carried out in accordance with WIS 4-32-08. Joints shall be confirmed to have full integrity in accordance with IS EN 12201-3.

### Unplasticised PVC Pipes

**10** Unplasticised PVC (PVC-U) pipes and fittings shall comply with the following requirements:-

- (i) PVC-U pipes shall comply with the requirements of IS EN ISO 1452-2 and PVC-U joints and fittings shall comply with IS EN ISO 1452.
- (ii) Solvent cements for jointing PVC-U pipes shall comply with IS EN ISO 1452 and IS EN 14814.
- (iii) PVC-O pipes shall comply with WIS-4-31-08, and MOPVC joints and fittings shall comply with IS EN ISO 1452.

## 2704 Materials – Valves & Fittings

### Sluice Valves

**1** Sluice valves shall comply with IS EN 1074. The direction of closing of sluice valves shall be as specified in Appendix 27/1. Sluice valves shall be metal tongued. They shall bear the following markings (either integral with the body or on a plate of durable material securely fixed to the body):-

- (i) Nominal Diameter (i.e. DN 100, 150, etc);
- (ii) Nominal pressure rating (i.e. PN 10 or PN 16).

**2** Sluice valve chambers shall be constructed in accordance with the NRA Road Construction Details listed in Appendix 27/2. Valve caps shall be fixed to the valve spindle or provided with a reducer as required to fit a standard key.

### Butterfly Valves

**3** Butterfly valves shall comply with IS EN 1074 and IS EN 593. In addition, each valve shall be supplied and fitted with a suitable flanged adaptor. All valves shall be suitable for either manual or automatic actuator operation.

**4** Butterfly valve chambers shall be constructed in accordance with the NRA Road Construction Details listed in Appendix 27/2.

### Hydrants

**5** Hydrants shall comply with the requirements of IS EN 14339, IS EN 1074-6 and BS 750 and shall be of the type specified in Appendix 27/1.

**6** Hydrant chambers shall be constructed in accordance with the NRA Road Construction Details listed in Appendix 27/2.

### Air Valves

**7** Air valves shall comply with the requirements of IS EN 1074-4. Unless otherwise specified in Appendix 27/1 air valves shall be double orifice type and shall include an isolating valve. The isolating valve shall be a gate valve to IS EN 1074 and shall be of boltless bonnet design.

Air valve chambers shall be constructed in accordance with the NRA Road Construction Details listed in Appendix 27/2.

### Dimension Standards

**8** All valve dimension standards shall comply with IS EN 558.

### Flange Adaptors

- 9 Flange adaptors shall allow for a total movement of 5 mm and shall be manufactured with flanges in accordance with IS EN 1092 Part 1. Flange adaptors shall be complete with studs, bolts, nuts and washers and shall be finished in a thermoplastic polyamide coating in accordance with AS/NZS 4158.

### Valve Orientation

- 10 All valves shall be installed with the valve shaft in the horizontal plane.

## 2705 Pipe Jointing

### Pipe Jointing

- 1 All pipes must be clean prior to laying. Open ends of pipes and fittings shall be sealed with a suitable plug to prevent ingress of foreign material while pipe laying is not in progress.

Furthermore:-

- (i) Any protective cap, disk or other appliance on the end of a pipe or fitting shall only be removed permanently when the pipe or fitting which it protects is about to be jointed. Any exposed pipe ends shall be capped when pipe laying is not in progress in order to prevent vermin or soil entering the pipework.
- (ii) Suitable measures shall be taken to prevent extraneous material from entering the pipe and to anchor each pipe to prevent flotation or other movement before the works are complete.
- (iii) Pipe jointing surfaces and components shall be kept clean and free from extraneous matter until the joints have been made or assembled. Care shall be taken to prevent ingress of grout or other extraneous material into the joint annulus after the joint has been made.
- (iv) Where pipes with flexible joints are laid to curves, the deflection at any joint as laid shall not exceed the maximum deflection specified in IS EN 805.
- (v) Proprietary joints shall be made in accordance with the manufacturer's instructions.
- (vi) Jointing compounds shall not be used when making flanged joints.

### Welded Joints for Plastic Pipes

- 2 Fusion joints in PE pipes shall only be made between pipes having the same physical characteristics.
- 3 Butt fusion jointing shall be carried out in accordance with WIS 4-32-08 published by the Water Research Council (UK) and butt fusion jointing machines shall comply with WIS 4-32-16. All butt fusion joints shall be debeaded internally. The surface temperature of the heating plate shall be monitored by means of a calibrated digital thermometer.
- 4 All electrofusion jointing shall be carried out in accordance with WIS 4-32-08 and IS EN 12201-3.
- 5 Where solvent welded PVC-U pipes are jointed outside the trench, they shall not be lowered into place until the period for complete setting of the joints has elapsed as recommended by the manufacturer.

## 2706 Pipe Cutting

- 1 Pipe cutting shall be carried out with an approved mechanical pipe cutter (the use of abrasive wheel cutters for cutting into existing mains is not permitted).
- 2 Pipes shall be cut by a method which provides a clean square profile, without splitting or fracturing the pipe wall and which avoids damage to any protective coating. Where necessary, the cut ends of pipes shall be formed to the tapers and chamfers for the type of joint to be used and any protective coatings shall be made good and the ends sealed.
- 3 Suitable protective collars shall be fitted to exposed ends of pipes during operational work to prevent damage.
- 4 Where ductile iron pipes are to be cut to form non-standard lengths, the Contractor shall comply with the manufacturer's recommendations in respect of the ovality correction and tolerances to the cut spigot end.
- 5 Existing Asbestos Cement pipes shall not be cut. Full pipe sections shall be removed and new pipework installed to replace the removed sections. Specific safety precautions involving specialist training of operatives are required when working with asbestos. Any Asbestos Cement pipe material removed from the works shall be dealt with in accordance with the relevant EPA guidance.

## 2707 Excavation, Bedding, Laying, Surrounding and Backfilling

- 1 Excavation for watermains shall be carried out in accordance with the requirements of Series 500 and Series 600.
- 2 Pipe bedding and surrounding material and backfill material shall be in accordance with the NRA Road Construction Details listed in Appendix 27/2. Trench backfill shall be deposited in layers and compacted in accordance with the requirements of Series 600.
- 3 Pipes shall be laid such that sags or crests do not occur between scour and air valves.
- 4 Pipes shall only be laid on setting blocks where a concrete bed or cradle is used.
- 5 Watermain maker tape shall be laid above the pipe in accordance with Clause 2710.

### Thrust Blocks

- 6 Concrete and reinforcement for use in thrust blocks shall be as specified in Appendix 27/1 and shall comply with the requirements of Series 1700.

## 2708 Testing

- 1 The Contractor shall successfully carry out a Pressure Drop Test of the watermain in accordance with IS EN 805 prior to swabbing and disinfection.  
  
The Main Pressure Test, as outlined in IS EN 805 shall be by means of the Pressure Loss Method.
- 2 Unless otherwise specified in Appendix 27/1 the watermain shall be tested to a pressure as calculated in accordance with IS EN 805 for a period of 1 hour.
- 3 The maximum acceptable pressure loss shall be as specified in Appendix 27/1.

### Water for Testing, Swabbing and Disinfection

- 4 The Contractor shall provide the necessary water for all testing, swabbing and disinfection of the watermains and any associated works. The water shall be of potable standard and suitable for use in water supply situations.
- 5 If a Pressure Drop Test fails on any length of watermain, the Contractor shall locate and

remedy the cause of the failure. Any defective pipes or couplings discovered as a result of the test shall be replaced. On completion of any remedial works, the Pressure Drop Test shall be repeated until such time that the watermain has successfully passed the test criteria.

- 6 The Contractor shall furnish a suitable test pump to pump the watermain to the required pressure at a constant rate. The pump provided shall be equipped with a stroke-counting device to allow measurement of volumetric input, along with details of volume per pump stroke for the pump. (A water meter or other appliance may be provided to measure volumetric input by agreement with the Employer's Representative). The Contractor shall also provide hoses, connections and any other apparatus, approved for contact with potable water, necessary to fill the main and carry out the test.
- 7 Gauges used for testing pressure pipelines shall be either of the conventional circular type, not less than 200mm diameter and calibrated in metres head of water, or shall have a digital indicator capable of reading increments of 0.1m head. Before any gauge is used, it shall be checked independently and a dated calibration certificate provided to the Employer's Representative.
- 8 Pressurising of the watermain shall only be carried out under the continuous supervision of the Contractor's personnel.
- 9 The Contractor shall ensure that open ends are stopped with plugs, caps or blank flanges and that thrusts from bends, branch outlets and pipeline ends are transmitted to solid ground or to suitable temporary anchorages.
- 10 Where a new watermain is to connect to an existing watermain the final connection shall also be inspected under normal operating pressure with no visible leakage.
- 11 The watermain shall be filled slowly at a constant rate, with all venting facilities open, in order to allow the dispersion of free air. Where possible filling should take place from the lowest point in the watermain in order to prevent back siphonage.
- 12 After filling, watermains shall be left under normal operating pressure for 24 hours in order to stabilise the watermain prior to testing.



## 2709 Swabbing, Disinfection and Flushing

### Swabbing

- 1 Upon successful completion of the Pressure Drop test, the Contractor shall clean the watermain by passing through a foam swab. This process shall be repeated until a clear wash of water is achieved.
- 2 Swabs shall consist of solid cylindrical polyurethane foam in accordance with IS EN ISO 845 and BS 3379.
- 3 Sizes and densities of swabs shall comply with the Operation Guidelines for the Removal of Loose Deposits from Water Mains, published by the Water Research Council (UK). The Contractor shall provide all necessary equipment and water to undertake the swabbing.
- 4 The Contractor shall provide temporary washout facilities along the watermain in order to recover the swabs.

### Disinfection

- 5 Pipes shall be disinfected in accordance with Appendix 27/1.

### Chlorine Residual Test

- 6 Where disinfection has been achieved through chlorination a chlorine residual test shall be undertaken at the end of the watermain which is furthest from the point of injection. Testing shall in accordance with the guidance given in the EPA Water Treatment Manual – Disinfection unless otherwise specified in Appendix 27/1. The disinfection process shall be repeated if the chlorine residual is less than 10mg/l or otherwise as specified in Appendix 27/1.

### Bacteriological Testing

- 7 Sampling shall be undertaken in the presence of the Employer's Representative and the Water Services Authority. The samples shall be tested within 6 hours of sampling at an approved laboratory. The criteria for testing for samples shall be in accordance with Appendix 27/1 and shall meet the requirements of the European Communities (Quality of Water Intended for Human Consumption) Regulations 1998 and the European Communities (Drinking Water) Regulations 2000.

### Flushing

- 8 After disinfection, the watermain shall be flushed with potable water before the main is brought into service.

### Disposal of Water from Cleaning, Testing, Disinfection and Flushing

- 9 The Contractor shall provide all necessary facilities for the removal and disposal of water used for cleaning, testing, disinfection and flushing. The facilities shall include, but are not limited to, pumps, pipes, temporary connections, etc. Adequate provision shall be provided for the removal of settleable material from the water. De-chlorination of the water used for watermain disinfection should be carried out to the level specified in Appendix 27/1.
- 10 Discharges to sewers shall not take place without the consent of the relevant Local Authority. If approval is given to discharge to a sewer, the rate and volume of discharge is to be agreed with the Local Authority.
- 11 Discharge to existing streams, watercourses or surface water sewers shall not take place without the prior approval and consent of the Local Authority. Notwithstanding the requirements of the Local Authority no discharge of chlorinated water to an existing stream, watercourse or surface water sewer, foul sewer or watercourse will be undertaken unless the chlorine residual is within the range of 0 and 0.2mg/l.

## 2710 Marking of Watermains

### Marker Tape

- 1 A 400mm wide blue polyethylene marker tape, printed with the words 'WATERMAIN' in capital letters at intervals not exceeding 750mm and incorporating a polypropylene reinforcing band is to be laid directly over the centreline of the watermain at a depth of 350mm below the finished Ground Level.

In the case of non ferrous pipes, the marker tape shall include steel tracer wire which is bonded at tape joints and properly grounded onto valves, etc, to ensure that it can be re-traced by proprietary detection equipment following backfilling.

### Marker Posts

- 2 The Contractor shall erect an indicator plate for each sluice valve, scour valve, air valve and hydrant adjacent to the particular fitting. Indicator plates shall be fixed to adjacent

buildings where appropriate, or otherwise mounted on marker posts made of precast concrete. Each post shall be reinforced with 3 No. T10 bars 1m long and shall be set in the ground in an ST4 concrete footing 0.59m deep x 0.58m long x 0.4m wide. Each plate shall be set in a recess previously formed in the post and shall be fixed to the post with 4 Nr. 12mm diameter M.S. rag bolts. Indicator plates and Marker posts shall be constructed as shown in RCD/2700/13.

- 3 Hydrant indicator plates shall be single hydrant indicator plates with fixed black letters complying with BS 3251 except that the plates shall conform to colour reference no. 309 (canary yellow) in BS 381C.
- 4 Sluice valve, scour valve and air valve indicator plates shall comply with the specification for single hydrant indicator plates with fixed letters in BS 3251 except that they shall be coloured white and, instead of the letter H, shall bear the letters SV, ScV and AV respectively.





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