

Quinn Consulting Engineers

Roo West GWS

Works Specifications

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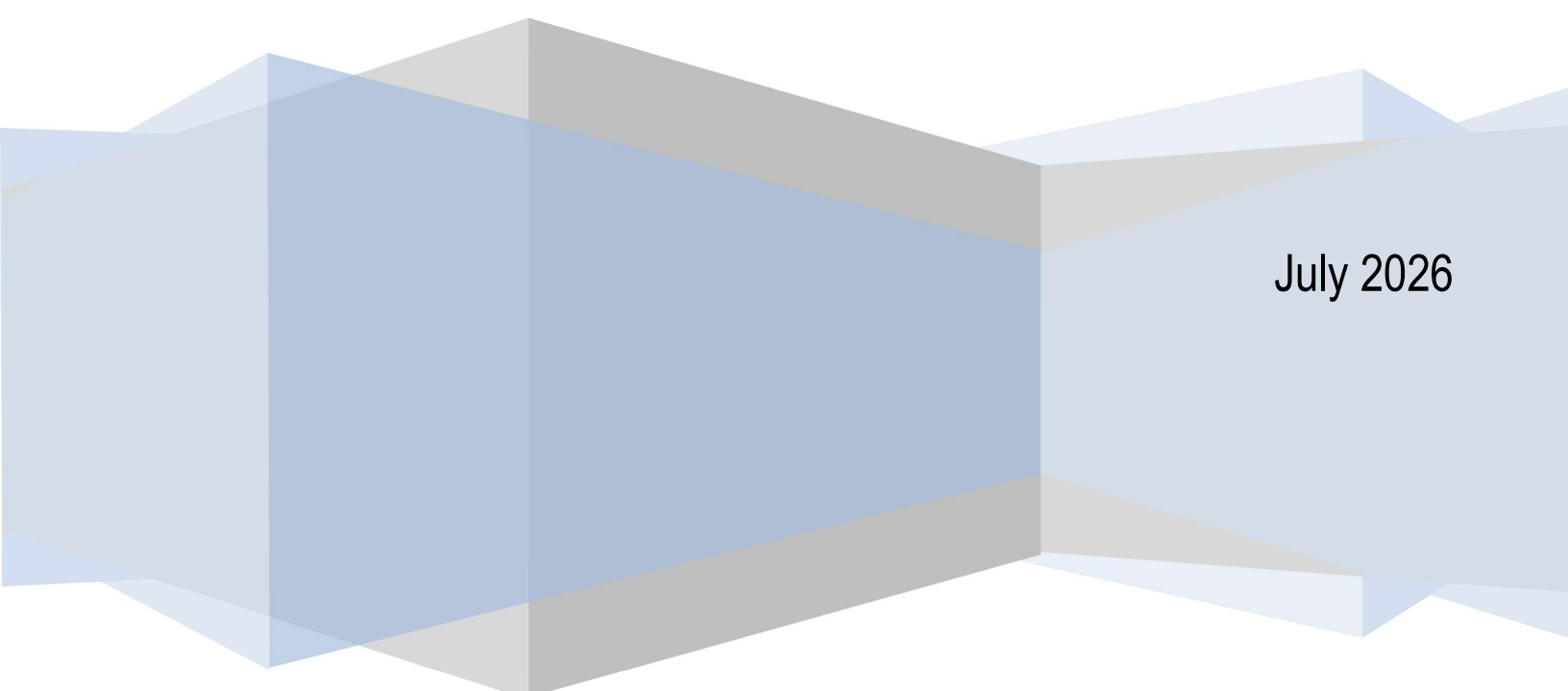
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SECTION 1 – GENERAL

1.1 SCOPE OF WORKS.

This Contract includes excavation and laying of watermain as per the Contract Drawings including all associated valves, fittings and chambers etc.

1.2 SITES AND WAYLEAVES.

- 1.2.1 The sites shall mean the lands or portion of land or land and water, roadways, laneways in or about which the works are to be laid, constructed or erected.
- 1.2.2 The water mains shall be laid to the lines and levels shown on the drawings. The Contractor should note that the works must be constructed in a phased manner i.e. all construction, including restoration must be completed in one area before commencing in the next area.
The Contract also includes for maintenance of the works for a period of twelve months from the date of completion as certified by the Employers Representative.
- 1.2.3 The works should be constructed with the safety of the public mind at all times and in such a manner as to cause the minimum disruptions to residents and road users.
All excavations shall be backfilled and temporary restoration carried out and the works left in a clean, tidy and safe condition before work may commence on adjacent sections.
- 1.2.4 The Contractor shall take all precautions and care to preserve the amenities of the surrounding areas and avoid unnecessary damage disturbance or injury during the progress of works. All necessary precautions shall be taken during the course of construction to prevent movement or damage to the existing premises, outbuildings, walls, services etc. adjacent to the works.

1.3 NOISE SUPPRESSION.

- 1.3.1 The contractor shall ensure that the level of noise resulting from the construction of the works does not constitute a nuisance and that noise emissions conform to the requirements of B.S. 5228 (1997). All plant shall be adequately silenced to conform to the requirements of B.S. 5228 (1997).
- 1.3.2 These restrictions shall apply particularly to all hours outside normal working hours. Normal working hours are from 8.00 hrs. To 18.00 hrs. Monday to Friday.
- 1.3.3 Noise restrictions shall be as follows: -

Normal Working Hours: (8.00 - 18.00 hrs).	70 dB (A) - equivalent continuous sound level in rural, suburban and urban areas away from main road traffic and 72dB (A) in urban areas near main roads.
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Outside Normal
Working Hours
(18.00 - 23.00 hrs.) 55 dB (A) - equivalent continuous
sound level.

Night Time (23.00 to 8.00 hrs.) 40 dB (A) - equivalent continuous
sound level.

1.3.4 The noise levels given above shall apply at the fencing surrounding the work area or at adjacent residential, commercial or institutional properties.

1.3.5 The Contractor will be required to use mains - powered (or approved alternative) electric pumps outside normal working hours.

1.4 DUST CONTROL / SPILLAGES.

1.4.1 The Contractor shall take all necessary precautions in his method of working and his maintenance of work areas to avoid nuisance to the public or damage to property arising from dust or spillage of mud or other material.

1.4.2 Where necessary, covering or damping of affective areas shall be carried out and spoil heaps etc., removed, if necessary, to a suitable location.

1.4.3 Spillage of mud or other materials from machinery onto public or private property shall be prohibited and all plant and equipment shall be cleaned prior to travelling on the public roadway or other paved areas.

1.4.4 The Contractor shall be responsible, at his own expense, for strictly adhering to these requirements.

1.4.5 Blasting may only be carried out with the written approval of the Employers Representative. In addition, the Gardaí regulations governing the purchase, transport, storage and use of explosives shall be fully complied with and provided for in the rates. Prior to commencement of blasting, trial blasts shall be carried out to establish the optimum hole pattern and charge size. Rock excavation shall include for the costs of these trial blasts. The final procedure shall be subject to the Employers Representative approval.

1.5 SAW CUT ROADS.

1.5.1 Where pipelines are to be laid in roads and footpaths, the surface shall be saw-cut to a depth of 100mm before the surface is broken.

1.6 LIGHTING.

1.16.1 Warning lights shall be erected as considered necessary.

1.7 WATCHMAN.

1.7.1 The Contractor shall provide competent watchmen as may be required at all times during and outside working hours.

1.8 TRAFFIC CONTROL.

- 1.8.1 The Contractor shall be responsible for the provision and proper positioning of all warning and advisory signs, traffic cones, signals and warning lamps which may be necessary for the proper control of traffic and to minimise inconvenience to the general public caused by his operations.
- 1.8.2 Warning and advisory signs shall be 900mm x 900mm minimum size, with 225mm minimum height reflective lettering. Signs must be kept clean at all times. Signs must be mounted or fixed in position, unaffected by wind or moving traffic.
- 1.8.3 Traffic cones are to be used to form tapers on the approach side of the construction area. Cones are to be spaced about 4m apart. They must be frequently checked to ensure that they maintain their correct position. Cones must be reflective and red in colour.
- 1.8.4 The Gardaí shall be given at least two weeks warning of the intention to commence construction.
- 1.8.5 In general, the Contractor will be required to maintain two-way traffic on roads where construction is taking place.
- 1.8.6 Where circumstances dictate, the Contractor may be allowed to restrict traffic movement to alternating one-way. This one-way traffic is to be controlled by temporary traffic lights. The approval of the Employers Representative, the relevant Local Authorities, and the Gardaí must be obtained before such restrictions can be allowed.
- 1.8.7 It is the Contractor's responsibility to obtain any necessary road opening licences from Clare County Council. This alignment has been agreed with the local area roads engineer and was the basis for the calculation of the road opening licence fee. The road opening licence fee is required to be paid in full to the Roads Department of Clare County Council prior to works commencing. This is a non-negotiable and non-refundable fee.
- 1.8.8 Suitable advance signs indicating the nature of the project, the Employing Authority, the Contractors name shall be provided on each approach to the construction area. These signs shall be moved and re-erected as required by the progress of operations. The layout of each of these signs to be approved by the Employers Representative.

1.9 ACCESS TO FRONTAGES.

- 1.9.1 The Contractor shall ensure that the minimum of inconvenience is caused to frontages, and shall, before commencing work on any section where access to property is being interfered with, give adequate notice to owners, occupiers or tenants which may be affected by his operations, and comply with their reasonable requirements.

1.10 CLEANLINESS OF SITE.

- 1.10.1 Roads shall be kept clean and swept as necessary to keep them free of loose material, and the working area maintained in a tidy condition.

1.11 PUMPING.

- 1.11.1 Pumps for use outside normal working hours shall be electrically powered. The power shall be either mains, or by a suitably powered and adequately silenced generator set. The generator shall be sited at a location which will result in the lowest possible noise at the nearest residence, hotel or other premises.
- 1.11.2 Diesel powered pumps will not be allowable outside normal working hours, due to the noise suppression requirements.

1.12 EXISTING SERVICES.

- 1.12.1 The locations of existing watermain, sewers, telecommunications and ESB services etc., are to be determined by the Contractor before construction commences. The Contractor shall contact the various utilities concerned and have them mark out, on site, the location and depth of the various underground services.
- 1.12.2 No extras will be payable arising from damage to services.

1.13 CONSTRUCTION SEQUENCING.

- 1.13.1 In order to minimise disruption to the public, it is required that the Contractor confine his operations to designated work areas. He will be required to complete work, including final restoration, in each work area before commencing work in the next work area.

1.14 DISPOSAL OF SPOIL.

- 1.14.1 Surplus or unsuitable spoil shall be removed and disposed off site to licensed tips. It is the Contractor's responsibility to locate a suitable tip for this material. In this regard the Contractor's attention is drawn to his obligations under the Waste Management Act 1996, the Planning Act 2000 and the Planning and Development Regulations 2001.

1.15 LEVELS.

- 1.15.1 All levels shown on drawings refer to Ordnance Datum unless otherwise stated. Sections will be found sufficiently accurate for constructional purposes. Where flood levels, lake levels, stream and culvert levels are shown, these are based on the best available information. The Contractor must verify such levels for himself before using them.

1.16 INSURANCE.

- 1.16.1 All appropriate Insurance shall be taken out by the Contractor before construction shall commence.

1.17 FAILURE OF CONTRACTOR TO CARRY OUT WORKS.

- 1.17.1 In the event of the Contractor failing to carry out the works in accordance with the contract documents, the employer may have the work done, and deduct the cost of so doing from any payment due to the Contractor under contract, provided three weeks notice in writing has been given by the employer. Such action by the employer shall not invalidate the Contract.

1.18 INSPECTION OF SITES.

- 1.18.1 The Contractor shall visit the sites of the proposed works and note their description and relative locations. He should acquaint himself with
- (a) generally with the layout of the proposed scheme and particularly any features of irregularities of surface which could not be shown or delineated on plans;
 - (b) of the exact position of all existing services (watermains, sewers, cables, etc.) and structures likely to be encountered in the course of the work.
- 1.18.2 He should in addition carry out tests on the sites as will enable him to assess the works involved in the Contract. Extra payment will not be allowed for any difficulties due to site conditions encountered in the construction of the scheme in accordance with the plans.

1.19 CONTRACTOR'S RESPONSIBILITY FOR CARRYING OUT THEIR RESPECTIVE CONTRACT'S.

- 1.19.1 The Contractor shall be and shall continue to be until the works are handed over to the employer, solely and absolutely responsible for the carrying out of the works, or any part thereof, or for injury or damage to any person or property of any description whatever which may be caused by, or result from the execution of the works, whether the works have been carried out skilfully and carefully to this specification or not.

1.20 STANDARD SPECIFICATION.

- 1.20.1 Nothing stated in this Specification is to be construed as discriminating against products and materials manufactured in any of the Member States of the European Union.
- 1.20.2 Where reference is made to a standard specification prepared by the National Standards Authority of Ireland (N.S.A.I.) or the British Standards Institution (B.S.I.) the reference shall be deemed to apply to the issue of the specification with amendments, if any, current at the date of invitation to tender for the works.
- 1.20.3 Where items to an Irish Standard Specification, (IS) a British Standard Specification, (BS) or any other standard specification of a Member State of the European Community are called for, this requirement shall be read as including items to a relevant international standard, or the relevant national standard of any Member State of the European Community, which provides an equivalent guarantee of safety and suitability.
- 1.20.4 Where items certified by the National Standards Authority of Ireland as complying with an Irish Standard are called for, the requirement shall be read as either certified by the National Standards Authority of Ireland as complying with the Irish Standard, or shall be certified as complying with a relevant international standard, or with the relevant national standard of another Member State of the European Community, which provides an equivalent guarantee of safety and suitability.
- 1.20.5 Where certified products are called for they shall carry the mark of the certifying body.

1.21 COMPLETION.

- 1.21.1 The whole of the works and any further works reasonably necessary for the proper completion and operation of the water supply scheme shall be executed to the satisfaction of the employer.
- 1.21.2 Field, road and other surfaces shall be restored and any deficiency in surfacing material shall be made good by the Contractor unless otherwise provided for in the contract.
- 1.21.3 The sites shall be left clean and tidy and all surplus material shall be levelled off or removed as the employer may direct. All damage of any kind whatsoever shall be made good. The works shall be deemed to be handed over on the date on which the employer or the Employers Representative certifies that the works are complete to their satisfaction.

1.22 QUALITY OF MATERIALS AND WORKMANSHIP.

- 1.22.1 The Contractor shall provide all materials required together with labour, plant and machinery, for the complete performance of the contract. The whole of the materials and workmanship shall be of the best quality and description of their respective kinds and shall in all cases be to the approval of the employer or the Employers Representative, whose decision as to the quality and suitability of materials and workmanship shall be final and binding.

1.23 MAINTENANCE OF EXISTING SERVICES DURING CONSTRUCTION.

- 1.23.1 The Contractor shall maintain all existing services during the construction and take every precaution to ensure that the minimum of inconvenience is caused to the Public by the construction of the works.

1.24 SETTING OUT.

- 1.24.1 The Contractor shall set out the works and during progress of works, shall amend at his own expense any errors from an inaccurate setting out. The Contractor shall provide all labour, materials, for testing and measuring of works and afford at his expense all means of access to inspect any parts of the works.

1.25 DELIVERY OF MATERIALS.

- 1.25.1 The Contractor shall ensure that all materials are deposited on the site when and where required and he shall take responsibility for their protection.

1.26 PROTECTION OF WORKS.

- 1.26.1 The works shall be carried out with the safety of the public in mind at all times and in such a manner as to cause minimum disruption to residents and road users.
- 1.26.2 The Contractor shall fence, light, provide warning notices and otherwise protect the works, trenches, and all heaps of excavated materials. He shall be responsible for accidents or damage arising from his failure to do so and for any inconvenience caused to the Public or to property users or owners.

1.27 PROPERTY CONNECTIONS TO WATERMAIN.

- 1.27.1 The Contractor shall write to the group scheme informing them that his tender has been accepted for the works once he receives the Letter of Acceptance. He shall request that the group scheme inform their members those property owners whose existing service pipe does not extend to the edge of their property

adjacent to the public road, must provide a service pipe up to this location for the contractor to connect the new service pipe from the new boundary box into.

- 1.27.2 The Contractor shall notify the group scheme of his expected start date on site as soon as this becomes apparent. The Contractor shall notify all property owners in writing (either by letter or leaflet drop) of the upcoming works and what he will be providing in relation to the connection to the new watermain and what the individual property owner must provide.
- 1.27.3 The Contractor shall liaise with all property owners regarding their preferred position for the installation of the boundary box. The contractor shall maintain the existing watermains until all connections are completed to the new watermain. The Contractor shall be responsible for ensuring that property owners have a service pipe extended to edge of their property for connection to the new watermain.

SECTION 2 – EXCAVATION, LAYING WATERMAINS AND BACKFILLING

2.1 CLASSIFICATION.

2.1.1 Excavation shall be classified as:-

- (1) Excavation in any material except solid rock
- (2) Excavation in solid rock

Excavation in solid rock shall be as defined in Clause 2.4.1

2.2 EXCAVATION FOR WATERMAINS.

2.2.1 All watermain trenches shall be excavated using excavators (except where hand excavation is necessary). **The use of trenchers and directional drilling is prohibited.** All edges of the excavated areas shall be saw cut prior to excavation.

2.2.2 Trenches shall not be opened in excess of 100 metres ahead of pipe lying. The minimum width of trench shall generally be 450mm to allow adequate room for jointing the pipes, placing and compacting of the backfill. Where two pipes are laid in the same trench the maximum width of trench shall be 450mm greater than the combined external diameters of pipes to allow 150mm for compaction between the pipes.

2.2.3 Mains shall be laid with cover, measured vertically from the top of the pipe to the surface of the ground of not less than 900mm. Mains which could be located under the road in future improvement schemes shall be laid so that the eventual cover shall not be less than 900mm. In all cases allowance shall be made for laying the pipes on a prepared under bed of a fine grained material - (maximum particle size of 10mm). The prepared under bed, when lightly compacted, shall not be less than 50mm or a quarter of the pipe diameter, whichever is the greater. In all cases the under bed shall provide uniform support to the pipe for its full length. The pipe bedding depth shall be increased by 100mm in areas where there is rock or mixed soils containing boulders or hard spots.

2.3 EXCAVATION FOR FOUNDATIONS AND TRENCHES.

2.3.1 The sides of all excavations shall be adequately supported at all times to safeguard men working within, to avoid sideslips and to prevent subsidence which could cause potential damage to adjacent property. The bottom of all excavations shall be carefully levelled and accurately shaped to receive the structure to be placed upon them and all concrete shall be laid on an even and solid foundation.

2.3.2 Battering of excavations to a safe angle of repose will only be permitted where no danger to work people, the public or property is foreseen.

2.4 ROCK EXCAVATION.

- 2.4.1 Rock excavation shall be carried out as far as possible by rock breaking machinery or hand breaking all in accordance with the restrictions set out in the above Clauses.
- 2.4.2 The term “rock” is to be understood to mean solid rock in mass formation including boulders in excess of one half of one cubic metre in volume with hardness of three or more on Mohs’ scale of hardness.
- 2.4.2 Blasting may only be carried out with the written approval of the Employers Representative. In addition the Gardaí regulations governing the purchase, transport, storage and use of explosives shall be fully complied with and provided for in the rates.
- 2.4.3 Prior to commencement of blasting, trial blasts shall be carried out to determine the optimum hole pattern and charge size. The final procedure shall be subject to the approval of the Employer.

2.5 EXCAVATION IN FAULTY GROUND.

- 2.5.1 All soft places, faults, etc. in the bottom of the trench shall be excavated to such a depth as may be directed and void(s) filled to within 75mm of the required level with concrete composed of 20 parts of gravel to one part of the cement on which shall be placed in position a layer of 75mm of sand well rammed.

2.6 EXCAVATION BELOW LINE SHOWN.

- 2.6.1 Any excavation carried out inadvertently by the Contractor below the required depth for the structure shall be filled and compacted with approved material up to the required level, at the Contractor’s expense.

2.7 PROTECT ADJACENT PAVED SURFACES.

- 2.7.1 The Contractor shall carry out excavation, disposal of spoil and construction of the works in such a manner that adjacent paved and trafficked surfaces are not unduly damaged and, unless specified elsewhere, any damage caused to such surfaces outside the pavement widths for surface restoration shall be made good at the Contractors own expense.
- 2.7.2 Any spillage of materials or deposition of mud and clay on roads shall be cleaned up immediately.
- 2.7.2 All paving flags, kerbs etc., likely to be damaged during the construction of the works shall be carefully removed and replaced at a later date.

2.8 PROTECT LAWNS AND GARDENS.

- 2.8.1 Where excavation is carried out in private lawns or gardens, the turf shall be cut in squares and carefully removed for re-use during reinstatement.
- 2.8.2 The Contractor shall not without the Employers Representative permission, cut or break down any live fence or trees in the line of the proposed works, but shall tunnel under them. Lawns and gardens on which excavated material is placed or walls which support it must be protected by planks or canvas.

2.9 PROTECT FIELDS AND OPEN AREAS.

- 2.9.1 The Contractor shall carefully strip the topsoil over those areas likely to be disturbed during construction and save for re-use during reinstatement. The work shall be done in such a manner that the area to be stripped at any one time is kept to a minimum and all disturbed areas shall be fully reinstated when that section of the works is completed.

2.10 TREE FELLING.

- 2.10.1 The line of the watermain should be selected to avoid as far as possible all growing timber. Where, however, trees must be felled, work shall be carried out with the utmost care and with the permission of relevant authorities. The contractor shall be held responsible for any damage to other trees or any other structure during the felling. All roots shall be grubbed up and the site left clean.

2.11 TEMPORARY REMOVAL OF EXCAVATED MATERIAL.

- 2.11.1 If all or any excavated material cannot be stored on the site in such a manner as to maintain adequate traffic flow it shall be removed from the works and temporarily stored. After the construction of the works as much of this material as is of satisfactory quality and necessary for the purpose shall be brought back and used for backfilling the excavation.

2.12 PROTECT EXISTING BUILDINGS AND SERVICES.

- 2.12.1 The Contractor shall make all necessary provision for shoring, strutting, underpinning or supporting any walls, foundations or other built structures, the stability of which may possibly be endangered by the execution of the works. All existing services encountered in the course of the work shall be protected as directed by the person, company or authority in which they are vested.

2.13 TIMBERING EXCAVATIONS.

- 2.13.1 The Contractor shall furnish, put in place and maintain such sheeting, bracing etc., as may be required to support the sides and roof of the excavation and to prevent any movement which can in any way injure the masonry, concrete or pipeline, diminish the necessary width of excavation, or otherwise injure or delay the work or endanger adjacent pavements, buildings or other structures. If the Employers Representative is of the opinion that at any points sufficient or proper supports have not been provided, he may order additional supports put in at the expense of the Contractor and the compliance with such orders shall not release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside the sheeting, but if voids are formed they shall be immediately filled and consolidated to the satisfaction of the Employers Representative.
- 2.13.2 The right of the Employers Representative to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders and the non-exercise of this function shall not relieve the Contractor from liability for damages to persons or property, occurring from or upon the work, occasioned by negligence or otherwise, growing out of the failure on the part of the Contractor to leave in place in the excavations and trench sufficient sheeting and bracing to prevent any caving or moving of the ground adjacent to the banks of the excavations and trench.

2.14 PUMPING AND BALING.

- 2.14.1 Where required for the protection of formations, road sub-grade or the sub-soils beneath the foundations and pipelines the Contractor shall remove by pumping, baling or otherwise any water which may accumulate or be found in the excavations and trenches and other openings made under this contract and shall form all dams, flumes or other works necessary to keep them entirely clear of water while

pipelines are being laid and backfilled and foundations, structures and roads are being constructed. The Contractor shall have at all times upon the works sufficient pumping machinery ready for immediate use.

- 2.14.2 Water from the trenches and excavations shall be disposed of in such a manner as to avoid damage to roads, public or private property, silting of drains or blocking water courses, the work completed or in progress and it shall not cause unnecessary interference with the use of the road works or access ways by the public or become a public health hazard.

2.15 REMOVAL OF OFFENSIVE MATTER.

- 2.15.1 All filth or other offensive matter met with during the excavation of the works shall be immediately moved to a suitable dump and shall not be deposited upon the surface of any street, or any place near a dwelling house or where it is likely to be a nuisance.

2.16 LAY TEMPORARY DRAIN.

- 2.16.1 Whenever so directed by the Employers Representative, the Contractor shall excavate a trench or lay a temporary pipeline from the excavations to a natural water course.

2.17 PIPE LAYING AND JOINTING.

- 2.17.1 *GENERAL:* All pipes shall be laid to the lines and levels shown on the drawings or to such other alignments and gradients as may be directed by the Employers Representative. All watermains shall be completed with air valves, scour valves, sluice valves, hydrants and other specials as shown on the drawings or detailed elsewhere in the specification. All watermains shall as far as possible be laid in the road margins and clear of the road surface. Each pipe shall slope upwards in the direction of the air valve serving the section of line in which it is laid. Mains shall be laid with cover, measured vertically from the top of the pipe to the surface of the ground of not less than 900mm. Mains which could be located under the road in future improvement schemes shall be laid so that the eventual cover shall not be less than one metre. All pipes and specials shall be inspected before laying and defective ones removed from site.

2.18 PIPE BEDDING.

- 2.18.1 The pipes shall be laid on a prepared under bed of imported granular material finished 150mm above the pipe invert and the pipes shall be worked into their true line so that they are firmly bedded over their length. For uPVC or Polyethylene pipes the imported granular material shall be 10mm single sized pea-gravel.
- 2.18.2 Alternatively, if permitted in writing by the Employers Representative, the imported granular bed may be a natural pit or river sand passing a 5mm B.S. sieve and thoroughly washed in a mechanical washing plant. Similarly, if permitted in writing by the Employers Representative, selected fine material from the excavation may be used. For uPVC or Polyethylene pipes the selected fine material shall not exceed 10mm in size.
- 2.18.3 The use of imported sand or selected fine excavated material will not be permitted where scouring of the pipe bed may occur.

2.19 PIPE JOINTS.

- 2.19.1 Fusion welded joints, site fusion jointing shall be strictly in accordance with UK 3.10.4WIS 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 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.

- 2.19.2 Unplasticised P.V.C. pipes shall be jointed strictly in accordance with "The Recommendations for Handling and Installation of Unplasticised P.V.C. Pipe" published by the IIRS.
- 2.19.3 Unless otherwise particularly specified or directed spun iron pipes shall be jointed using an approved "push-in" type joint to the manufacturer's instructions.
- 2.19.4 Joints in steel pipes shall be made with Johnson Couplings assembled in strict accordance with the manufacturer's instructions unless otherwise specified or directed.
- 2.19.5 No joint shall be laid with an angle of deflection greater than the maximum recommended by the Pipe Manufacturer.
- 2.19.6 *Cleaning:* Prior to jointing the internal bore of the pipes shall be cleaned of all foreign matter and after laying the open end of the pipeline shall be effectively sealed to prevent incursion of foreign matter.

2.20 AIR VALVES.

- 2.20.1 Double air valves shall be used and these shall be fitted to watermains at all high points where air is likely to accumulate. These valves may be of the flange type with isolating plug cock. and fitted by means of a C.I. tee with a tapped flange.
- 2.20.2 To facilitate the filling and emptying of watermains suitable located double air valves shall be fitted. All air valves shall be suitable for working pressures up to 12.2kg/cm² (175 p.s.i.)

2.21 SCOUR VALVES.

- 2.21.1 Scour valves shall be fitted at convenient locations so that watermains can be adequately scoured into a nearby stream or watercourse. Sluice valves used for scouring purposes shall be fitted on a Tee-branch as near as possible to the main. A 75mm diameter scour shall be used on all watermains from 100mm diameter to 300mm diameter. A 50mm scour shall be used on watermains under 100mm diameter.

2.22 EXTREME WEATHER CONDITIONS.

- 2.22.1 Pipe laying shall not be carried out when the temperature is below 0°C. Particular care shall be exercised when laying pipes at extreme temperatures.

2.23 RIVER, STREAM AND FIELD DRAIN CROSSINGS.

- 2.23.1 Mains and services laid under rivers or streams shall be constructed in Class K9 ductile iron pipe work to BSEN545 and shall be bedded and surrounded by 150mm of concrete for a length extending 1.5m beyond either side of the river or stream (as measured at ground level). Adequate cover, in no case less than 500mm, shall be provided between the top of the concrete surround and the bed of the stream. Mains or services laid under field drains shall be inserted in concrete pipes. Damaged field drains shall be made good.

2.24 BRIDGE AND CULVERT CROSSINGS.

- 2.24.1 Where a pipeline has to be laid across a bridge or culvert, the pipeline must be laid in the road or margin provided that the depth between the road surface and the keystones of the arch is sufficient to give a minimum cover of 300mm on the pipeline. In all such cases, the pipeline should be wrapped in insulation and encased in a 150mm surround of concrete for the entire length of the bridge or culvert, and same brought up to surface level along parapet, arises chamfered.
- 2.24.2 Where the above cover is not possible the pipeline shall be laid on suitable bearers secured to the outside face of the parapet wall. The pipeline in these circumstances shall be encased in fibreglass or other insulating material protected by tar-reinforced paper or sheet polythene surrounded in net wire and clipped finally by metal straps to the bearers. Care shall be taken that heavy components such as valves are fully supported so that no torque or weight is transmitted to the pipeline. Final installation details to be agreed with the local Roads Area Engineer.

2.25 RAILWAY CROSSINGS.

- 2.25.1 Railway crossings shall be carried out in accordance with Iarnród Éireann regulations and requirements.

2.26 MARKER POSTS.

- 2.26.1 The location of the hydrants, air valves and sluice valves etc shall be shown by indicator plates and marker posts positioned to the approval of the engineer.

Marker posts shall be reinforced concrete manufactured in accordance with I.S. 162/1968 or to Local Authority requirements. They shall be set in concrete and shall project at least 700mm over ground level.

Hydrant plates should comply with the requirements of BS 3251. They should show the diameter of the watermain in millimetres on the upper part of the plate and the distance of the marker from the hydrant on the lower part of the plate. All characters should be black and the remainder of the front face should conform to colour reference No.309 (canary yellow) of BS 381C.

Sluice valve and air valve plates should be in cast iron, measuring 200mm x 200mm. They should have the letters SV or AV as appropriate, cast in relief. The plates should have a background in black bitumastic paint, with the letters in white enamel.

Indicator plates may be fixed to solid boundary walls. Where marker posts are used they should be constructed as per standard details.

Lettering Detail : DAV – Double Air Valve, S.V. – Sluice Valve, Sc.V. – Scour Valve, W.M. – Water Meter, B.W.M- Bulk Water Meter, P.R.V – Pressure Reducing Valve, NRV – Non Return Valve

2.27 SERVICE CONNECTIONS.

- 2.27.1 All service connections shall conform to Local Authority and Irish Water requirements. Service Connection pipes suitable for Works shall be of **MDPE** or **HDPE** (PE-80) material with SDR-11 or SDR-17 rating. All plastic water Service Connection pipes shall be blue in colour. (**HPPE** (PE-100) material with SDR-11 and SDR-17 rating may also be used though this pipe is less flexible.) An alternative pipe material, subject to approval, shall be provided where pressure in the Works is greater than the performance rating of these materials. The **MDPE**, **HDPE** and **HPPE** service pipes shall comply with IS EN 12201 Part 2 (Plastic Systems for Water Supply, Drainage and Sewerage Under Pressure – Part 2, Pipes) and IS EN 12201 Part 3 (Plastic Systems for Water Supply, Drainage and Sewerage Under Pressure – Part 3: Fittings) and with UK WIS 4-32-08 (Specification for the fusion jointing of polyethylene pressure pipeline systems using PE80 and PE100 materials).

All mains tapings shall be heavy gauge using approved types of saddles and ferrules. Minimum cover to service pipes shall be 600mm. A boundary box as specified in Clause 3.12 and on the drawings shall be fitted on all property connections.

- 2.27.2 Where the watermain is located on the public road, the boundary box shall be fitted on the margin or footpath at the curtilage of the premises to be serviced. Where the watermain is located on private property the boundary box shall be located in a visible and accessible location as near as possible to the watermain but not in the line of vehicle wheel tracks. Service pipes to fields shall have cover as specified above and shall be connected to approved drinking troughs with totally enclosed ball valves.
- 2.27.3 Each house shall have a separate tapping to the watermain and the service pipe shall be connected to a kitchen sink. Service pipe and house plumbing shall be in accordance with outline specification for the erection of a new house (obtainable from Government Publications, Sun Alliance House, Molesworth Street, Dublin).

2.28 CUTTING PIPE.

- 2.28.1 Where it may be necessary to cut any lined or unlined pipe either as a closing length or to bring any special or valve into its required position the cutting shall be done in such a manner as to make a clean even cut at right angles to the axis of the pipe. Care shall be taken in lined pipes that the lining is not damaged in any way by such operation and any such damage shall be made good by the Contractor at his own expense.

2.29 PIPE SUPPORT IN BAD GROUND.

- 2.29.1 Where pipes are to be laid in bad ground, approved type joints shall be used and the pipes supported in such manner as may be particularly specified or directed.

2.30 PIPE SURROUND.

- 2.30.1 Unless particularly specified or otherwise directed the pipes shall be surrounded to a depth of 150mm over the top of the pipe barrel with material to the same standard as that specified for the pipe bedding, the surround being carefully compacted around and over the main. The surround shall be placed and compacted carefully to avoid displacing or damaging the completed pipeline.

2.31 ANCHORAGE OF PIPES AND FITTINGS.

- 2.31.1 All flexibly jointed mains will require anchorage at points where there is a change of direction, a cap end, tee connection or gradient exceeding 1 in 6. The anchorage shall be constructed in Grade 25 concrete and shall extend to undisturbed ground. No flexible joint or part of a flexible joint shall be encased in an anchor block.

2.32 BACKFILLING (IN NORMAL GROUND).

- 2.32.1 Unless otherwise directed all excavations shall be backfilled as soon as the structures therein have acquired adequate strength or pipelines have been laid and tested. Once started, backfilling shall be carried out expeditiously.
- 2.32.2 Excavations in roads or trafficked areas shall be backfilled with approved graded granular material.
- 2.32.3 **Imported graded granular material shall be to Clause 804 of the Specification for Road Works issued by the National Roads Authority. It shall be laid and mechanically compacted in 150mm thick layers without drying out or segregation to the requirements of Clause 802 of the NRA Specification for Roadworks.**
- 2.32.4 Where excavated material is used for backfilling, it shall be laid and mechanically compacted in layers not exceeding 200mm thick with a minimum of drying out or segregation.
- 2.32.5 In fields, mechanical compaction shall be 6 passes of a vibrating plate compactor which shall provide a static pressure under the base plate of 0.02N/mm². In roads, mechanical compaction shall be 10 passes of a vibrating plate compactor which provides a static pressure under the base plate of 0.02 N/mm².
- 2.32.6 If the Contractor allows material which, on excavation, is suitable for re-use to become unsuitable for backfilling, he shall transport it off site and replace it with other suitable material at his own expense.

2.33 BACKFILLING (IN ROCK).

- 2.33.1 Backfilling of trench with rock is not permitted.

2.34 DEFICIENCY OF MATERIAL FOR FILL.

- 2.34.1 Should there be a deficiency of suitable material for backfilling, the Contractor shall supply and place such additional materials as may be required.

2.35 DISPOSAL OF SURPLUS.

- 2.35.1 As each excavation and trench is refilled the surplus excavated materials shall be at once removed, the surface having been properly restored to its original level.

2.36 USE OF MATERIALS EXCAVATED FROM PUBLIC PROPERTY.

- 2.36.1 The earth, stone, gravel, clay, turf, sand, timber and all other materials excavated from the works on public property shall not become the property of the Contractor, but the Employers Representative will allow the Contractor to use the same for the purpose of this contract, provided no detriment to the works is occasioned thereby, and that such portions of the said materials are suitable and in accordance with the terms of the specification.

2.37 MATERIAL EXCAVATED FROM PRIVATE PROPERTY.

- 2.37.1 Surplus sand, gravel, or other materials taken from any excavations on private property shall belong to the owner of the property, and must be dealt with as the owner requires, but if such owner does not require the materials then the Contractor shall remove and dispose of it as described in Clause 2.35.

SECTION 3 – MATERIALS.

3.1 BRICKWORK/BLOCKWORK.

3.1.1 Materials shall comply with the following standards:-

Solid Concrete Blocks - I.S. 20
Hollow Concrete Blocks - I.S. 40
Concrete Bricks - B.S. 1180
Clay Bricks - I.S. 91
Calcium Silicate Bricks - I.S. 190
Sand - B.S. 1199 & 1200
Lime - I.S. 8
Wall Ties - B.S. 1243
Damp-proof Courses - B.S. 743
Aluminium DPC's - B.S. 1470

3.1.2 Blocks described as “fairfaced” shall be selected ordinary blocks with a smooth even face and sound and sharp arises one or both sides as required. The compressive strength of masonry units shall be not less than 7N/mm².
The Contractor shall submit samples of materials he intends to use for the approval of the Employers Representative.

3.1.3 (a) Cement mortar shall be 3:1 sand: cement
(b) Gauged mortar shall be 3:1 sand: hydrated lime gauged 6:1 sand/lime: cement before use.
(c) All mortar used for below ground structures shall be 1: ¼: 3 cement: lime; sand.

3.1.4 Bricks and blocks shall be stacked on a level site out of contact with the ground and shall be protected against the weather.

3.1.5 Brickwork / blockwork shall be carried up evenly, no part being raised more than 1m above any other part. Any wall left on different levels shall be raked back. All completed work shall be protected against the weather. Joints shall not exceed 8mm for brickwork or 12mm for blockwork.

3.2 MATERIAL FOR MORTARS.

3.2.1 The cement used shall be in accordance with I.S. 1:1963 “Portland Cement” or BS12.

3.2.2 Limes used in mortars shall be non-hydraulic (calcium) limes or semi-hydraulic (calcium) and magnesium limes to conform to the requirements of B.S. 890.

3.2.3 The sand shall be free from deleterious materials and substances and shall comply with the requirement for quality and grading of sand for mortar given in B.S. 1199 and B.S.

3.2.4 Water shall be potable and free from impurities harmful to the mortar. Where the quality of supply is doubtful it shall be tested in accordance with B.S. 3148.

3.2.5 Plasticizers should comply with the requirements of B.S. 4887 and should be used only with the WRITTEN permission of the Employers Representative. The Contractor shall provide the Employers Representative with the appropriate manufacturer's recommendations and then submit:-

- (i) evidence of satisfactory performance of the admixture when correctly used;
- (ii) details of his arrangements for the use of the admixtures;
- (iii) an undertaking to conform to the manufacturer's specification.

3.3 CONCRETE STRUCTURES.

3.3.1 STANDARD SPECIFICATIONS CONCRETE.

Embodied in this specification are the following specifications:-

I.S. 1 :	1987	Portland Cement (amended 1971)
I.S. 5 :	1974	Aggregates for Concrete
I.S. 20(Part I) :	1987	Concrete Building Blocks
I.S. 162 :	1968	Concrete Marking Posts
B.S.4449 (1988) & B.S. 4482(1985)		Rolled Steel Bars
B.S.4483 (1985)		Steel Fabric
B.S.4482 (1985)		Mild Steel Wire

3.3.2 CONCRETE.

- 3.3.3 Concrete used in Concrete Structures for this scheme shall comply with the concrete grade parameters in the following table:-

CONCRETE GRADE	C35	C20
Characteristic 28-day cube strength (N/mm ²)	35	20
Maximum Aggregate Size (mm)	20	20
Minimum Cement Content (Kg/m ³)	370	300
Slump (mm)	50-100	30-70
Maximum Water/Cement Ratio:	0.50	0.55

Grade C 35 concrete shall be used in the following structures:-
Dams, Intake Chambers, Sumps, Reservoirs and roofs.

Grade C 20 concrete shall be used in the construction of the following:-
Pump houses, Valve Chambers, Culverts, Bridge Crossings and Anchor Blocks.

Where ready-mix concrete is used, it shall be in accordance with the above specification and a certificate to that effect shall be provided by the supplier.

3.3.4 PLACING OF CONCRETE.

- 3.3.5 All concrete shall be placed in accordance with Standard Codes of Practice. During inclement or frosty weather, all concreting work shall be suspended. Concrete damaged by frost or otherwise defective shall be out and replaced with good concrete. All exposed concrete surfaces shall be kept moist for at least 14 days after placing.

3.4 CEMENT MORTARS

Cement mortars shall be mixed in one of the following proportions:-

Class	Mix	Cement Cleaned dry washed sand	
A	1 : 1	50 Kilo bag	50 Kilo (.98 Cwt.)
B	1 : 2	50 Kilo bag	100 Kilo (1.97 Cwt.)
C	1 : 3	50 Kilo bag	150 Kilo (2.95 Cwt.)

- 3.4.1 Cement mortars shall be mixed, as and when required and only in small quantities. Any mortars which has become too set or which has been mixed for a period of more than one hour shall be rejected. Class A mortar shall be used for jointing stone-ware or precast concrete pipes and forming inverts, Channels and Junctions. Class B mortar shall be used for bedding bricks and blocks and for the finishing plaster cast. Class C mortar shall be used in the under-coat for plastering.

3.5 STRUCTURES.

- 3.5.1 Pump houses, reservoirs, break pressure tanks, intake chambers, treatment works shall be constructed in accordance with plans and specifications approved by the Employer.

3.6 BLOCK WALLS.

- 3.6.1 Walls of concrete blocks shall be built on foundations as specified and shown on detailed plans. They shall be built on horizontal even and uniform courses with regular joints not exceeding 8mm. Intersecting walls shall be properly bonded with each other, all courses particularly at quoins and intersections being properly levelled and plumbed.

3.6.2 Precast Concrete Lintels.

Precast Concrete Lintels shall be factory made with steel bar hooked reinforcement to B.S. 4449. Crushing Strength of Concrete shall be 30 N/sq. mm at 28 days. Lintels shall be marked "Top" on uppermost face.

3.6.3 Prestressed Precast Concrete Lintels.

Design shall be in accordance with B.S. 5977: Part 1 and they shall be supplied by an approved specialist manufacturer to suit the spans and loadings which apply.

3.6.4 Steel Lintels.

Design shall be in accordance with B.S. 5977: Part 1 and lintels shall be in galvanised pressed steel. Lintels shall be provided with plaster key and shall be designed to eliminate cold - bridging.

Where indicated on the Drawings Austenitic Stainless Steel Type 304 or 316 lintels shall be used. Such lintels shall comply with the requirements of B.S. 5977: Part 2.

3.6.5 Wall Ties

Wall Ties shall be of Stainless Steel type 316 manufacture and shall be vertical twist type to comply with B.S. 1243. Stainless steel shall meet the requirements of B.S. 1534. Width of ties shall not be less than 20mm and thickness shall not be less than 3mm nor greater than 5mm. Minimum embedment of each end of the tie in the mortar joint shall be at least 50mm with a slight fall on the tie from inner to outer face.

In general spacing of ties shall be at 450mm vertically and horizontally giving an equivalent number of ties per square metre of 5.0. Additional ties shall be provided within 225mm of all openings so that there is one for each 300mm height of opening. In general spacing of ties shall comply with the following table:

Minimum thickness either skin in mm	Type of Tie	Cavity Width	Ties	Spacing of Ties	
		mm	Per sq m	Horiz mm	Vert mm
65 to 90	All	50 to 75	5	450	450
90 or more	All	50 to 75	2.5	900	450
90 or more	Vert twist	75 to 100	3	750	450
90 or more	Vert Twist	100 to 150	5	450	4500

Damp Proof

Sheet damp proof courses shall be bitumen Courses: hession based to comply with B.S. 743 and shall weigh not less than 4.46 Kg per square metre.

Sample Panel

The Contractor shall construct on a suitably levelled concrete base sample panels 1500mm x 1500mm to demonstrate the specified facings, bond, colour, quality and pointing of mortar. After approval he shall maintain and protect the panel until masonry work is completed.

Mortar Mix Proportions

Mortars that comply with the table below shall be used for the different grades and types of masonry. Proportions of the various constituents shall be adjusted within the permitted limits to suit the sand and weather conditions. Mixes are designated in nominal volume proportions of cement and dry hydrated lime to dry sand. Sulphate resisting cement shall be used for below ground conditions.

Type	General Brickwork	Blockwork	Below Ground
Cement : Lime : Sand	1:1:5 or 6	1:1:5 or 6	1:1/4 :3

Laying of Blocks

Blocks shall be laid in true and regular courses on a full smooth and levelled bed of mortar all joints frogs and other recesses shall be filled solid. Joints shall be pressed back with a trowel and struck off flush. Mortar shall be kept off the face of the work.

Joints shall be kept to an average consistent thickness of 10mm. Where approved the specified joint thickness may be evenly modified to suit adjacent work. Overall panel sizes shall be checked before commencing work to establish correct joint thickness.

Bonding shall be in stretcher bond and irregular or broken bond shall be avoided. Perpend and quoins shall be kept plumb. Walls shall rise evenly (both skins together in cavity work). No part of the wall shall rise more than 1.2 metres above any other part and all variations in level shall be evenly stepped.

Walls shall not be constructed at such a pace that lower courses are disturbed. Maximum rate of laying to be 1.5 metres height per day. Large unsupported areas of wall shall be temporarily braced if disturbance by wind or other influence could occur.

Mix Masonry Units

Blocks from different consignments shall be mixed to avoid a patchy appearance.

Cavity to be Kept Clean

Efficient means shall be provided to exclude mortar or debris from the cavity between leaves by the use of laths, draw holes, thick rope etc. Any ledges which could permit mortar accumulation shall be eliminated and the Contractor shall ensure that any accidental dropping of mortar onto cavity trays or wall ties is prevented.

Cavity Insulation

Cavity insulation board shall be fixed in accordance with the manufacturers instructions and shall also comply with the following requirements:

- a) Insulation shall conform to Part C of the Building Regulations.
- b) Boards that are warped due to incorrect storage shall not be used.
- c) The insulated leaf shall be built above the other leaf to a sufficient height to support the board being secured to it.
- d) Unless otherwise detailed insulation shall commence below D.P.C. to overlap any ground slab insulation by at least 150mm.
- e) Insulation shall not be pushed into cavities.
- f) Wall face shall be completely cleaned of mortar and other projections and the insulation board fixed tightly to it by means of ties or other fixings as specified by the manufacturers.
- g) Boards shall be tightly butted with staggered vertical joints to ensure no gaps in insulation.
- h) The top of any insulation not extending to the top of wall shall be protected by a cavity tray if the residual cavity is less than 50mm.

- i) Board shall be carefully cut and fitted around any openings or interruptions of the cavity.
- j) Board shall be carefully cut and fitted around any projecting wall ties.

Coursing and Weep holes

The leaves of cavity walls shall be raised together and approximately equally so that the difference in height does not exceed the vertical spacing of consecutive rows of vertical twist pattern ties or 1500mm for all other ties. Perpend shall be left open to provide weep holes at approximately 900mm centres at the base of cavity walls and where the cavity is bridged. At least 2 weep holes shall be provided at cavity trays over openings.

Openings

All openings through cavity walls shall be sealed with masonry and damp proof material. Small ducts shall be lined with slates or tiles.

Cavities below Ground Level

Cavities below ground level shall be filled with mortar or concrete grade 20 with the top face sloping outwards.

Final Sealing of Cavity

Final Sealing of the cavity shall not be carried out until approved by the Engineer.

Double-Leaf Collar Jointed Walls

Where a wall is constructed of two separate leaves with a vertical collar joint not exceeding 25mm wide between them following conditions apply:

- a) Each leaf is to be at least 90mm thick.
- b) Flat metal wall ties of cross-sectional area 20mm x 3mm at centres not exceeding 450mm both vertically and horizontally or an equivalent mesh at the same vertical centres, are to be provided.
- c) The minimum embedment of the ties into each leaf is to be 50mm.
- d) The vertical collar joint between the two leaves is to be solidly filled with mortar as the work proceeds

Jointing and Pointing

Work shall be jointed as soon as the mortar has set sufficiently. The face of the joint shall be tooled and compacted to give the specified profile. Where walls require to be plastered and the surface of the masonry is too smooth to provide a key joints shall be raked out after the mortar has set to form a key for plaster. Work shall be pointed with a flush/flush rubbed /weathered/concave (bucket- handle) recessed (set back) joint.

Pointing to blockwork with a fairface shall be with a fair rounded recessed joint 5mm deep formed in the mortar as work proceeds when it has gone some way towards setting.

Cutting into Masonry

Cutting into any masonry shall be subject to the following conditions:

- a) Delay cutting until the mortar has hardened.
- b) Obtain approval to cut into load-bearing walls or walls of hollow units.
- c) Obtain approval to cut holes greater than 300mm square.
- d) Perform cuttings in a manner that involves minimal vibration to the wall.
- e) Do not chase any walls less than 75mm thick.
- f) In solid walls do not chase deeper than one sixth wall thickness when horizontal or one third when vertical.

Damp Proof Courses

Work to flexible D.P.C.'s shall be as follows:

- a) In cold weather warm rolls prior to unrolling to avoid cracking.
- b) Lay an even bed of mortar for D.P.C. and complete the bed to normal thickness and finish smooth.
- c) Ensure mortar is free from any aggregate that could puncture the D.P.C.
- d) In cavity walls provide a separate D.P.C. for each skin and ensure that the edges do not project into the cavity (i.e. thus forming a potential mortar trap). Support cavity trays wherever possible.
- e) At base of cavity walls slope D.P.C.'s towards outer skin and weep holes.
- f) Use unjointed lengths as much as possible. Lap at least 100mm at passings. Lap full width at angles.
- g) Over openings and under sills in cavity walls, and in all other vulnerable locations, use unjointed lengths or seal the lap.
- h) Form watertight joints with any adjacent damp proof membranes.

- i) Extend D.P.C.'s 150mm beyond lintels.
- j) Meter boxes or the like: extend D.P.C. 150 mm beyond and if cables penetrate the inner skin, take the D.P.C. behind and below the box.
- k) At jambs of openings in cavity walls provide D.P.C. in close contact with frames properly fixed to prevent sagging with a full lap to D.P.C. at head.
- l) At sills provide D.P.C. turned up at back and ends with front edge projecting 5mm.
- m) Ensure that D.P.C.'s are a minimum of 150mm above ground level, with particular reference to stepped work.
- n) Leave edges of D.P.C.'s projecting 5mm from face of external walls. Do not point in mortar.

Mastic Sealants

Mastic Sealants shall be applied as follows:

- a) Clean and prepare joint surfaces.
- b) Apply any specified primer and allow it to dry.
- c) Insert specified back-up material (normally plastic foam strips) to ensure sealant is forced against joint faces.
- d) Apply specified bond-breaker tape where adhesion is to be avoided.
- e) Use correct size nozzle on applicator.
- f) Use two-part sealants as soon as mixed and within setting period.
- g) Apply sealant steadily and firmly to ensure joint is filled.
- h) Neatly finish the sealant with wetted spatula or by other suitable method to form a convex face; feather-edged and concave seals shall be cut out and re- formed.

Weather Precautions

Precautions shall be taken to avoid any damage arising from inclement weather.
The following shall be particularly noted:

- a) Cold Weather: Do not lay wet blocks.
- b) High Winds:
Cease laying in exposed positions.
- c) Rain:
Cease laying in all except very light rain or showers.

d) Intermittent Freezing Conditions:

- (i) Cover sand with insulated water-proof covers clear of the heap.
- (ii) Cease Laying when the air temperature is at or below +3 degrees Celsius unless precautions are taken to ensure that mortar is +4 degrees Celsius when laid and the masonry is protected from freezing until the mortar has hardened.

e) Continuous Freezing Conditions:

Seek approval for continuation of work during a cold spell and take the following precautions:

- (i) Protect Mixing Plant
 - (ii) Heat aggregate and water (Max 60 degrees C)
 - (iii) Increase strength of mortar.
 - (iv) Provide insulated covers to the completed work.
 - (v) Totally enclose the mixing plant and masonry.
- f) The exposed tops of masonry shall be covered at all times when work is not proceeding with waterproof sheeting. Insulation shall be provided if necessary. The inner boards of any working platform not in use shall be turned up to prevent splashing of wall faces already built.

Mortar Testing

Six 100 mm cubes should be prepared on site for every 150 m² of wall, using any one designation of mortar, or for every storey of the building, whichever is the more frequent. Specimens should be stored and tested in accordance with BS 4551.

Half of the site samples should be tested at 7 days. The average strength should exceed two-thirds of the appropriate 28-day strength.

When the site samples are tested at the age of 28 days, the mortar will be deemed to pass if the average of the values obtained from three cubes exceeds the appropriate site values given in table 1, B.S.5628.

Structural Unit Testing

Six structural masonry units shall be selected at random from every 2000: blocks delivered to site, using any one compressive strength and for every storey of the building, whichever is the more frequent. The compressive strength of the sample units shall be obtained using the test methods given in B.S. 6073. The structural units will be deemed to pass if the average of the values for the compressive strength of unit obtained from the six samples exceed the appropriate value given in table 2 BS 5628.

3.7 PLASTERING/RENDERING

General

Internal and External Sand Cement Rendering shall comply with B.S. 5262.

Cement

Cement shall be ordinary Portland cement and shall comply with B.S. 12 and I.S.1. White and coloured cements shall comply with B.S. 12 and shall be obtained from an approved manufacturer.

Sand for Rendering

Sand for rendering shall comply with B.S. 1199 Table 1.

Stop Beads:

Stop beads, angles etc., to B.S. 6452 shall be constructed of galvanised steel. For external rendering, rendering in wet and high humidity areas use beads manufactured from authentic stainless steel grade 304 S 15 to BS 1149.

Rendering Mixes & Final Thickness

Unless otherwise shown, the rendering thickness shall be 19mm applied in two coats.

Apply 10mm thick cement: sand (1:3) undercoat Scratch a wave pattern of key grooves at 20mm spacing.
Apply 9mm thick cement: sand (1:4) final coat and finish with a wood float finish.

Surface Preparation

For dense concrete blockwork and concrete elements, clean off dust and loose particles. Apply a PVC emulsion bonding agent and spatter dash the surfaces to be rendered.

For lightweight aircrete concrete blockwork, clean off dust and loose particles. Apply a fine water spray to control initial suction and spatter dash the surfaces to be rendered.

Spatter dash

Spatter dash shall be used where required to provide a key. It shall consist of a wet mix of cement and coarse sand (1:1.5-3) forcibly thrown and left as thrown. Under dry conditions spray with water at intervals until fully hardened.

Rendering Generally

The Contractor shall ensure backgrounds are suitable and render as follows:

- a) Apply undercoat to a uniform thickness of not less than 8 mm and bring to a level surface with a straight edge.
- b) Before applying further rendering, brush down and lightly and evenly wet the undercoat.
- c) apply two undercoats (where required) as equal thicknesses.
- d) Scratch undercoats to form a mechanical key.
- e) Apply rendering in the shade as far as is practicable; or otherwise prevent from drying out too quickly.
- f) Allow drying shrinkage to finish before applying another coat.
- g) Apply finish coat to minimum thickness as indicated on the drawings.
- h) Plain finish coat shall be finished with a suitable trowel to provide the smoothest possible surface.

Fixing Metal Bead

Metal bead shall be securely fixed to surfaces in accordance with the instructions of Expamet Ltd or similar approval.

Sample Rendering

The Contractor shall provide a suitable background of not less than 2 sq. m. area and demonstrate the specified rendering. Once approved, he shall maintain and protect the panel as the standard of colour and finish required. He shall remove on completion if not a part of the permanent rendering.

Weather Protection

Rendering shall not commence or continue in frosty weather unless precautions are taken to keep the temperatures of the materials and of the structure above 3 degrees Celsius for an adequate period. Rendering shall be protected from the frost, extreme drying conditions and continued dampness.

3.8 FENCING

Sites of pump houses, treatment works, reservoirs, break pressure tanks, intake chambers and sources shall be properly fenced using concrete fence posts, chain link fencing and suitable entrance and piers.

Concrete fence posts shall be to I.S. 136/1982

Chain link fencing shall be to I.S. 130/1980

Fencing shall comply with the relevant provisions of:-

I.S. 126 - Galvanised Fencing Wire

I.S. 130 - Chain Link Fencing

I.S. 203 - The erection of Anti-Intruder Chain Link Fences

I.S. 136 - Concrete Fence Posts

I.S. 177 - Anti-Intruder concrete fence posts.

In other respects fencing shall comply with the relevant provisions of the appropriate Part of BS 1722.

Alignment

Fencing shall be to a flowing alignment in elevation following approximately the level of the ground. The Contractor shall trim the ground along the line of the fence as required. The fencing shall be neatly and effectively joined to existing hedges, fences and to other structures.

End and Straining Posts

Unclimbable end and straining posts shall be 175mm x 175mm at the base, 125mm x 125mm at the top of the vertical portion and tapering to 100mm x 100mm at the outer end of the curve. The posts shall be 3 metres long in vertical overall height, and shall be reinforced with 4 No. 12mm mild steel round bars - helically bound with approved binding wire.

A suitable indent shall be formed in the post on three faces to take the struts. The design of the indent shall be such that the tennon on the strut fits comfortably into it. End posts shall be provided with suitable double-way holes at right angles. Six holes in each direction at right angles for wires shall be placed in the posts at intervals of 300mm commencing 150mm above the ground level or 900mm from the bottom of the post. Provide straining posts at 50m centres maximum.

Strut

Struts for unclimbable fences shall be 2.40 metres long, 100mm x 100mm in section and reinforced with 4 No. 10mm bars, similarly bound. The struts shall be suitably holed to receive wires before specified for end posts. Earth plates against which struts abut shall be 375mm x 375mm thick suitably indented to receive the struts. The upper end of the strut shall be provided with a tennon to fit comfortably into the indent in the end post.

Intermediate Ports

Intermediate unclimbable posts shall be 150mm x 150mm at the base, 100mm x 100mm at the top of the vertical portion, and tapering to 75mm x 75mm at the outer end of the curve. The posts shall be 3 metres long in overall vertical height, and shall be reinforced with 4 No. 10mm bars bound as before described. Six holes shall be placed in the posts at intervals of 300mm commencing 150mm above ground level or 750mm from the bottom of the post.

Wires and Spacers

Line wires shall be No. 8 S.W.G. high tensile galvanised steel having an ultimate strength of 70 tons per square inch (*110 kfg/mm²). Spacers shall be galvanised 15 B.W.G. metal corrugated in section and attached to the wires with galvanised clips. Five lines of this wire shall be provided. Additional in the case of the unclimbable fence, four rows of two strand, 12 gauge, 4 point, 75mm thick set galvanised barbed wire shall be attached to the curved portions of the posts well tied and braced at third points with galvanised mild steel flats.

Chain link Mesh

Chain link mesh shall be woven from galvanised wire complying with I.S. 126. Unless otherwise stated the chain link mesh shall have a 50mm mesh size and be woven from 10 S.W.G. mild steel wire of good uniform quality and of circular cross section. The width of the roll of fencing shall be 2.0 m.

Fittings

The fittings for the fences shall be as shown on the drawings and comply with the following requirements. Where galvanising is specified, it shall comply with B.S. 729: "zinc coatings on iron and steel articles".

- a) Eye bolt strainers shall consist of bolts of 250mm overall length x 10mm diameter sufficiently threaded and fitted with a nut and washer. They shall be galvanised.
- b) Ring nut fittings for the threaded ends of eye bolts shall be galvanised.
- c) Winding bracket strainers shall be of suitable design, manufactured from mild steel flat not less than 40mm x 3mm and shall be fitted with a winder of 15mm minimum diameter, and with a ferrule or ratchet winder. Winding brackets shall be galvanised.

Erection of Post and Mesh Fencing

1. The concrete for construction of reinforced concrete posts shall be Grade 20 concrete, subject to a reduction of the maximum size of aggregate to 10mm and to the use of rapid hardening cement. The posts shall be cast in oiled timber or steel moulds and shall be cured for at least one month before placing in the fence.
2. Chain link mesh shall be secured to horizontal line wire with 14 S.W.G. mild steel wire galvanised to B.S. 443 at intervals of 150mm on the top wire and at intervals not greater than 450mm on two other wires, one of which shall occur at the bottom and the other approximately in the middle of the mesh.
3. Straining posts and struts and earth plates shall be set at the corners of the site as shown on the Drawings. Each straining post shall be set 750mm into the ground at intervals not exceeding 50 metres and surrounded with 0.5 cubic metres of Grade 20 concrete. Intermediate posts shall be set 600mm into the ground at intervals not exceeding 3.0 metres and surrounded with 0.25 cubic metres of Grade 20 concrete. Five lines of wire as specified shall be run at intervals of 300mm c/c measured from the top of the posts. They shall be attached to galvanised eye bolts in the straining post at one end, and to the galvanised ratchet winders in the straining post at the other end, and pulled taut. Three spacers or such other number as the Engineer considers necessary, shall be clipped to the wire in each bay between the posts. It will be regarded of the utmost importance that rigidity and good alignment is obtained throughout and the Contractor must satisfy the Engineer in this regard before payment is made.

3.9 PRESSURE MAINS

3.9.1 All pipes and fittings shall conform to the standards specified and shall be marked with manufacturers name or identification mark, date of manufacture, nominal size and class of pipe.

3.9.2 The following standards shall apply:-

Unplasticised PVC Pipe	I.S. 123:1964 & EN 1452:2000, (Parts 1 to 5).
Polyethylene Pipe	IS EN 12201
Spun Iron Pipe	I.S. 4622
Bolts and Nuts	I.S. 4190
Washers	I.S. 4320
Gaskets	I.S. 2494
Steel Pipes	I.S. 534

Cast Iron Fittings	I.S. 262
Sluice Valves	B.S. E.N. 1074-1:2000
Hydrants	B.S. E.N. 1074-1:2000
Stopcocks	B.S. 5433
High Density Polyethylene	
Service Pipe Type 50	I.S. 135
Copper & Copper Alloy	
Compression Tube	
Fittings	I.S. 239
Copper Service Pipe	B.S. 659
Marker Posts	I.S. 162
Air Valves	B.S. E.N. 1074-1:2000

3.9.3 uPVC Pipes

Unplasticised P.V.C. pipe for watermains shall comply with EN 1452:2000 and shall be certified by the Institute for Industrial Research and Standards under the Department of the Environment's Certification Scheme, as complying with the "Local Government" Provisional Specification reference PLGA/6, and shall bear the appropriate Mark of Conformity. Manufacturers or suppliers may be called upon by the Employers Representative to produce evidence from the I.I.R.S. that their products are so certified. All uPVC pipes shall conform to I.S. 370:2007 – "Colour Code for Buried Plastics Piping".

3.9.4 PE Pipes

Polyethylene (PE) pipe shall meet the requirements of WIS 4-32-17 and IS EN 12201: Part 1 and Part 2 (Plastic systems for water supply, drainage and sewerage under pressure – Part 1, General, and Part 2, Pipes) and IS EN 12201-3 (Plastic systems for water supply, drainage and sewerage under pressure – Part 3: Fittings). All PE fittings shall meet the requirements of WIS 4-32-14 and 4-32-15. PE pipes shall have a strength classification of PE100 to give a minimum 50 years strength of 10MPa. The pipe shall have a normal pressure designation of PN16 and shall have an SDR rating of 11 or lower. Polyethylene pipes shall be jointed using butt fusion welding, electro fusion welding or mechanical fittings. Butt fusion and electro fusion welding shall be carried out in accordance with Water Industry Specification WIS 4-32-08, Issue 3, April 2002. All pipe jointing and welding shall be carried out by certified welders. All PE pipes shall conform to I.S. 370:2007 – "Colour Code for Buried Plastics Piping".

3.10 CAST IRON TEES

Cast Iron Tees shall be used in all cases, except for smaller sizes than 50mm diameter. Below 50mm diameter P.V.C. or gunmetal tees shall be used.

3.11 FERRULES

Combined uPVC or Polyethylene ferrules and saddles where approved by the Local Authority shall be fitted in accordance with manufacturers' instructions.

3.12 BOUNDARY BOXES

All work associated with the installation of water meters carried out in accordance with this Specification shall comply with the current versions of the various Standard Codes of Practice for such work and, in particular, the following codes:-

BS 5834-1:1985	Surface boxes, guards and underground chambers for gas and waterworks purposes - Specifications for guards, including foundation units
BS 5834-2:1983	Surface boxes, guards and underground chambers for gas and waterworks purposes – Specification for Small Surface boxes.
BS 5834-3:1985	Surface boxes, guards and underground chambers for gas and waterworks purposes – Specification for Large Surface boxes.
BS 5834-4:2005	Surface boxes, guards and underground chambers for gas and waterworks purposes – Specification for Preformed Chambers.
BS 6700:1997	Specification for the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilage
BS EN 805:2000	Water supply – Requirements for systems and components outside buildings
BS EN 806:2005	Specification for installations inside buildings conveying water for human consumption, Design
BS EN 14154-1:2005	Water meters – Part 1: General requirements
BS EN 14154-2:2005	Water meters – Part 2: Installation and conditions of use
BS EN 14154-3:2005	Water meters – Part 3: Test Methods and Equipment
BS EN 124:1994	Gully Tops and Manhole Tops for Vehicular and Pedestrian Areas – Design Requirements, Type Testing, Marking, Quality Control
WIS 4-37-01	Boundary boxes for metering & control of domestic and small industrial water services
WIS 4-37-01A	Amendment

All boundary box components shall be constructed of corrosion-resistant materials which are compatible with being buried for prolonged periods whilst retaining their dimensional and structural characteristics. The boxes shall:

- (i) Comply with the latest revisions of WIS 4-37-01 and BS5834;
- (ii) The height of the cover in relation to the main body of the box shall be capable of a vertical dimensional adjustment by convenient intervals of measurement to allow for minor variations in finished ground levels. The length of the guard tube shall be capable of a minimum adjustment of 150mm;
- (iii) Be watertight to Class 1 of WIS 4-37-01;
- (iv) Have cover complying with the requirements of BS EN 124:1994. The class of cover shall be in accordance with table RBB1 on the Typical Detail Drawings for the project and be stamped with the words 'Water Meter & Uisce'.
- (v) Come complete with a stopcock and non-return valve;
- (vi) Have a design life of 50 years when subjected to normal operating and maintenance conditions;
- (vii) Be manufactured by an ISO9001 quality accredited organisation.
- (viii) Be fitted with a Frost Plug Disc.

If a special non-standard stopcock key is required, suppliers will include in their quotation for the provision of a key with each unit. If a special tool is required to open the box, suppliers will include in their quotation for the provision of a tool with each unit. The boundary box shall be supplied with a bridging piece to allow the lines to be flushed prior to the installation of the meter.

Boundary boxes shall be installed on all service connections to domestic and non-domestic properties. They shall be located as close as possible to the property boundary, in public rather than private property.

All boundary boxes should be designed with adequate space to facilitate the installation of automatic meter reading (AMR) module(s). This means that there should be a minimum clear distance of 200mm between the top of the installed meter and the bottom of the box cover.

Boundary boxes shall be capable of accepting industry standard end fitting G1.5" threaded (concentric) meters up to Qn 2.5m³/hr. For Qn 3.5m³/hr, boundary boxes shall be capable of accepting industry standard end fitting G2" threaded concentric meters.

In addition all boundary boxes installed under this contract shall allow for the following:-

- Visual reading of the meter.
- Meter fitting.
- Maintenance, removal or in-situ dismantling.
- Access to the stopcock.
- Clear visibility of the meter when opened.
- Suitable access to the meter chamber for maintenance.
- Be easily operated by a single person.

The manifold/meter-housing device shall form part of the meter boundary box and the assembly shall:-

- Include a check-valve.
- Include internal fittings fixed to the box wall and/or
- Have an 'anti-shear' torque mechanism to prevent damage to the unit by over-tightening.
- Have a minimum pressure rating equivalent to that of the supply pipe pressure rating.

The base of the boundary box shall be 450mm x 450mm x 100mm thick and shall be constructed using either Grade C25 concrete or high strength (21N/mm²) concrete blocks. The base shall be laid on a 75mm deep compacted layer of Clause 804 bedding material. 150mm Grade C20 concrete shall be placed around all sides of the box to within 150mm of the cover level. A 150mm deep layer of Grade C35 concrete surround shall then be placed on the concrete surround up to top of box level, again to a distance of 150mm around all sides of the box.

If the connection pipe is found to be a material other than polyethylene, such as PVC or other brittle pipe material, then the Contractor shall provide a flexible connection between the meter and the existing pipe.

The type of connections to the existing pipes including fittings and methods of work shall be submitted to the Employers Representative for approval. The details submitted shall include for different pipe materials

and pipe sizes. The Contractor shall maintain a stock of fittings and materials so as to be able to make connections to whatever pipe size/type is found. Connections shall be robust, durable, water-tight and in accordance with current best practice.

The Contractor shall notify the consumer once the bridging piece has been installed in the boundary box in order to allow the consumer to flush out the line. Once the consumer line is thoroughly flushed out then the Contractor shall install the actual consumer meter.

Reinstatement shall be carried out in accordance with the Specification. The Contractor shall reinstate the surface at the meter location to its original condition. Meter locations may only be in public areas.

3.13 WATER METER INSTALLATION AT BOUNDARY BOXES

3.13.1 Meters shall be installed in boundary boxes and shall be Elster V200 / V210 hybrid volumetric water meters or equivalent approved.

All meters shall conform to BS 14154-1:2005. Water Meters, Part 1, General Requirements. They shall conform to BS5728, ISO4064 Class C at a minimum. All meters shall be rated to IP68.

The meters shall conform to the above requirements at all times throughout their design life.

The Contractor shall submit full details of his proposed water meters, which are subject to approval by the Employers Representative.

The Contractor shall install the meters in accordance with BS 14154-2:2005. Water Meters - Part 2; Installations and conditions of use.

In addition to the requirements of BS 14154-2:2005, the contractor shall ensure that the integrity of the meter and its reading, including any signal transmitted, shall not be affected by the following conditions:-

- Ambient relative humidity
- Water pressure.
- Transmission of vibrations.
- Water quality (suspended particles).
- Electrostatic discharge.
- Continuous magnetic field.
- Electromagnetic disturbances.
- Any other relevant mechanical, chemical, climatic, electrical.

The meter shall meet its specified accuracy and reliability under all operating conditions that it would expect to endure during its design life.

The meters shall be capable of being read automatically or manually and maintained/replaced with the minimum of difficulty and without undue risk to personnel.

The meter and couplings shall be leak proof and the connectors shall be capable of being replaced without any significant disturbance to the customer's pipe work.

All meters shall have AMR capability.

3.13.2 Commissioning

The contractor shall test and commission all meter installations in accordance with the Specification.

Where any installation fails to achieve the test requirements for testing and commissioning, the Contractor shall remedy any defect and retest the installation at his own cost within a maximum of 10 working days.

3.14 SLUICE VALVES

Sluice Valves shall comply with B.S. E.N. 1074-1:2000

3.15 HYDRANTS

Hydrants shall comply with B.S. E.N. 1074-1:2000 and with the Local Authority requirements.

3.16 VALVE CHAMBERS AND SURFACE BOXES

Unless otherwise specified the materials, dimensions and finishes of appurtenances shall be as follows:-

Sluice Valve Covers:

Cast Iron, clear opening, 445 x 280 x 100mm deep suitable for heavy duty (Class D400 to EN124). Provide approved identification marking on cover.

Hydrant covers:

Cast Iron, clear opening, 445mm x 280mm x 100mm deep suitable for heavy duty (Class D400 to EN124). Provide approved identification mark on cover.

Air Valve covers:

Cast Iron, clear opening, 445mm x 280mm x 100mm deep suitable for heavy duty (Class D400 to EN124). Provide approved identification mark on cover.

Stopcock Covers:

Cast Iron, clear opening, 445mm x 280mm x 100mm deep suitable for heavy duty (Class D400 to EN124). Provide approved identification mark on cover.

Valve and hydrant chambers shall be constructed on a 200mm base in 225mm high strength (21N/mm²) concrete blockwork to the dimensions and details indicated on the drawings. Care shall be taken that no portion of the camber shall rest on the watermain.

3.17 TRANSPORT AND STORAGE

3.16.1 The handling, transportation and storage of pipes and fittings shall be done in accordance with the manufacturer's recommendations and in accordance with the following: - Unplasticised PVC Pipe ... Recommendation SR3 published by I.I.R.S.

3.16.2 During loading, unloading, stacking and general handling of pipe on site care shall be taken to avoid damage to all materials and in particular the coating/wrapping of iron or steel pipes and fittings. During transportation pipes shall be adequately supported for their length on a flat surface.

All pipes shall be lifted with approved slings to prevent damage.

Pipe fittings and appurtenances shall be stored on a secure level site in a neat and orderly manner. Only those items required for immediate use shall be deposited along pipeline route.

SECTION 4 TESTING, FLUSHING AND STERILISING MAINS

4.1 TESTING PIPELINES

4.1.1 When the pipeline has been laid and all connections are made, the pipe, including all connections up to and including each boundary box, shall be tested under hydraulic pressure in accordance with the following table:

Class of Main	Working Pressure	Test Pressure
B	60m head (85 p.s.i.)	91m head (129 p.s.i.)
C	90m head (123 p.s.i.)	137m head (195 p.s.i.)
D	120m head (170 p.s.i.)	183m head (260 p.s.i.)

4.1.2 Before testing, valves shall be checked and sealed, the sections of the main filled with water and the air released. After having been filled, pipelines shall be left under working pressure for a period of 24 hours so as to achieve conditions as stable as possible for testing.

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 for a period of one hour, by pumping if necessary. At the end of this period the original pressure shall be restored by pumping and the loss measured by drawing off water from the pipeline until the pressure recorded at the end of the test is again reached.

4.1.3. The permissible loss shall not exceed 2 litres per 100mm nominal bore per kilometre length per 10m head (calculated as the average head applied to the section) per 24 hours.

4.1.4 The pipes shall be tested in such lengths and at such times as the Employers Representative shall direct. All defective pipes whether cracked, porous, leaky or showing other faults shall be replaced with new pipes. All leaking joints shall be made good.

4.1.5 The testing equipment used shall be of an approved type and make.

4.1.6 Testing of Polyethylene (PE) 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 the Engineer 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 to 10 bar	1.5 times the rated pressure
12 bar to 16 bar	1.5 times the working pressure
<i>(or 5 bar plus working pressure, whichever is least)</i>	

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

- 4.1.7 In addition to the initial test on the separate pipeline sections, on completion of all the mains and service connections the main shall be re-tested in whole or in parts to the actual working pressure plus 0.25N/mm^2 and by the same procedure as that outlined for individual sections.

4.2 FLUSHING AND CHLORINATING WATER MAINS

- 4.2.1 Before the works are handed over the Contractor shall flush out the entire pipeline system. Flushing shall be carried out before house connections are made unless otherwise directed. Water for the flushing operation shall be potable water.
- 4.2.2 Chlorination of the mains shall be carried out in an approved manner and at agreed times. Before starting the work the Contractor shall submit full details of his proposals for chlorinating the main including disposal of the chlorinated water to the Employers Representative for his approval.

Any of the following sterilants may be used:-

Liquid Chlorine, Dry Chlorine, Calcium Hydro chlorite.

Chlorine shall be injected at the upstream end of the pipeline section to be sterilised at such a rate that the residual chlorine available at the downstream (Scour) end shall be 10 parts per million. When this residual has been achieved the mixture in the main shall be allowed to stand for a period of twenty four hours. The main shall then be emptied and thoroughly flushed. Care shall be taken in the chlorination, emptying and flushing of the main that the heavily chlorinated mixture does not contaminate existing water mains or existing watercourses, drains or streams.

- 4.2.3 The watermain shall be deemed to have been properly sterilised and suitable for incorporation into the permanent works once a sample (or a number of samples if necessary), taken by the laboratory of Clare County Council, are deemed to be compliant.
- 4.2.4 The Contractor shall include for unlimited repeat sterilisation of the water mains (either the entire watermain or sections of watermain as necessary) at his own expense until a compliant sample (or a number of samples, if necessary) have been verified by the laboratory of Clare County Council.
- 4.2.5 The Contractor shall allow for adequate testing time of the water samples by the laboratory of Clare Co. Council (normally 24 hours minimum) and shall carry out the watermain sterilisation works to suit the laboratory testing times, which may vary.

SECTION 5 - REINSTATEMENT

5.0 GENERAL REQUIREMENTS

All road reinstatement shall be carried out to the minimum requirements set out in the Reinstatement Specification and Licence Conditions issued with the Road Opening Licence. A copy of the Road Opening Specification and Licence Conditions are included separately with the Tender Documents. The contractor shall submit details of their proposed surfacing subcontractor to the local Roads Engineer prior to any restoration works being carried out.

5.1 TEMPORARY REINSTATEMENT- TRENCH SURFACES

- 5.1.1 In Fields, grass margins and gardens: All surplus spoil shall be removed from this site and building rubbish etc., cleared away. Topsoil shall be spread to a minimum depth of 225mm and sods replaced where applicable. The whole disturbed area shall be compacted, levelled and cleared of stones greater than 25mm diameter.
- 5.1.2 In roads and grass margins within 1m of road edge: Unless particularly specified or directed temporary reinstatement shall be as follows:-

Backfilling of trenches shall be taken up to the road surface (full depth in verges) in Clause 804 Granular Material, complying with the National Roads Authority Specification for Roadwork's. It shall be laid and compacted in layers, each layer receiving a minimum of six passes of a 2000 kg vibratory roller or approved equivalent. Mechanical compaction will not be permitted within 400mm of the crown of the pipes and this zone shall be placed and compacted by manual means.

The top of the trench shall be blinded and finished as follows:

County Roads: Saw cut and place 75mm compacted depth of DBM using 14mm nominal size chips and category resistance to polishing PSV60. Reinstatement shall extend minimum 100mm beyond the firm edge of the excavation as detailed on the drawings. The contractor shall provide, place and maintain appropriate signage to highlight the temporary surface until such time as the complete of the works. The Contractor shall agree all temporary road signage details with the Local Roads Engineer.

Regional Roads: Saw cut and place 75mm compacted depth of DBM using 14mm nominal size chips and category resistance to polishing PSV60. Reinstatement shall extend minimum 100mm beyond the firm edge of the excavation as detailed on the drawings. The contractor shall provide, place and maintain appropriate signage to highlight the temporary surface until such time as the complete of the works. The Contractor shall agree all temporary road signage details with the Local Roads Engineer.

The Contractor shall not be permitted to have in excess of 1km of unsurfaced trench backfilled at any one time for the duration of the contract. The 1km length shall be measured as an aggregate of all trench openings or a as a single trench, all within the scope of the contract.

- 5.1.3 In Footpaths: Unless particularly specified or otherwise directed temporary reinstatement under footpaths shall be as follows:-

Backfill to within 100mm of original surface.

The remaining 100mm shall be filled with 75mm broken stone suitably blinded with fine material and covered with a 25mm layer of tar macadam or the flags or paving slabs temporarily replaced.

- 5.1.4 Maintenance of Reinstated Surfaces: The Contractor shall be fully responsible for the maintenance and reinstatement of the road trench surfacing until the maintenance period, has been passed. All road reinstated surfaces shall be maintained in a safe and tidy condition at all times and any subsidence shall be immediately made good.

5.2 ROAD REINSTATEMENT - TRENCH SURFACES

- 5.2.1 Road restoration shall not be carried out until all subsidence has ceased.

- 5.2.2 In Fields, Grass Margins, Gardens: Unless otherwise specified - fields and gardens to be reinstated shall be levelled, rolled, raked, and seeded with best quality grass seed at 50 grams per square metre and finally re-raked and re-rolled.

In tidy grass margins the disturbed areas shall be levelled and left in a neat and tidy condition, free from large (25mm in diameter and upwards) stones.

- 5.2.2 In Roads and Footpaths: Unless otherwise specified, all road reinstatement of roads and footpaths shall be carried out by the Contractor as follows: -

Backfilling of trenches shall be taken up to 325mm from road surface (full depth in verges). A 250mm layer of Clause 804 Granular Material, complying with the National Roads Authority Specification for Roadwork's, shall be laid compacted and blinded. It shall be compacted in a maximum of two layers with a minimum of six passes of a 2000 kg vibratory roller or approved equivalent. Mechanical compaction will not be permitted within 400mm of the crown of the pipes and this zone shall be placed and compacted by manual means.

Existing surfaces shall be cut back to form straight vertical joints and all vertical joints and all joints and projecting features, e.g. manholes etc., shall be painted with hot bitumen.

Road Reinstatement shall be carried out as follows:

County Roads (surface dressed): Saw cut and place 75mm compacted depth of AC20 dense bin 70/100 rec to CI 906 of NRA specification for roadworks, or alternatively as specified on the contract drawings. Reinstatement shall extend minimum 100mm beyond the firm edge of the excavation as detailed on the drawings or agreed with the local authority. The exact dates of road reinstatement and the proposed method of work (Method Statement) shall be submitted to and approved by the local Roads Engineer prior to commencement of works. The contractor shall provide and maintain appropriate signage, as agreed with the local Roads Engineer, to highlight temporary surface until completion of the works.

Regional Roads: Saw cut and place wearing course of 40mm layer of AC10 or close surf 70/100 rec to Clause 912 of NRA specification for road works, base course of 60mm layer of AC20 dense bin 70/100 rec to Clause 906 of NRA specification for road works and 80mm cement bound granular mixture B

(CBGM B) to SRW series 800, or alternatively as specified on the contract drawings or agreed with the local authority. Reinstatement shall extend minimum 100mm beyond the firm edge of the excavation as detailed on the drawings. The exact dates of road reinstatement and the proposed method of work (Method Statement) shall be submitted to and approved by the local Roads Engineer prior to commencement of works. The contractor shall provide and maintain appropriate signage, as agreed with the local Roads Engineer, to highlight temporary surface until completion of the works.

- 5.2.3 Maintenance of Reinstatement of Roads: The Contractor shall adhere to the requirements of Road Opening Licence Conditions in relation to maintenance of Road Reinstatement.

5.3 RESTORATION OF SITE AREAS, ETC.

- 5.3.2 Surplus excavated spoil shall be spread over the site of the Works or placed in embankments as shown on the drawings or directed by the Employers Representative.
- 5.3.2 The ground shall be graded and topsoil spread to a minimum depth of 225mm over the entire disturbed area including slopes of cuttings and embankments.
- 5.3.3 Where topsoil which had been stripped from the site is found to be insufficient additional topsoil shall be imported as necessary.
- 5.3.4 Surfaces shall be carefully cleaned of stones greater than 25mm, weeds, rubbish etc., and levelled, rolled, raked, seeded with approved best quality grass seed at 50 grams per square metre, re-raked and re-rolled.

SECTION 6 – HEALTH & SAFETY

6.0 GENERAL

6.0.1 The Contractors attention is drawn to the Health & Safety requirements of the Public Works Contract.

6.1 PRELIMINARY SAFETY AND HEALTH PLAN

6.1.1 The attention of Contractors is drawn to the **Preliminary Health and Safety Plan (Design Stage)** which is included with the Tender documents.

6.1.2. The **Preliminary Health and Safety Plan (Design Stage)** was developed by the Project Supervisor for the Design Process (PSDP).

6.2 REGULATIONS AND CODES OF PRACTICE

6.2.1 In developing the Safety File for the Project, the Contractor will be required to take full cognisance, where appropriate, of the following:

- (i) **Safety, Health and Welfare at Work (Construction) Regulations 2006 (S.I. No. 504 of 2006) and any amendments thereof.**

6.3 TEMPORARY WORKS

6.3.1 It is a requirement of this contract that the Contractor for the works shall appoint a competent Temporary Works Designer who will have overall design responsibility for all temporary works and for the stability of all structures during the construction process.

6.4 SAFETY FILE

6.3.2 It is a requirement of this contract that the Contractor shall deliver a Safety File prepared on a preliminary basis, to the Project Supervisor Design Process at the end of the project. In particular, the Safety File should contain all “As-Built” information and construction details particular to the project.

SECTION 7 – PROPOSED TELEMETRY WORKS

Not Applicable.