

TMK CONSULTING ENGINEERS

SPECIFICATION 1710168 HY_A

SEPTEMBER 2018



SPECIFICATION FOR HYDRAULIC SERVICES

**PROPOSED RESIDENTIAL DEVELOPMENT
419 REGENCY ROAD, PROSPECT**

FOR: NIATRON 10 PTY LTD



Civil - Structural - Environmental - Geotechnical - Mechanical - Electrical - Fire - Hydraulics - Lifts - Green ESD
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1 PRELIMINARIES

1.1 Scope

The Works include, but are not necessarily limited to, the matters or things referred to in the Specifications, Drawings, Amendments and any correspondence.

1.2 Directions to Contractor

Directions, instructions and the like given in this Specification, whether or not they include the expression *'the Contractor shall'* or equivalent, shall be deemed to be given to and accepted by the Contractor, unless otherwise stated in the Contract.

1.3 Interpretations

The following terms may or may not be used in this Specification, but if used, the following interpretations shall apply in the Contract, except where the context otherwise requires:

'Architect' means the designer of the building works.

'Bill of Quantities' means a document named therein as a Bill of Quantities issued to Tenderers stating estimated quantities of work to be carried out.

'Building Contractor' means the individual or company contracted for the construction of Contract works.

'Contractor' means the person bound to execute the work under the Contract.

'Construction Manager' means the individual or company with the role of managing the construction team and various contractors to build and test the building systems for the project, represents the owner in taking bids of subcontractors and coordinating their activities, and administering all of the construction contracts. The Construction Manager also works with the commissioning authority to identify and correct deficiencies.

'Constructional Plant' means appliances and things used in the execution of the work under the Contract, but not forming part of the Works or the Temporary Works.

'Drawings' means the Drawings referred to in the Contract and any modification of such Drawings notified to the Contractor by the Superintendent and includes such other Drawings as may, from time to time, be supplied to the Contractor by the Superintendent, or the use of which has been permitted by the Superintendent, for the purposes of the Contract.

'Engineer' means the specifier of the relevant engineering works.

'Practical Completion' means that stage in the execution of the Work under the Contract when the Works are complete except for minor omissions and minor defects and documents and other information required under the Contract which, in the opinion of the Superintendent, are essential for the use, operation and maintenance of the Works have been supplied.

'Priced Bill of Quantities' means the Bill of Quantities priced and lodged by the Contractor with the Superintendent and accepted by the Superintendent as the rates.

'Principal' means the person who authorizes an agent or the Superintendent to act on their behalf to create one or more legal relationships with a third party for the purposes of the Contract.

'Schedule of Rates' means any Schedule included in the Contract which, in respect of any Section or item of work to be carried out, shows the rate or respective rates of payment for the execution of that work and which may also include lump sums, provisional sums, contingency sums, other sums, quantities and prices.

'Superintendent' means the person acting on the Principal's behalf for the purposes of the Contract.

'Temporary Works' means works used for the execution of the work under the Contract but not forming part of the Works.

'Works' means the whole of the work to be executed in accordance with the Contract, including variations provided for by the Contract, which are to be handed over to the Principal.

'work under the Contract' means the work which the Contractor is or may be required to execute under the Contract and includes variations, remedial works, Constructional Plant and Temporary Works.



1.4 Classified Documents

This Specification, the relevant Drawings and other documents shall not be disclosed to persons other than those required to see them in the course of their duties, except with the prior consent of the Principal and then only subject to such conditions as the Principal may impose.

Handle prints or copies of classified Drawings and other documents in accordance with instructions given by the Principal.

1.5 Discrepancies in Documents

The several documents which constitute or evidence the Contract shall be taken as mutually explanatory and anything contained in one but not in another shall be as equally binding as if contained in all.

The Contractor shall, without adjustment to the Contract sum, supply and execute minor items not expressly mentioned in the Contract but necessary for the satisfactory completion and performance of the work under the Contract.

1.6 Drawings and Specifications

The Drawings and the Specification represent generally the forms, dimensions and description of the Works.

Where any discrepancy exists between figured and scaled dimensions, the figured dimensions shall prevail.

Drawings made to larger scales and those showing particular parts of the Works shall take precedence over Drawings made to smaller scales and those for more general purposes.

1.7 Interpretation of Drawings

The layout of plant and equipment as shown on the Drawings are diagrammatic only. Obtain measurements and other information necessary to carry out the work specified.

If the Works include alterations and / or additions to existing work, verify the dimensions of the existing work before proceeding, and notify discrepancies as required by the Contract.

1.8 Program of Work

The Contractor shall, before commencing work on site, supply a construction program showing the dates by which, or the times within which, the various stages or parts of the work under the Contract are to be executed, and shall adhere to that program unless a deviation therefrom is approved or directed by the Superintendent.

If the Superintendent approves or directs a deviation from the program, the Contractor shall within the reasonable time stated in any such direction, supply a further construction program.

1.9 Protection of Persons and Property

The Contractor shall avoid interference with or damage to property on or adjacent to the site, and shall provide temporary protection to existing fixtures, fittings and surfaces as well as new work, during the course of the Contract and shall repair and reinstate all damage caused thereto by him either directly or indirectly.

The Contractor shall take all necessary precautions to protect and prevent nuisance to the owners, tenants or occupiers of the site and properties adjacent to the site, and to the public generally for the duration of the Contract.

1.10 Care of the Works

The Contractor shall be solely liable for the care of the Works, the Temporary Works, Constructional Plant and all materials and other things brought on to the site for the purpose of the carrying out of the work under the Contract by or on behalf of the Contractor or any of his sub-contractors.

The Contractor shall at his own cost make good any loss or damage to the Works, the Temporary Works, Constructional Plant and the aforesaid materials and other things resulting from any cause, other than the excepted risks defined in Clause 1.10.1 *Excepted Risks* below, when such making good is necessary for the satisfactory completion of the Works.



1.10.1 Excepted Risks

- Any negligent act or omission of the Principal, his agents or employees.
- War, invasion, hostilities, revolution, insurrection.
- Any risk specifically excepted in the Specification.

1.11 Existing Services

Check all relevant existing services Authorities before work commences to identify the location of all services.

In the event of damage to any water, gas, steam, compressed air, electric, drainage, sewerage, telephone, fire alarm, control cable, or other services in the area, the Contractor shall render any assistance required in connection with any such incident. Work in that vicinity shall be stopped immediately and not recommenced until instructions are received from the Superintendent.

- If the service is to be continued, repair, divert, or relocate the damaged service as required.
- If the service is to be abandoned, cut and seal or disconnect and make safe.

In either case satisfy the relevant Authorities.

The cost of dealing as above with 'live' services not visible or the location of which could not be ascertained by the Contractor from the appropriate Authority or from the Contract will be considered as a variation to the work under the Contract provided that the Contractor has taken all reasonable precautions to determine the location of existing services and safeguarded them before trenching, re-leveling, road making, demolition, or similar operations are commenced.

Notify the Superintendent immediately upon the discovery of services or obstructions not shown on the Drawings.

1.12 Storage On-Site

Store materials and equipment on-site so as to prevent damage to the site, the stored material and minimize hazards to persons. Keep storage areas neat and tidy.

Do not use roads, driveways, paths, hard standings and the like forming part of the Works for storage unless prior written approval has been given.

1.13 Noise Control

Take all practicable precautions to minimize noise resulting from work under the Contract. Fit all construction equipment with noise suppressers and use so that noise is minimized.

Do not use loud hailers.

Petrol and diesel driven tools are not permitted without prior approval of the Superintendent.

1.14 Temporary Works

Alter, adapt and maintain Temporary Works as necessary, and remove them progressively as the work proceeds, unless otherwise specified or instructed.

Obtain the written consent of the Principal for the inclusion in the Works of any Temporary Works which are proposed to be left in position at the completion of the Contract.

1.15 Practical Completion

Without prejudice to meanings which may be stated or implied elsewhere in the Contract, 'Practical Completion' shall mean that stage in the execution of the work under the Contract when such documents and other information required under the Contract which, in the opinion of the Superintendent, are essential for the use, operation and maintenance of the Works, have been supplied and the Works are substantially complete except for minor items.

Minor omissions and minor defects may include:

- Those which do not prevent the Works from being reasonably capable of being used for their intended purpose, and
- Those which the Superintendent determines that the Contractor has reasonable grounds for not correcting promptly, and



- The rectification of such will not prejudice the convenient use of the Works, and
- Those tests which are required by the Contract to be carried out and passed before the Works are handed over to the Principal have been carried out and passed.

Without limiting the generality of the foregoing, the following particular requirements shall have been met:

- The testing of fire systems has been satisfactorily completed.
- The Contractor's hoist, crane, scaffolding and other major items of constructional plant have been removed from the Works.
- Keys have been labelled appropriately and handed over.
- Statutory Authority requirements have been satisfied and approval certificates handed over to the Principal.
- The Contractor has handed over the 'As Constructed' Drawings to the Principal.
- Equipment and fixture warranties, operating manuals and any other relevant information in relation to the Works have been handed over to the Principal.

1.16 Materials, Labour and Plant

The Contractor shall, unless the Contract otherwise provides, supply at his own cost and expense, everything necessary for the proper completion of the work under the Contract and the proper performance of his obligations under the Contract.

1.17 Samples

Items deemed as samples shall be in accordance with an approved sample, or within a range defined by the Superintendent as an approved sample, otherwise such items shall be liable to rejection. Keep approved samples in good condition on the site until Practical Completion.

1.18 Warranty Period

The Building Contractor is to provide warranty and certificates covering the work against defective material and workmanship for a period of 12 months from the date of Practical Completion.

The warranty shall include a statement that the whole of the work has been carried out in accordance with relevant Australian Standards, Codes and Manufacturers in effect at the time of installation.

Warranties are to be provided with the Maintenance Manuals and within 14 days of Practical Completion.



2 GENERAL REQUIREMENTS

2.1 Scope

Refer to Section 1 *Preliminaries*, which form a part of this Specification.

All technical questions regarding this Contract shall be directed to TMK Consulting Engineers on (08) 8238 4100 or at Level 6, 100 Pirie Street, Adelaide, SA.

2.1.1 Outline Description

Work in this Contract generally comprises the supply and installation of sanitary plumbing, including soil and waste piping systems, drainage and services including gas, hot and cold water systems.

All work shall be carried out under the terms of this Specification and shall conform with all relevant Statutory Authorities, relevant Australian Standards, Building Code of Australia and Government requirements and to the satisfaction of the Superintendent.

The Hydraulic Services Drawings are:

1710168-H1 to 1710168-H4

The Work under this section includes, but is not limited to:

2.1.2 Site Infrastructure

The work covered by this Clause includes the following:

- Connection to existing sewer connection off Airlie Avenue, upgraded from 1 x 100 mm to 1x 150mm. Confirm sewer depth and location prior to commencing any work. Make application and pay all fees to SA Water.
- Connection to 1 x new 40 DN potable water meter off Airlie Avenue. Make application and pay all fees to SA Water.
- New gas meter rated for 800 MJ/h @ 2.75 supply. Make application and pay all fees to APA.
- Provide a gas solenoid valve assembly in lockable cover. Provide all associated controls, valves / valves required for automatic gas shutdown on fire alarm. Carry out all associated works.
- Provide Serviced hot water/gas management system by Origin Energy including hot water metering & monitoring.
- Terminate, disconnect and remove redundant services on site. Make application and pay all authority fees as required.
- The provision of backflow prevention to new buildings / areas, in accordance with statutory requirements.
- Services mains to be run in common service trench, where suitable.
- Excavation and backfill of all trenching for sewer, trade waste drainage and water services, including all trench shoring and dewatering of trenches as required.
- Removal of excavated spoil from site.
- Excavation to determine exact location of existing site services prior to installation of new pipework.
- New external water reticulation system.
- Provision of irrigation take-off valve box, in above ground valve boxes for Landscape Contractor to connect to.

All hydraulic services to comply with AS/NZS 3500 *Plumbing and drainage* and SA Water requirements.

2.1.3 Building Works

The work covered by this section includes the following:

Provide a new sewer distribution system to serve the building, and:

- Acoustic lagging as required for BCA compliance.
- Drain all dishwashers to the sink traps within all apartments / tenancies.
- Sewer waste connection to washing machines in the laundries. Refer to Drawings for indication of works.
- The supply, installation and connection to the plumbing system of all fixtures and fittings required. Refer to Architectural documentation for sanitary fixtures / tapware schedule.

Provide a new water / gas reticulation system throughout, and:

- Provide 1 x 20 DN water meter for each apartment / tenancy. Water meter to be digital and have pulse output suitable for remote monitoring cold water.



- Origin Energy to supply all private hot water meters. Reticulation to and from hot water meter and installation of meter by Hydraulics Contractor. Coordinate with Origin Energy.
- Provide an isolation valve for cold and hot water in apartment / tenancy before and after water meter.
- Provide an isolation valve to each apartment / tenancy with tempering valves for tempered water supply to hand basins, showers and baths.
- Provide a 20 DN take-off and supply to each apartment / tenancy.

Comply with AS/NZS 3500 *Plumbing and drainage* and authority requirements.

- Allow to pick up power / controls and reticulate as required.

2.1.4 General

- Sanitary plumbing, drainage and vents to AS/NZS 3500 *Plumbing and drainage*.
- Provision of sleeved penetrations through floors, walls and concrete footing.
- Coordination with the Construction Manager / Building Contractor for penetrations and chasing of walls and floors for services where required.
- Coordination with the Construction Manager / Building Contractor for studs and nogging in walls to support mounted sanitary equipment.
- Set out of all services to ensure exact location of pipe connection to fixtures.
- Liaison and coordination with all other trades during installation of plumbing services.
- Coordination with all other services to ensure all drainage and reticulation points are correctly located.
- Supply and installation of hot and cold water, including all piping fittings and insulation to the entire hot water pipe work.
- Sewer and water connection applications and connection fees.
- Tundishes for air conditioning condensate discharge.
- All penetrations within a fire wall / slab to be fire rated.
- Excavation and backfilling of all trenching for new soil, waste drainage, water and gas pipework including concrete and bitumen cutting and removal of spoil where necessary.
- Isolation valve identification tags.
- Pipe identification to all accessible services.
- Initial backflow test to all testable devices.
- The testing and commissioning of the plumbing, drainage, and water systems to obtain all necessary certifications and authority approval.
- Maintenance and servicing, defects liability and warranty for 12 months from the date of Practical Completion.
- Preparation and issue of 'Work-as-Executed' Drawings and 3 sets of approved Maintenance Manuals. Manuals to be presented in plastic binders complete with wiring diagrams, maintenance and operation instructions and phone numbers for assistance in the event of problems.
- Provision of electronic copy maintenance manuals and 'As-Installed' Drawings in ACAD format.
- Instruction on maintenance items.

2.2 Site Visitation & Familiarisation

Visit and examine the site and refer to current Contract Drawings and this Specification in order to understand and become familiar with the visible existing conditions under which you are obligated to operate.

2.3 Australian Standards

Unless otherwise specified in the Contract, materials and workmanship shall be in accordance with the latest edition of the relevant Australian Standards and codes.

The following standards may be referred to in Specification:

AS 1056	<i>Storage water heaters</i>
AS 1152	<i>Specification for test sieves</i>
AS/NZS 1167	<i>Welding and brazing - Filler metals</i>
AS 1192	<i>Electroplated coatings - Nickel and chromium</i>
AS/NZS 1260	<i>PVC U pipes and fittings for drain, waste and vent application</i>
AS 1289.5.1.1	<i>Methods of testing soils for engineering purposes – Soil compaction and density tests – Determination of the dry density/moisture content relation of a soil using compactive effort.</i>
AS 1345	<i>Identification of the contents of pipes, conduits and ducts</i>
AS 1432	<i>Copper tubes for plumbing, gas fitting and drainage applications</i>
AS 1462	<i>Methods of test for unplasticized PVC (UPVC) pipe and fittings</i>
AS/NZS 1477	<i>PVC pipes and fittings for pressure applications</i>
AS 1572	<i>Copper and copper alloys - Seamless tubes for engineering purposes</i>
AS 1628	<i>Water supply – Metallic gate, globe and on-return valves</i>
AS 1646	<i>Elastomeric seals for water works purposes</i>



AS 1851	<i>Routine service of fire protection systems and equipment</i>
AS 2032	<i>Installation of PVC pipe systems</i>
AS/NZS 2033	<i>Installation of polyethylene pipe systems</i>
AS/NZS 2243	<i>Safety in laboratories</i>
AS 2419	<i>Fire hydrant installations</i>
AS 2444	<i>Portable fire extinguishers and fire blankets requirements.</i>
AS 2566	<i>Buried flexible pipelines</i>
AS 2887	<i>Plastics wastes fittings</i>
AS/NZS 2982	<i>Laboratory design and construction</i>
AS/NZS 3500	<i>Plumbing and drainage</i>
AS 3688	<i>Water supply – Metallic fittings and end connectors</i>
AS/NZS 3718	<i>Water supply – tapware</i>
AS/NZS 4129	<i>Fittings for polyethylene (PE) pipes for pressure applications</i>
AS/NZS 4130	<i>Polyethylene (PE) pipe for pressure applications</i>
AS/NZS 4692.1	<i>Electric water heaters – Energy consumption, performance and general requirements</i>

2.4 Authorities and Approvals

2.4.1 Authorities

All specified work shall be undertaken in accordance with Statutory Authority requirements and the General Conditions of Contract and the ordinances, regulations, by-laws and the like including those listed below:

- SA Water Rules and Regulations.
- SA Water Water Supply Branch.
- SA Water Sewerage Branch.
- South Australian Gas Authority rules and regulations.
- State or Commonwealth Departments of Health.
- Any other Authority that has regulations, codes or powers over the work.

2.4.2 Approvals

All approved certificates shall be submitted to the Superintendent prior to the issue of the Certificate of Practical Completion.

2.4.3 Authority Marks

Pipes, fittings, accessories and the like used in the Works shall bear approval marks where and as required by the regulatory Authority.

2.4.4 Authority Fees

Pay all Authority fees for inspection, connection, and supply of service points, for all services.

2.5 Drawings and Dimensions

2.5.1 Construction Drawings

Construction Drawings showing pipe work layouts are diagrammatic only.

Before commencing work or ordering materials, verify and detail onto Construction Drawings all aspects of the installation including the exact positions of fixtures, water and drainage lines, plant, appliances and the like to which the pipe work is to be connected and obtain SA Water approval for all work.

2.5.2 'Work as Executed' Drawings

Progressively prepare throughout the Works, and provide before the date for Practical Completion, 'Work as Executed' Drawings of all specified services to the same scales and on the same sized standard sheets as the Contract Drawings.

Show the locations of pipes and fittings, including inspection openings, cleaning eyes, pits, control valves, and the like, and the depths of underground pipe work.

Give co-ordinate dimensions where applicable.



2.6 Workmanship

Workmanship shall be of the highest standard with each section of the work being properly and neatly executed to the best of trade practice and in accordance with relevant Australian Standards.

Untidy work exposed to view, or concealed, will not be accepted.

The Works shall be carried out by suitably qualified trades persons registered with the appropriate Statutory Authorities.

2.7 Materials

Materials used shall be the best of their respective kinds, manufactured in accordance with the relevant Australian Standards.

2.8 Installation

Pipe work shall be carefully lain or suspended in straight lines between changes of direction with uniform gradients (where required) and in such a manner so that the pipe work will not sag or buckle.

Pipe fittings must not be stressed by straining into alignment or grade.

Tags are to be made of non-ferrous metal with wording in upper case 8 mm minimum in height.

Pipe sections shall be fabricated from the longest possible lengths. Building up sections with short off-cuts will not be accepted.

Provide all the bends, elbows, junctions, branches, inspection openings, expansion joints, grease arrestors, neutralizing pits, sumps, manholes, valves and unions and the like to satisfactorily complete the work.

2.8.1 Materials

Refer to *Equipment and Material Schedules* in Section 8 of this Specification.

2.8.2 Flushing of Pipe Work

Except for gas services, flush each pipeline with clean water and leave it clean and free from debris on completion. The gas service is to be flushed with compressed air.

2.8.3 Accessible Fittings

Pipe fittings requiring maintenance or servicing, including inspection openings, cleaning points, isolation valves, joints designed to enable removal of pipes etc shall be located in accessible positions, with adequate clearance.

2.8.4 Dissimilar Metals

Do not install copper in contact with steel, zinc or other materials likely to generate electrolytic, galvanic or corrosive action. Make junctions between dissimilar metals with special fittings manufactured in suitable compatible material.

2.8.5 Changes of Direction

For sewer and stormwater, where practicable, use bends in preference to elbows. Use elbows where pipes are led up or along walls and then through to fixtures.

For service pipe work, where practicable, use long radius bends in preference to short radius bends.

2.8.6 Joints

Fit joints tightly. Seal and make leak proof, with no internal projections, burrs or obstructions.

Refer to *Equipment and Material Schedules* in Section 8 of this Specification for jointing methods for the different pipe materials.



2.8.7 Isolation Valves

Where practicable, arrange isolation valves together in operational groupings in convenient and readily accessible positions.

Provide and install service identification tags to all valves. Tags are to be made of a non-ferrous metal with 8 mm minimum height upper case wording.

2.8.8 Concealed Pipe Work

Where possible, install pipe work runs in ceilings and roof spaces, under suspended ground floors, plant room, and the like.

Arrange adjacent services horizontally, parallel with each other and with walls, beams and the like. Keep at least 150 mm above ground surface if under suspended ground floors.

Provide adequate spacing of at least:

- 25 mm between pipes or pipe insulation.
- 50 mm between pipes or pipe insulation and electrical cables, and
- 100 mm between hot and cold water pipe work.

Take off branches at right angles.

Conceal pipe work so that where possible it is accessible within ducts or non-habitable enclosed spaces and does not appear on external walls.

Obtain prior approval for the location of exposed pipe work.

2.8.9 Chasing in Pipe Work

Where possible, build in pipe work during constructions rather than chasing-in pipe work after construction of walls and floors.

Where it is necessary to chase pipe work into walls and floors, use a mechanical saw to cut chases to the required depth.

Do not chase structural walls or reinforced concrete without prior approval, in writing, from the Superintendent.

2.8.10 Non-Accessible Pipe Work

Where pipe work is proposed to be enclosed and not accessible after completion, obtain prior approval for the location of pipe runs and pipe fittings and record actual locations on the 'Work as Executed' Drawings.

2.8.11 Stress in Pipe Work

It is the Contractor's responsibility to ensure that stresses in pipe work are kept within allowable limits and forces due to expansion are not transferred to equipment.

Install all pipe work such that it shall not be subject to undue stresses and strains.

2.9 Testing

Test pipe work at regular intervals, or as required during the progress of the work.

2.9.1 Concealed Work

Do not cover or conceal underground or enclosed work until it has been inspected and tested in sections, where necessary, to the approval of the Superintendent and the relevant Authorities.

Leave pipe joints exposed to enable observation during testing.



2.9.2 Pipe Work Testing

Supply apparatus and materials necessary to carry out the tests required by the Specification or regulatory Authorities, in the presence of the Superintendent and the authorized representative of the relevant Authority for the service under test.

2.9.3 Materials Testing

Where required, provide test certificates prepared by an independent testing authority to confirm that materials comply with the relevant standards.

2.9.4 UPVC Pipe Work

Ensure solvent cement joints have been cured for at least 24 hours before testing.

2.9.5 Test Methods Pipe Work

Fill the pipe work and test at the pressure and duration stated in the Table below, unless overridden by Regulatory Authority requirements.

TEST METHODS				
SERVICE	TEST FLUID	TEST PRESSURE	DURATION (hrs)	ALLOWABLE LOSS
Sewer, soil waste	Water	Static head in accordance with SA Water requirements		
Mains water	Water	1800 kPa	2	Nil
All other water services	Water	1000 kPa	2	Nil
Gas	Air	In accordance with Gas Authority requirements		
CO ²	Air	1500 kPa	2	Nil

2.9.6 Rejections

Pipe work is liable to rejection if the water or air loss exceeds the limit permitted by the relevant test.

2.9.7 Test Method of Fixtures

To be filled to spill level with water after installation and visually checked for leaks.

2.10 Core Holes

Set out core holes and sleeves in floors, walls, beams and columns and obtain approval of the set out prior to placing concrete or coring.

2.11 Penetrations

2.11.1 Fire Rating

Do not penetrate fire walls and structural members without prior approval.

All fire wall penetrations shall maintain the fire rating of the wall. Submit details of fire penetrations for approval prior to installation.

2.11.2 Footings and Beams

Where pipe work passes through footings or beams on a site where the soil type is E1 or E2, lag the pipe work with closed cell poly lagging with a minimum thickness of 40 mm around the pipe. On sites with lesser expansive soil types, refer to Statutory Authority requirements, but in any case, no less than 25 mm thickness of lagging around pipe.



2.11.3 Flashing Roof Penetrations

Flash pipes and flues where they penetrate the roof with a purpose made flashing.

Sealing the pipe to the roof material will NOT be accepted.

Where the flashing is sealed with a silicone type sealant, the sealant is to be sandwiched between the flashing and the roof material and not just smeared over the surface of the joint between the flashing and the roof material.

2.12 Sleeves

Where service pipes pass through walls, floors, beams or columns, provide purpose-made metal sleeves with 12 mm clearance all round pipes, packed with gunned silicone rubber joint sealer (self-extinguishing grade).

Where PVC or poly pipes pass through fire barriers, install pipe work through approved fire stop collars.

2.13 Capping Off

During construction, temporarily seal open ends of pipes to prevent the entry of foreign matter into pipe systems. Provide purpose-made covers of pressed steel or rigid plastic. Do not use rags, paper, wood plugs, electrical or duct tape.

2.14 Expansion Joints

Crossing building expansion joints with pipe lines shall be avoided where possible. Where this is not possible, pipe lines adjacent to the building expansion joint shall be located in a readily accessible position and fitted with an approved expansion joint.

2.15 Supports

Provide supports including hangers, saddles, bolted clips and the like, sufficient to secure the pipe work to adjacent surfaces and to support it at joints, at changes of direction and at intervals suitable to the size and type of pipe and as necessary to prevent sagging of pipe work. Make provision for adjustment of gradient as required.

With the exception of pipe work chased into walls and floors, all pipe work shall be secured a minimum of 20 mm clear of all surfaces.

2.15.1 Support Material

The same material as the pipe, or galvanized or non-ferrous metals, with bonded PVC or fibreglass woven tape sleeves to separate dissimilar metals.

Provide fixings of compatible material.

2.15.2 Fixing to Masonry

Use galvanized steel or non-ferrous metal bolts or screws into expanding metal masonry anchors.

Do not use explosive powered fixings.

2.15.3 UPVC Pipe

Support in accordance with AS/NZS 2032 *Installation of PVC pipe systems* Clause 6.3 and at maximum spacings detailed in Tables 6.2 and 6.3.

2.16 Water Hammer

It is the Contractor's responsibility to ensure that the entire water service is free from water hammer. All water hammer shall be rectified by the Contractor and at the Contractor's expense.



2.17 Pipe Work Finishes

In addition to the protective coatings (galvanizing, epoxy coating and the like) specified in the pipe work installation Clauses of this Section, provide the finishes to pipe work, including fittings, supports and the like referred to in *Fixtures and Equipment Schedule* in Appendix A.

2.18 Pipe Identification

2.18.1 Colours and Pipe Labelling

All vertical and horizontal service pipes shall be named and coded by a colour band fixed at 3000 mm intervals.

The base coloured band shall be 50 mm wide for the whole circumference of the pipe in a visible position with a coloured arrow indicating the direction of flow and a label indicating the contents, lettering to be 25 mm height.

The following shall apply:

PIPE LABELLING		
SERVICE	BASE COLOUR	LABEL WORDING
Water cold	EMERALD GREEN No. 228	Drinkable cold water
Water hot	EMERALD GREEN No. 228	Drinkable hot water
Non drinkable cold water	EMERALD GREEN No. 228	Non drinkable cold water
Non drinkable hot water	EMERALD GREEN No. 228	Non drinkable hot water
Fire service	SIGNAL RED No. 537	Fire service not drinkable
Soil pipes	BLACK	Soil
Waste pipes	BLACK	Waste
Soil vent pipes	BLACK	Soil vent
Waste vent	BLACK	Waste vent
Trade waste pipes	BLACK	Trade waste
Trade waste vent	BLACK	Trade waste vent

Additionally provide supplementary cautionary YELLOW and BLACK safety signals adjacent the flow direction arrow to be applied to trade waste services and non drinkable reticulation.

All isolation valves shall be identified by engraved melamine laminated plates with 8 mm height upper case WHITE lettering on BLACK background, fixed to handle, noting areas of isolation.

Note: Sanitary drainage installed below ground surface to be provided with continuous labelling.

2.18.2 Extent

Apply basic identification colours to the pipe work in locations as required. If that pipe work is scheduled to be painted, paint the full length in the appropriate identification colour. If the pipe work is not scheduled to be painted, apply the identification colour in bands at intervals in accordance with AS 1345 *Identification of the contents of pipes, conduits and ducts*.

2.19 Excavation

Excavate trenches to the lines, levels and grades as required for underground services in AS/NZS 2032 *Installation of PVC pipe systems*. Trenches must be straight between manholes, sumps, inspection pits, junctions, valve pits and the like, with vertical side and uniform grades unless otherwise noted on the Drawings or specified.

Check the required inverts of all services before commencing trenching to ensure that no conflict exists between levels of services. Any conflict shall be reported immediately to the Superintendent.



2.19.1 Trench Widths

In accordance with Regulatory Authority requirements, keep trench widths to the minimum consistent with the laying and bedding of the relevant service, and the construction of manholes and pits.

2.19.2 Trench Depths

In accordance with the relevant service requirements and its bedding method as detailed in AS 2032 *Installation of PVC pipe systems*.

2.19.3 Pipe Minimum Cover

Unless overridden by Regulatory Authority requirements or otherwise specified, the following shall apply.

	Minimum Cover (mm)
Pipes not subject to vehicular loading:	450
Pipes subject to vehicular loading:	
Not in roadways	600
Under sealed roadways	600
Under unsealed roadways	750
Pipes in embankments or subject to construction equipment loading:	750

2.19.4 Shoring of Trenches

Where required, shore trenches to relevant Authority requirements and maintain in a safe condition. Provide and install barriers and lights as required.

2.19.5 Common Trenches

Where services are installed in common trenches, liaise with other trades and ensure locations, depths and spacing between services comply with the relevant Statutory Authorities.

2.19.6 Obstructions

Cut back roots encountered in trenches to not less than 600 mm clear of the relevant service.

Remove other such obstructions including roots, stumps, boulders etc which may, in the opinion of the Superintendent, interfere with the proper functioning of the service.

2.19.7 Unsuitable Ground

Ground unsuitable for the purposes of the Works, includes FILL liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances including oil, cement, chemicals and the like, or ground which is or becomes soft, wet and unstable etc.

2.19.8 Notification

If unsuitable ground is encountered, notify the Superintendent immediately and obtain written instruction from the Superintendent before carrying out any further work in the affected area.

2.19.9 Rock Excavation

Assume no rock will be encountered when excavating.

If rock is encountered, a Variation will be issued for its removal. Notify the Superintendent prior to removal and verify the volume to be removed. Provide a rate per cubic meter for rock excavation. The verified volume will be multiplied by the tendered rate to give the cost of the Variation.



2.19.10 Pipe Bedding

Unless otherwise specified or required by Statutory Authorities, pipes may be laid without underlay provided that the trench is free from hard objects such as stones, sharp projecting rocks or tree roots, and providing the trench bottom is trimmed to provide continuous, uniform and adequate support to the pipe, including chases where necessary to prevent sockets, flanges or the like from bearing on the trench bottom.

If the trench is over-excavated or is in rock or shale, bed the pipes on a continuous cushion of bedding material a minimum of 75 mm thickness.

2.19.11 Bedding Material

Sand or selected excavated material free from hard or sharp objects or lumps in accordance with AS/NZS 2032 *Installation of PVC pipe systems*.

For plastic pipes, fine aggregate graded as follows in accordance with AS 1152 *Specification for test sieves*:

QUARRY SAND	
Sieve aperture (mm)	Percentage not passing (by mass)
6.7	100
4.75	70 to 100
2.36	45 to 100
1.18	40 to 100
0.6	20 to 90
0.3	8 to 50
0.15	0 to 20
0.075	2 to 10

2.20 Backfilling Trenches

Backfill trenches as soon as possible after installation and approval of pipe work. Compact as specified to the compaction density which applies to the location of the service trench.

2.20.1 UPVC Pipe Work

Prior to backfilling, fill UPVC pipe work with water and leave full until backfilling and compaction is complete.

2.20.2 Pipe Support

Compact so that the pipe is buttressed by the walls of the trench.

2.20.3 Backfilling

Quarry sand shall be placed and compacted to top of pipe and then compacted to 150 mm above the pipe. Compaction for 150 mm above the top of the pipe shall be by hand without disturbing or damaging the pipe or pipe joints.

The rest of the trench backfill shall be free from any foreign materials and shall be compacted in layers NOT exceeding 150 mm thick of loose fill to 100% of Standard compaction in accordance with AS 1289.5.1.1. *Methods of testing soils for engineering purposes – Soil compaction and density tests – Determination of the dry density/moisture content relation of soil using compactive effort.*

2.21 Excess Spoil and Rubbish

Allowances shall be made to remove all excess spoil and rubbish from site unless otherwise specified or directed by the Superintendent.



2.22 Reinstatement

Unless otherwise noted on the Drawings or specified, reinstate and make good all chases, penetrations and the like.

Concrete or bitumen damaged, disrupted or removed during construction shall be repaired or replaced and left in as good or better condition than originally found.

2.23 Maintenance and Commissioning

Be responsible for the operation of the complete system and of each item of equipment covered by this Specification until the time that the whole installation is operating to the satisfaction of the Superintendent. Make all adjustments and alterations during the commissioning period which are required to establish safe and reliable conditions.

Maintenance of the Fire Services is to be in accordance with AS 1851 *Routine service of fire protection systems and equipment*.

Demonstrate to the Principal that the system is satisfactorily commissioned before the Certificate of Practical Completion can be issued. Notice of intent to issue the Certificate of Practical Completion will be given in writing with effect from 4.00 pm on the date of satisfactory conclusion of that demonstration.

Prior to Practical Completion hand over to the Principal all guarantees, services and operational manuals for any hot water units, circulation pumps, gas appliances and the like.

Maintenance period coextensive with the defects Liability Period.

2.24 Defects and Maintenance Liability

The Contractor shall, in accordance with Statutory Regulations, make good at his own expense any defects found within 12 months of Practical Completion of such work which in the opinion of the Principal is due to faulty workmanship or defective materials.

Any materials, pipes, bends, junctions, fixtures, fittings and apparatus found to be defective or which has not been approved for the purpose used, shall be removed and replaced and all defective joints re-made to conform to the regulation, Specification or Standards nominated.

2.25 Intent

It is intended that the Works shall include everything obviously required to complete the installation to the satisfaction of the Principal. The Specification shall take precedence over the Drawings.

Provide all materials and labour to satisfactorily complete the Works.

All elements of the installation shall be undertaken in accordance with SA Water, the SAMFS or any other Statutory Authority requirements.

2.26 Liaison and Coordination

The Contractor shall allow for liaison with all other trades on the project to ensure that problems can be solved before the work is installed.

The Contractor shall carefully check space requirements with other Contractors and ensure that his equipment, piping, etc, can be installed in the spaces allotted for same.

The Contractor shall be responsible for setting out the pipe runs before the pouring of concrete and providing and installing any sleeves and pipes which may be necessary to avoid cutting holes in the finished works.

All pre-fabricated sections must be fixed in position in sufficient time to avoid delay to other trades.

Co-ordinate with the Construction Manager to ensure that the following is provided in acceptable locations:

- Inspection opening locations in floors and walls for stack and surface inspection openings (IO's).
- Access openings for isolation valves in ducts and non-accessible areas large enough for the removal and replacement of the valve.
- Location of grated outlets in graded floors.
- The flood gully is installed to Statutory Authority requirements or if this cannot be achieved, a reflex valve is installed to the sewer system.
- Tundishes for air conditioner condensate waste.
- Locations of external taps.



3 SANITARY DRAINAGE REQUIREMENTS

3.1 General

Refer to Section 2 *General* which outlines the minimum standards, procedures and installation requirements that are to be followed and adhered to.

Clauses in this Section shall over-ride Clauses in Section 2 *General*, which may be in conflict.

3.2 Installation

Install all sanitary plumbing systems as shown on the Drawings or as specified in accordance with AS/NZS 3500.2 *Plumbing and drainage - Sanitary plumbing and drainage*. Incorporate local Statutory Authorities and regional variations.

3.3 Gradients

Install drains to the levels and gradients shown on the Drawings. Where gradients are not shown, drains are to be graded to relevant Authority requirements, but in any case not less than the grades shown in the following Table.

MINIMUM GRADES OF DRAINS	
NORMAL SIZE	MINIMUM GRADE (%)
DN 65	2.50
DN 80	1.65
DN 100	1.65
DN 125	1.25
DN 150	1.00
DN 225	0.65

Check that these minimum grades can be achieved. If not, seek direction from the Design Engineer before continuing installation.

3.4 Materials

Unless otherwise noted on the Drawings, specified or scheduled, all pipe work shall be UPVC of the appropriate class and grades suitable for the type of installation.

Joining shall be in accordance with *Equipment and Material Schedules* in Section 8 of this Specification.

3.5 Connections

Connect all fixtures shown on the Drawings or specified to the sanitary drainage system in an approved method.

3.6 Inspection Openings

Install inspection openings (IO's) on stacks, risers and underground pipe work as required and as indicated on the Drawings.

Raise all underground IO's to the surface and finish with an approved cover as scheduled. If the cover is not physically attached to the IO riser, ensure the rise is located central of and with at least 50 mm clearance of the cover.

Where multiple IO's are outside a building, ensure they are all equally distanced off the external building line.

3.7 Floor Waste Gullies

Install floor waste gullies as shown on Drawings and as required.

Grates are to be of the same material as the floor wastes, unless otherwise scheduled.



3.8 Fixture Wastes

Where possible, install fixture wastes so that they are not exposed to view.

3.8.1 Basin Wastes

Vanity Basins

Unless otherwise noted on the Drawing(s) or specified, vanity basin wastes shall be installed with a maximum of 100 mm clearance off the finished wall surface and within 100 mm of the centreline of the basin.

Offsets in vanity basin waste will NOT be accepted.

Wall Basins

All wall basin wastes are to be built into the wall.

3.8.2 Materials

Refer to *Equipment and Material Schedules* in Section 8 of this Specification.

3.9 Fixture Traps

Trap all fixtures as required.

Materials are as outlined in *Equipment and Material Schedules* in Section 8 of this Specification.

3.10 Vents

Provide and fix vent pipes as shown on the Drawings and where required. Offset as required and extend through roof to correct height and fit with an approved cowl.

Where possible, connect vents below roof level so as to minimize roof penetrations.

3.10.1 Roof Flashing Penetration

Flash vent pipes where they penetrate the roof with a purpose-made flashing.

Sealing the vent pipe to the roof material will NOT be accepted.

Where the flashing is sealed with a silicone type sealant, the sealant is to be sandwiched between the flashing and the roof material and not simply smeared over the surface of the joint between the flashing and the roof material.

Liaise with roofing trades to ensure the specified flashing requirements are met.

3.11 Discharge from Air Handling Systems

The condensate waste from air conditioning units with minimal discharge rates may be omitted from the Drawings. Where this happens, the tundish location only will be shown on the Drawings.

The condensate waste from the air conditioning units with minimal discharge rates shall discharge to sewer by one of the following methods:

- Into a gully or hot water unit tundish.
- Into a pipe tundish installed above the flood level of a sink. The waste from the tundish shall be 20 mm copper built into the wall or under the bench and connected to the sink trap by a 20 mm flexible connection. The tundish waste pipe shall be continuously graded to the trap connection.
- Into the pipe tundish installed under vanity or wall basins. Tundish waste is to discharge into the same floor trap as basin waste.

For air handling units with large discharge rates, the discharge method will be as shown on the Drawings.



4 SANITARY FIXTURE REQUIREMENTS

4.1 General

Refer to Section 2 *General* which outlines the minimum standards, procedures and installation requirements that are to be followed and adhered to.

Clauses in this Section shall over-ride Clauses in Section 2 *General*, which may be in conflict.

4.2 Installation

Supply and fix sanitary fixtures including baths, water closets, basins, vanities, sinks, urinals and the like as noted on the Drawings specified or scheduled. Install to Manufacturer's recommendations and Statutory Authority requirements.

Supply and fix accessories including plug and washer, brackets, fixings, basin buttons, trims, sealants, mortar and the like to correctly and securely install the fixtures.

NOTE: *During construction, the plumber shall be responsible for the installation of noggins and supports in stud walls for the fixing to and support of sanitary fixtures.*

4.3 Built-in Fixtures

Make allowance to liaise with the joiner and other trades to ensure the correct location and size of cutouts in bench tops for vanity and semi-recess basins, inset laundry and kitchen sinks, tapware and the like.

During installation, supply and install sealing strips or seal fixtures to bench surfaces with an appropriate purpose made sealant.

4.4 Freestanding Fixtures

All vitreous and polypropylene sanitary fittings shall be WHITE unless otherwise noted on the Drawings, specified or scheduled.

All fixtures shall be plumb and level, neatly finished in a tradesman like manner, without damage and as outlined in the Section 2 (*General* Requirements) of this Specification.

4.4.1 Sealing Freestanding Fixtures

Sanitary fixtures that abut walls shall be sealed to the wall with a purpose made sealant of the same colour as the fixture unless otherwise specified or directed by the Superintendent.

The sealant shall be finished off in a tradesman like manner with no sealant being visible beyond the sealing rim or edge of the fixture.

4.4.2 Fixing Pans

With the exception of wall hung pans, pans shall be loose fitted in position and the floor edge of the pan marked on the floor. The pan is then to be removed and the floor tiles or covering shall be removed to within 25 mm of the marked line. Chisel out the floor to at least 30 mm depth and slightly undercut.

Install the pan with a strong mortar mix (minimum 3 sand 1 cement) in a manner so as to fill the internal void of the pan. Remove excess mortar and undercut by 3 mm. Fill undercut with a grout the same colour as the tile grout or floor cover colour.

Pans that come loose after installation shall be removed and re-fitted if undamaged or replaced if damaged, at the Contractor's expense.

4.5 Exposed Fixings and Brackets

All exposed fixings shall be chrome plated brass or stainless steel and brackets are to be hot dip galvanized steel unless otherwise specified or scheduled.



5 SERVICE SUPPLY PIPE WORK REQUIREMENTS

5.1 General

This section covers the entire supply and installation of potable and non-potable water supply for cold water, hot water, garden water incorporating backflow prevention, gas and fire hose reel service.

Refer to Section 2 *General* which outlines the minimum standards, procedures and installation requirements that are to be followed and adhered to.

Clauses in this Section shall over-ride Clauses in Section 2 *General*, which may be in conflict.

5.2 Installation

The entire supply service pipe work shall be solid drawn copper tube with the minimum wall thickness as specified in the *Equipment and Material Schedules* in Section 8 of this Specification or unless otherwise noted on the Drawings or specified.

5.2.1 Insulation

To help reduce noise transmission, the entire internal cold water pipe work is to be insulated in the same manner as specified for hot water in Clause 6.2 of this Specification.

5.2.2 Concealment

With the exception of connections to fixtures and equipment, pipe work is NOT to be exposed in the building unless otherwise noted on the Drawings or specified.

5.3 Pipe Sizes

Install pipes as required to all fixtures and equipment.

Where the pipe sizes are shown they are minimum sizes only. Water service sizes selected shall be to ensure pressure drop and water volume is in accordance with AS/NZS 3500.1 *Plumbing and drainage – Water services*.

Confirm that the available static and dynamic head is sufficient prior to commencing work. Be responsible to ensure the Superintendent is made aware, in writing, of pressure and / or flow problems prior to commencing work.

The gas and fire services shall be sized in accordance with Statutory Authority requirements.

5.4 Pipe Work Under Slabs

Service pipe work is NOT to be installed under slabs unless noted on Drawings or specified.

Where pipe work is to be installed under slabs, the following must be observed:

- Use only annealed copper tube.
- Where possible, installed in a continuous length with no joints or fittings.
- Have a protection coating as scheduled for underground service pipe work.
- Allowance is to be made for thermal expansion and contraction.
- Where the pipe work passes through concrete, lag with hair felt of no less than 25 mm thickness and wrap hair felt in Fortecon or duct tape.

5.5 Pipe Work Encased in Concrete

Service pipe work is NOT to be encased or cast into concrete slabs, floors or walls unless otherwise noted on the Drawings or specified.

Where pipe work is to be encased in concrete, the following must be observed:

- Use only annealed copper tube.
- Where possible, install in a continuous length with no joints or fittings.
- Allowance is to be made for thermal expansion and contraction.



- Fully lag with hair felt of no less than 25 mm thickness and wrap hair felt in Fortecon or duct tape.

5.6 Connections

Connect service pipe work to valves, fixtures, equipment and the like with demountable joints.

"Kinco" type connections used on the water services may only be used in areas where the floor is graded to a floor waste outlet. The copper tube must be correctly "croxed" prior to installation. In all other areas, compression type fittings must be used.

5.7 Cover Plates

Where water lines emerge from wall, floor or ceiling surfaces, provide purpose made cover plates of non-ferrous metal, finished to match the pipe, or of stainless steel.

Install in a neat, tradesman-like manner and of the size as follows:

PIPE DIAMETER	COVER PLATE DIAMETER (nominal)
Up to 20 mm	65 mm
Up to 50 mm	100 mm
Larger than 50 mm	50 mm larger than pipe

5.8 Pipe Work Finishes

In addition to protective coating (galvanizing, epoxy coating and the like) all pipe work, including fittings, support and the like, shall be installed as specified in Clause 8.10 of this Specification.

5.9 Accessories

Provide each fixture including conditioning plant with the accessories, water services including taps, valves, outlets and the like, necessary for the proper functioning of the fixture, compatible with the fixtures they serve and of types as selected and / or described in the Specification.

5.10 Valves

Where possible, conceal valves in ducts, cupboards or non-habitable areas. Where concealed in ducts and non-accessible areas, liaise with the Superintendent for an appropriate location and nominate the size of the openings required.

Provide and install a removable cover plate. Where installed below ground, install in a valve box. For valve box type, refer to the *Fixtures and Equipment Schedule* in Section 8 of this Specification.

5.11 Valve Selection Table

GATE AND NON-RETURN VALVES				
LOCATION	SIZE	TYPE	MATERIAL	CONNECTIONS
All locations	Less than 80 mm	Full bore ball valve	Copper alloy	Screwed
Above ground and in pits	Less than 80 mm	Swing check	Copper alloy	Screwed
	80 mm or larger	Full bore gate, or swing check	Cast iron or cast iron steel	Flanged
Below ground	80 mm or larger	Full bore sluice	Cast iron	Flanged



5.12 Backflow Prevention

Make allowance to install all backflow prevention devices to the water reticulation system as required by AS/NZS 3500 *Plumbing and drainage* incorporating regional variations and Statutory Authority requirements.

Install backflow devices at the locations shown on the Drawings as scheduled or as required by SA Water.

5.13 Isolation

Install building hot water supply isolation valves next to the hot water unit, or as shown on the Drawings.

Install an isolation valve to each gas appliance in an easily accessible position.



6 HOT WATER

6.1 General

This Section covers additional installation requirements for hot water pipe work, the installation of hot water units and circulation pumps.

Refer to Section 2 *General* which outlines the minimum standards, procedures and installation requirements that are to be followed and adhered to.

Refer to Section 5 *Supply Service Pipe Work* which outlines the minimum standards, procedures and installation requirements for pipe work, valves, materials, finished and the like, that are to be followed and adhered to.

Clauses in this Section shall over-ride Clauses in Section 2 *General* and Section 5 *Supply Service Pipe Work* which may be in conflict.

6.2 Installation

Hot water is to be provided to all sinks, basins, and laundry troughs and as indicated on the Drawings or as scheduled.

The entire hot water pipe work shall be insulated with the pipe support system being installed over the pipe insulation and NOT in contact with the pipe.

Pipe insulation type, wall thickness and jointing methods of the insulation shall be as scheduled in Clause 8.2.5 *Thermal Pipe Installation*.

NOTE: *Visual connections to fixtures and equipment are not required to be insulated.*

Hot water units shall be installed to Manufacturer's recommendations.

6.3 Hot Water Services

Provide and install hot water heaters at the locations shown on the Drawings, or as scheduled.

Heaters shall be of capacity and type as scheduled or noted on the Drawings.

6.4 Circulation Pump

Supply and install in the return line of the hot water ring main an inline circulating pump. The pump shall be similar to a "Grundfoss" inline circulating pump and shall have adequate capacity to ensure good supply of hot water to all outlets.

The maximum temperature loss on the return line is to be 3°C below the outlet temperature.



7 GAS SERVICE

7.1 General

Refer to Section 2 *General* which outlines the minimum standards, procedures and installation requirements that are to be followed and adhered to.

Refer to Section 5 *Supply Service Pipe Work* which outlines the minimum standards, procedures and installation requirements for pipe work, valves, materials, finishes and the like, that are to be followed and adhered to.

Clauses in this Section shall over-ride conflicting Clauses in Section 2 *General* and Section 5 *Supply Service Pipe Work*, which may be in conflict.

7.2 Installation

Gas is to be provided to all gas appliances and equipment as indicated on the Drawings or as scheduled. The installation of the pipe work and flues, connection to appliances and the like shall be to the relevant Statutory Authority requirements and Manufacturer's recommendations.

7.3 Flues

Provide and fix flues to gas appliances and equipment as shown on the Drawings and where required.

Offset flues as required and extend through roof to correct height and fit with an appropriate cowl. Flues shall be sized and of an appropriate material to suit the individual situation. Install in a manner so as not to create a fire hazard due to heat transfer.

Refer to *Fixtures and Equipment Schedule* in Appendix A of this Specification for flue material and type.

7.3.1 Roof Flashing Penetrations

Flash flue pipes where they penetrate the roof with a purpose made flashing that can withstand the heat transmitted from the flue.

Where the flashing is sealed with a silicon type sealant, the sealant is to be sandwiched between the flashing and NOT just smeared over the surface of the joint between the flashing and the roof material.

Sealing the flue pipe to the roof material will NOT be accepted.



8 EQUIPMENT AND MATERIAL SCHEDULES

8.1 General

Provide and install equipment and materials as scheduled.

Where supply and installation of 'equally approved or approved equivalent items' are intended to be used instead of scheduled items, approval in writing must be gained from the Superintendent prior to supply and installation.

8.2 Pipe Work

SERVICE	PIPE TYPE
Sewer pipes:	PVC: SH Class Grease: HDPE
Soil, waste and vent:	PVC - SWV Class
Cold water underground:	Class 12 Polypropylene MDPE pipe
Cold water:	<ul style="list-style-type: none">External underground: Class 12 Polypropylene MDPE pipe(ie Rehau)Internal above ground (not exposed to view, ie ceiling space): Class 12 Polypropylene MDPE pipe(ie Rehau)Internal above ground (exposed to view): Chrome plated Copper Type BBelow slab: Copper Type B wrapped to suppliers recommendations.
20 mm tundish wastes for air conditioning units:	Copper Type B
Hydrant main:	Blue Brute
Fire hose reel:	Copper

8.2.1 Underground Copper Pipes

Underground copper pipe work to be "polylag" or equally approved, installed to Manufacturer's recommendations or wrapped with "Denso" 600 with 55% overlap.

8.2.2 Roof Penetrations Flashings

Flash pipe work where it penetrates roofs with a "Dektite" flashing of the appropriate size or equally approved unless otherwise specified.

8.2.3 Pipe Work Temperature

For pipe work with operating temperature of up to 115°C use a flashing made of EPDM rubber.

For pipe work with operating temperature in the range of 115°C to 200°C use a flashing made of silicone rubber.

8.2.4 Flashing Colour

Where flashing the pipe work in visual locations with operating temperatures up to 115°C, the colour of the flashing shall be as near as practical to the roof colour unless otherwise specified.

For flashing to pipe work above the 115°C operating temperature range, the only available colour in silicone flashing is RED.

8.2.5 Thermal Pipe Installation

Insulate the entire hot water service pipework including branch lines with Bradford "ARMAFLEX" 13 mm wall thickness or equally approved.



Insulate the entire internal cold water service pipe work in the same manner as the hot water service pipe work so as to minimise noise transmission.

8.2.6 Jointing

MATERIAL		
Copper	Generally	15% Silver brazed PhosCopper (BROWN tip), or Copper and bronze press fittings, Viega Propress system or equivalent approved
	Taps	Compression fittings
	Valves up to 50 mm	Screwed
	Valves 50 mm and over	Flanged
Brass	Generally	15% Silver brazed PhosCopper (BROWN tip)
UPVC	SH Class	Solvent welded
	SWV Class	Solvent welded
	Pressure	Solvent welded
Polypropylene		Mechanical or electric welded
Insulation to hot water pipe work		Contact adhesive as approved by the Manufacturer. Taping joints will NOT be accepted

8.3 Traps and Wastes

FIXTURES	TRAP	WASTE
Kitchen sink	Polypropylene	PVC
Hand basins	Not exposed polypropylene Exposed copper chrome plated	PVC Copper and chrome plated
Tundishes	Polypropylene	PVC, unless noted otherwise

8.3.1 Floor Waste Outlets

Chrome plated brass cover with brass inserts.

8.4 Inspection Openings

LOCATION		MATERIAL
Internal		Nickel-bronze cover with brass inserts
External	Paved areas	Everlevel Type 1 cast IO marked "SEWER: with concrete support block approved equivalent
	Unpaved areas	Everlevel Type 2 cast IO marked "SEWER: with pre-cast concrete surround approved equivalent
	Concrete path	Ø 150 mm PVC bolted trap screw in accordance with Detail on Drawing

NOTE: External inspection openings shall include "bolt down" vandal proofing.

8.5 Stainless Steel Fixtures

Refer to *Fixtures and Equipment Schedule* in Appendix A for details.



8.6 Sanitary Fixtures

Refer to *Fixtures and Equipment Schedule* in Appendix A for details.

8.7 Tapware

Refer to *Fixtures and Equipment Schedule* in Appendix A for details.

Accessories such as taps, valves, outlets and backflow prevention such as vacuum breaks, shall include but not be limited to those scheduled below for specific locations or fixtures.

Taps and fittings in all areas shall be vandal proof T5 chrome plate on brass.

Flanges, outlets and accessories to be chrome plate.

NOTE: Hot and cold water tapware to turn off and on in the same direction of rotation NOT counter-rotating.

Where outlets and breaching pieces penetrate the stud walls, seal between the brass and the wall material with a silicone sealant, in a manner to stop egress of water into the stud wall cavity.

8.8 Hot Water Service

Refer to *Fixtures and Equipment Schedule* in Appendix A for details.

8.9 Valves

All isolation valves to be "Kim" quarter turn ball valves or approved equivalent unless otherwise specified. All valves to be installed with demountable joints.

LOCATION	SERVICE TYPE	ACCESSORY
All	Hot water services	In accordance with SA Water requirements
All	Hot and cold water isolation valves	
Valve boxes		Type: H-R products Size: 432 mm x 370 mm x 305 mm deep Code: 1419-12VBKL key lockable
	Installation requirements	Isolation valve is to be positioned within 75 mm of the underside of the valve box lid and in a position where the valve can be removed without disturbing the valve box.
Garden tap	All	Type: T head, screw nose bibcock Size: 20 mm Finish: Rough brass Fitting: To wall or on purpose made support 600 mm above finished ground level



8.10 Pipe Work Finishes

FIXTURES	PIPE TYPE	FINISH
Basins	Waste	Concealed: PVC Exposed: Chrome plated copper
	Hot and cold water	Exposed: Chrome plated Not exposed: Copper
Sinks	Waste	Concealed: PVC Exposed: Chrome plated copper
	Hot and cold water	Exposed: Chrome plated Not exposed: Copper
Cisterns	Cold water	Chrome plated copper
Hot water units	Cold water	Copper
	Hot water	Copper with Armaflex insulation
Pipe fittings	All	To match pipe work

For and on behalf of
TMK Consulting Engineers



APPENDIX A:

Fixtures and Equipment Schedule



A1 Stainless Steel / Sanitary Fixtures

Refer Architectural documentation for details.

A2 Tapware

Refer Architectural documentation for details.

A3 Miscellaneous Items

Backflow Prevention

1 x 40 mm Wilkins testable double check valve for incoming water supply (containment protection).
25 mm Wilkins DCVA for non-potable (irrigation) water supply.
15 mm Wilkins In Line Dual Check valve to each external hose cock.
1 x gas solenoid for gas meter supply.

Thermostatic Mixing Valves

Provide Enware Aquablend TMV 1500 thermostatic mixing valves throughout for tempered hot water to hand basins.

Apartments

Enware thermostating mixing valve with 20 mm cold water supply isolation valve in ceiling with access panel adjacent.

Make: Enware
Model: Mixing valve: Aquablend 1500 TMV.

Temperature set point: 43°C.

General Sinks, Laundry, Kitchen sinks

Un-tempered hot water: 65°C.

External Taps

All external taps shall be CB crew nosed 15 mm standpipe taps, supported on approved standpipes with backflow prevention, as Scheduled.

Isolation Valves – Internal

All rooms / fixtures provided with un-tempered water to be provided with a 300 mm x 300 mm x 75 mm recessed wall mounted stainless steel box, with cold and hot water isolation valves.

Isolation valve sizes as indicated on the Drawing.

Front panel to be colour matched to suit wall colour.

Areas served to be clearly labelled within box assembly.

Isolation Valves – External

Isolation valves installed above ground shall be ISIS DR ball valves.

Isolation valves used externally and above ground shall be Fratelli ball valves and installed in HR rectangular valve boxes, key lockable with Allen key.





HWS-1: Hot Water Systems

Make:	Rheem or equivalent approved.
Type:	Continuous flow unit with storage cylinders.
Model:	TPE02/1430
Storage cylinders:	1 x 410 L tanks.
Set up:	2x Rheem continuous flow heater manifolded together for common supply to main building, at 75°C supply.
Power:	1 off 240 V 50 Hz general purpose outlet (GPO) for each heater to be located within 1.2 metres of the installation. The GPO must be clear of the flue exhaust, draining water, gas supply pipe and water connections.
Special requirements:	1 off 10 AMP Isolator or GPO for Rheem Redi-set Continuous flow units mounted against wall.

Installation requirements

The Equa-Flow manifold system is to be utilised to ensure maximum hot water draw off from all units, to meet load requirements.

All hot water pipework to be insulated in the hot water system.

A hot water return loop to be incorporated, via an inline recirculation pump capable of handling all hot water requirements for the system.

Hot water system installation shall be in accordance with Manufacturer's recommendations.

In-Wall Tundish

Make:	Mod-Tec
Type:	Stainless steel in-wall tundish with powder coated cover plate, to Architect's colour selection. (Mount 400 afl to centre of cover panel).

Floor Wastes

Wet areas - Tiled

Floor Wastes: Nickel bronze floor waste round, 100 x 65. GE 'Slip-Safe' or equivalent.

Wet areas - Vinyl

Floor Wastes: Nickel bronze floor waste vinyl, 100 x 65. GE 'Slip-Safe' or equivalent.

Internal Inspection Points

Tiled Areas: Nickel bronze cleanout round. GE 'Slip-Safe' or equivalent.

Vinyl Areas: Nickel bronze cleanout vinyl. GE 'Slip-Safe' or equivalent.

Gas Shutdown – Automatic

Manufacturer:	Accutherm or equivalent approved.
Shut off system:	50 mm gas solenoid valve at high level

On fire alarm signal from FIP, gas supply to automatically shutdown.

All controls, solenoid valve, and all associated items by the Hydraulics Contractor.

Power supply to solenoid valve by Electrical Contractor.

Signal at FIP by Fire Contractor.

Private Water Meters

Make: Enware Hydrometers 20DN or equivalent approved.

Note: All water meters to be digital type with pulse output suitable for remote monitoring.

Provide access panels by Building Contractor as required.

Note: Origin Energy to supply private hot water meters, installation of meters and reticulation to and from these meters by hydraulics contractor.



Sewer Pipework – Acoustic Lagging

All above ground sewer and wastewater pipework, including risers, shall be acoustically lagged to ground level in accordance with BCA requirements. Alternatively, acoustic rated pipework such as Raupiano or approved equivalent, can be used.

PVC lagged with 4.5 kg/m² loaded vinyl on foam / fiberglass.

All fixings shall be of resilient mount type.

Where possible, stand-off brackets shall be used.

Water supply shall be fitted with hammer arresters.

Pipework shall be arranged such that it is located on the ensuite side of the wall to the maximum extent possible.

Penetrations through noggins and top and bottom plates shall be fitted with resilient grommets, or silicone sealed to prevent vibration.



APPENDIX B:

Schedule of Rates and Cost Summary



SCHEDULE OF RATES AND COST SUMMARY

B.01 SCHEDULE OF RATES

Provide a breakdown of hydraulic services rates. Rates quoted shall be exclusive of GST.

ITEM	RATE \$ (excl GST)
3 m of 100 mm diameter Ø sewer pipe work 1500 mm deep	
3 m of 150 mm diameter Ø sewer pipe work 1500 mm deep	
Cost of ensuite (only work within the ensuite)	
Sewer	
Water distribution	
Tapware	
Fixtures	
Cost of HW unit(s) as per Drawings, fully connected with 1 m of pipework	
Underground pipe work (water):	
20 mm	
25 mm	
32 mm	
40 mm	
50 mm	
65 mm	
Copper pipe work within the building	
20 mm Bare:	
Insulated:	
Valves	
Mixing valves	
Isolating valves	
Valve box	



B.02 SUMMARY OF COSTS

Provide a cost summary of the hydraulic services costs. Rates quoted shall be exclusive of GST.

ITEM	COST \$ (excl GST)	COST \$ (Incl GST)
1. Site Works		
Sewer distribution		
Water reticulation		
Gas distribution		
Sub Total		
2. Building Works		
Sewer works		
Fixtures / fitting		
Water distribution		
Valve box assemblies		
Grease arrestor		
Oil separator		
Gas works		
Hot water distribution		
Sub Total		
GRAND TOTAL		