LUCID
CONSULTING AUSTRALIA

HYDE PARK PLACE

248 UNLEY ROAD, HYDE PARK

Project No: LCE14462

Hydraulic Services

Specification

Tender Issue

Revision T1

SPECIFICATION ISSUE REGISTER

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1 GENERAL

1.1 CROSS REFERENCES

All work covered within this specification shall be read in conjunction with the following trade packages and contracts. Should any discrepancy occur between the references, the larger/greater shall be assumed and referred to the Engineer prior to proceeding with works.

- Preliminaries and General Contract Conditions.
- Architectural Documentation
- Electrical, Fire and Mechanical Services Documentation
- Structural and Civil Services Documentation.
- Geotechnical Soil Report.
- Acoustic Engineers Report and Documentation.
- Fire Engineering Report

The above documentation shall be made available upon request through the head contractor.

1.2 PROJECT DETAILS

The works described within this specification pertain to the Hydraulic Services installation for the proposed Hyde Park Place development at 248 Unley Road, Hyde Park.

1.3 DEFINITION OF TERMS

Consulting Engineers	-	Lucid Consulting Engineers
Proprietor	-	Client or end user of the proposed building
Principal/Client	-	Citify Group Pty Ltd
Head Contractor/Builder	-	Registered Building Contractor appointed to carry out the construction of the building. Hydraulic Contractor shall enter contact to undertake the Hydraulic Services installation with the successful builder.
Contractor	-	Installer undertaking the works.
Works	-	As described within this specification
Provide	-	Supply, install, commission and place into service
Equal Approved	-	Alternative product/method of installation which is presented to the consulting engineer and written approval is received.
Local Gas Authority	-	Envestra (APA Group)
Local Water Authority	-	SA Water Corporation
Local Technical Regulator	-	SA Water Trade Waste Department Office of the Technical Regulator
Local Fire Authority	-	South Australian Metropolitan Fire Services (SAMFS)
Local Power Authority	-	SA Power Networks

1.4 CONTRACT

Fixed Price Lump Sum Contract

The Hydraulic Contractor is to enter into a fixed price lump sum type contract. The following specification and accompanying drawings outline the general scope of works and have been prepared to enable specialist Plumbing Contractors to submit fixed sum tender prices for the plumbing installation. The drawings are intended to indicate the principles of design and should not be taken to define all offsets, bends etc which may be required to complete the installation and or be coordinated with other services. The Plumbing Services Contractor will be responsible for final coordination with other trades and for final coordination with Architectural Drawings and building structure.

The tender drawings are not to be used for architectural or structural work but are to be read in conjunction with architectural, structural and other relevant drawings.

Coordinate all pipe runs with Mechanical, Electrical, Fire and Sustainability Services trades to ensure non-clashing of services.

Deviation from the design principals shown will not be permitted without the written consent of the Superintendent.

Any discrepancies which may affect the installations shall be brought to the Superintendents attention before the work proceeds.

The Contractor shall also familiarise themselves with the location of existing pipe and cable runs. No variation will be issued for any damage caused to existing services.

1.5 DRAWINGS

Drawings associated with and forming part of this specification are scheduled below:

Drawing Number	Drawing Title
LCE14462-H000	Cover Sheet and Drawing Index
LCE14462-H001	General Notes and Legend of Symbols
LCE14462-H100	Site Plan
LCE14462-H101	Townhouse Services Arrangement
LCE14462-H200	Basement Sanitary Drainage Arrangement
LCE14462-H201	Ground Floor Sanitary Drainage Arrangement
LCE14462-H202	1st Floor Sanitary Drainage Arrangement
LCE14462-H203	2nd Floor Sanitary Drainage Arrangement
LCE14462-H204	3rd Floor Sanitary Drainage Arrangement
LCE14462-H205	4th Floor Sanitary Drainage Arrangement
LCE14462-H206	5th Floor Sanitary Drainage Arrangement
LCE14462-H207	6th Floor Sanitary Drainage Arrangement
LCE14462-H208	Basement Water and Gas Reticulation Arrangement

LCE14462-H209	Ground Floor Water and Gas Reticulation Arrangement
LCE14462-H210	1st Floor Water and Gas Reticulation Arrangement
LCE14462-H211	2nd Floor Water and Gas Reticulation Arrangement
LCE14462-H212	3rd Floor Water and Gas Reticulation Arrangement
LCE14462-H213	4th Floor Water and Gas Reticulation Arrangement
LCE14462-H214	5th Floor Water and Gas Reticulation Arrangement
LCE14462-H215	6th Floor Water and Gas Reticulation Arrangement
LCE14462-H216	Roof Hydraulic Services Arrangement
LCE14462-H300	Sanitary Drainage and Trade Waste Drainage Schematic
LCE14462-H301	Hot Water, Cold Water and Natural Gas Reticulation Schematic
LCE14462-H302	Details Sheet 1
LCE14462-H303	Details Sheet 2

The Hydraulic Services drawings and associated specification along with the architectural drawings are intended to define the principles of design and scope of the Hydraulic Services installation. The drawings are intended to indicate the principles of design and should not be taken to define all offsets, bends etc which may be required to complete the installation and avoid other services. The Plumbing Services Contractor will be responsible for final coordination with other trades and for final coordination with Architectural Drawings and building structure.

The tender drawings are not to be used for the purpose of defining the Architectural intent however are to be read in conjunction with architectural, structural and other relevant drawings.

Coordinate all pipe runs with all other trades to ensure non clashing of services.

Deviation from the design principals shown will not be permitted without the written consent of the Superintendent. Any discrepancies which may affect the installations shall be brought to the Superintendents attention before the work proceeds.

The Contractor shall also familiarise himself with the location of existing pipe and cable runs. No variation will be issued for any damage caused to existing services.

1.6 SCOPE

The work covered by this specification includes the following:

General Requirements

- The provision of a Hydraulic Services installation that satisfies all statutory legislative and code requirements and satisfies the general details herein.
- The planning, scheduling, procurement of components and installation to meet the programme, coordination and liaison with the head contractor and other trade packages.

- Full responsibility for the execution of the complete installation in accordance with the specification and drawings.
- The installation, testing, commissioning, maintenance, service and warranty and all sundry and material items, whether mentioned in detail or not, required to complete the installation and place into working order.
- Compliance with all relevant Work Health and Safety legislation and best practice including any site specific requirements or regulations such as attendance at site inductions and adherence to the procedures covered in such inductions.
- Full responsibility for the execution of the complete installation in accordance with the specification and drawings, and related authority requirements. Provide all manufactured items, materials, labour, cartage, tools, plant, appliances, and fixings necessary for the proper execution of the works, together with all minor and incidental works.
- Final coordination, manufacture, supply, installation, testing, commissioning and subsequent maintenance service and warranty for the stipulated period, of the work specified herein and shown on the accompanying drawings.
- The whole of the works shall comply with all relevant Regulations and to all Local Authority requirements. The cost of any materials or equipment required to meet such regulations and requirements shall be included in the Tender whether specifically shown or described in the documents or not.

Infrastructure Requirements

Make Application and Pay Associated Fees to 'SA Water Corporation' for the following works:

- For the installation of two (2) new 150mm sewer connections off Unley Road to service the proposed apartment development.
- For the installation of one (1) new 100mm sewer connection off Opey Avenue to service the proposed townhouses.
- For the installation of a new below ground 50mm water meter connection off Unley Road within an inground cast iron valve box complete with heavy duty lid to service the proposed apartment development.
- For the installation of three (3) new below ground 20mm water meter connections off Opey Avenue within inground cast iron valve boxes complete with heavy duty lid to service Townhouses A, B and C.
- For the installation of a meter manifold off Opey Avenue consisting of three (3) new above ground 20mm water meters to service Townhouses D, E and F.
- For the removal of one (1) 100mm sewer connection off Unley Road.
- For the removal of two (2) 100mm sewer connections off Opey Avenue.
- For the removal of one (1) 25mm water meter connection off Unley Road.
- For the removal of one (1) 20mm water meter connection off Opey Avenue.

Make Application and Pay Associated Fees to 'APA Group' for the removal of two (2) gas meter connections off Opey Avenue, including removal of existing gas meters.

Make Application and Pay Associated Fees to 'APA Group' for the installation of a new gas connection to the site off Opey Avenue serving the following gas meters – note that the gas meters shall be installed within a combined fire rated enclosure complete with louvered doors:

- One (1) off Gas Meter serving the apartment building capable of 1750MJ/hr at 2.75kPa.
- One (1) off Gas Meters for future café tenancies capable of 500MJ/hr at 2.75kPa.
- One (1) off Gas Meter for future restaurant tenancy capable of 1000MJ/hr at 2.75kPa.

Make Application and Pay Associated Fees to 'APA Group' for the installation for the following works servicing the proposed townhouses:

- Three (1) off Gas Meters each capable of 260MJ/hr at 2.75kPa servicing Townhouses A, B and C within individual gas meter boxes off Opey Avenue.
- Three (1) off Gas Meters each capable of 260MJ/hr at 2.75kPa servicing Townhouses D, E and F within a common fire rated gas meter enclosure complete with louvered doors.

Note:

- Temporarily maintain existing water and sewer connections for connection to Builder's Amenities, with final scope of works to be resolved with Main Contractor.
- Contractor shall bear full reasonability for verified and establishing sewer connection location and depth prior to commencement of any works. Abortive work caused due to failure to verify the above shall be at the cost of the plumbing contractor.
- Contractor shall confirm locations of new services with utilities personal prior to commencement of works.

Building Services Requirements

Soil and Waste Drainage System

- Internal suspended soil and water drainage system extending from new sewer connection points to serve apartments, commercial tenancies and base building areas in accordance with AS/NZS3500 including associated vents.
- Establish of reflux valve at boundary in lieu of complaint flood gully upstream of each sewer connection at high level in Basement in accessible location.
- Air admittance valves to drainage branches as indicated on drawings in accordance with AS/NZS3500 and manufacturer installation instructions.
- Full Vented Modified soil and waste stack system extending from apartments to high level in Basement in accordance with AS/NZS3500, including elevated drainage system for suspended pipework up to 2nd Floor.
- Acoustic lagging to all suspended soil and waste drainage pipework within the ceiling spaces and in accordance with the Acoustic Engineers requirements. Acoustic lagging shall extend to soil and waste stacks located within service ducts.
- Suspended soil and waste drainage system within Basement carpark serving townhouses extending from sewer connection point in accordance with As/NZS3500 including associated venting, inspection openings and overflow relief gullies for compliance with the requirements for multi-unit developments.
- Identification Labels to suspended soil and waste pipework and detectable identification tape to inground drainage systems.

Trade Waste Drainage System

- Trade Waste Drainage System serving Ground Floor Commercial Tenancies in accordance with AS/NZS3500 and requirements of SA Water Corporation.
- Supply and install two (2) off 5000 Litre grease arrestors complete with heavy duty gatic lids in accordance with SA Water Trade waste Corporation Guidelines, including associated vents.
- Provision of remote pump out point on Ground Floor extending from Basement to allow for remote pump out of grease arrestors complete with camlock connections.
- Identification Labels to suspended trade waste pipework and detectable identification tape to inground drainage systems.

Drinkable Hot and Cold Water Reticulation

- Drinkable cold water reticulation system in accordance with AS/NZS3500 extending from authority water meter to service apartments and commercial tenancies.
- Drinkable hot water reticulation system in accordance with AS/NZS3500 extending from central hot water plant to service apartments and commercial tenancies.
- Provision of cold water and hot water supplies to apartments and commercial tenancies complete with isolation valves and pulse output water meters as indicated on drawings. Note that hot and cold water meters shall be supplied by Embedded Network Provider for installation by hydraulic services contractor.
- Provision of cold water supply to pool plant room complete with reduced pressure zone device and separate dedicated supply for connection to emergency shower and eye/face wash as indicated on drawings.
- Pressure reducing valves to hot and cold water branch take-offs as required to maintain maximum operating pressure of 500kPa as indicated on drawings.
- Supply and installation of Thermostatic Mixing Valves and Tempering Valves as indicated on drawings in accordance with manufacturers installation instructions.
- Installation of testable double check valve on incoming cold water supply at high level in basement downstream of authority water meter in accordance with AS/NZS3500.
- Installation of testable double check valve on cold water supplies to washdown taps within waste area, adjacent pump chamber and adjacent grease arrestors in accordance with AS/NZS3500 and SA Water Corporation Trade Waste Requirements.
- Provision of capped water supply in waste room for future connection to irrigation systems complete with testable double check valve in accordance with AS/NZS3500.
- Provision of thermal and acoustic lagging to hot and cold water pipework as specified.
- Provision of cold water supply to each townhouse extending at high level in Basement Carpark from individual authority meters in accordance with AS/NZS3500.
- Identification labels to suspended pipework, tags to valve and equipment, and detectable identification tape to inground pipework.

Non-Drinkable Water Reticulation

- Non-drinkable cold water reticulation system for irrigation systems extending from capped backflow prevention device to base building planters in accordance with AS/NZS3500 and Guidelines for Non-Drinking water in South Australia.

- Identification labels to suspended pipework, tags to valve and equipment, and detectable identification tape to inground pipework.

Natural Gas Reticulation

- Natural gas reticulation systems extending from authority gas meters to serve apartments, central hot water plant and commercial tenancies in accordance with AS/NZS5601.
- Provision of natural gas supplies to each apartment as indicated on drawings complete with isolation valve in accessible location in accordance with AS/NZS5601.
- Provision of natural gas supply to each townhouse extending at high level in Basement Carpark from individual authority meters in accordance with AS/NZS5601.
- Identification labels to suspended pipework, tags to valve and equipment, and detectable identification tape to inground pipework.

Plant and Equipment

- Central Hot Water Plant as specified shall be supplied and installed by Embedded Network Provider for final connection by hydraulic services contractor, including supply and install of all flues in accordance with manufacturers installation instructions.
- Supply and install of drinkable hot water circulating pumpset as specified in accordance with the manufacturers installation instructions.
- Supply and install of drinkable cold water pressure pumpset as specified in accordance with the manufacturers installation instructions.
- Supply and install of drinkable cold water storage tanks as specified in accordance with the manufacturers installation instructions.
- Supply and install inground sewer ejector pump station as specified, complete with chamber, pumps, associated valves, pipework and controls in accordance with the manufacturer installation instructions.
- Supply and installation of all sanitary fixtures and tapware as scheduled in the architectural documentation in accordance with the supplier installation instructions.
- Supply and Install of Emergency Shower and Eye/Face Wash as specified in accordance with manufacturers installation instructions.
- Provision for commissioning of all plant supplied and installed by the manufacturer.

General Requirements

- Provision and installation of timber trimmers in walls for securing of fixtures and water pipework connection points.
- Fire stop collars to all PVC and HDPE pipework penetrations associated with the sanitary drainage systems where pipework penetrates fire rated floors, including pipework located within plumbing ducts and/or service rooms.
- Set-out or cause set-out of all plumbing penetrations, including the installation of all necessary sleeves. The plumber shall be responsible for this set-out and any rectification works necessary by incorrect set-out.
- Provision of roof over flashing (dektites) to all pipe penetrations through roof.

- Trenching and backfilling associated with service connections to the site. All compaction shall be strictly in accordance with the requirements of Local Council. Apply for permits and pay all necessary fees for temporary road and/or footpath closure.
- Allow for trenching and backfilling necessary to complete the work. Upon completion of backfilling, the work area and it's surrounds shall be left tidy and level, and all surplus soil removed from site and disposed of by the plumber and at the plumbers entire cost.
- All rubbish is to be disposed of in the designated waste disposal area as directed on site. All rubbish is to be disposed of in this manner the same day that it is generated.
- Apply for all necessary approvals to perform the described works and pay all relevant and required fees.
- Provide compaction testing of service trenches as per the civil and structural engineer's approval.
- Provide traffic control/management to works required.
- Temporary service connections to site amenities. Refer to Builder's scope of works in relation to temporary connections required during the construction period.
- Maintenance and Defects Liability Period of 12 months.

Note: Apartment Bathrooms shall be POD Bathrooms constructed by the builder off site and delivered to site for final connection by hydraulic services contractor. POD Bathroom shall include all internal cold and hot water pipework, internal drainage above slab and all sanitary fixtures and tapware. Hydraulic Services Contractor shall allow to connect apartment cold water and warm water supplies to capped supplies to POD, and extend drainage risers from POD below slab as indicated on drawings.

Variations to the Scope

Instructions may be issued throughout the project which may alter the scope of works. Any aspects of any such works which are not specifically mentioned in any instruction are to comply with this specification.

Any claims for any additional costs or credits for any such variations must be submitted with a complete breakdown of costs including quantities and rates for all labour, materials and equipment. Variation Claims submitted without breakdowns will be rejected.

Substitutions

Where a substitution to the specification is proposed, the contractor shall submit each substitution, incorporating technical details and a cost breakdown, to the head contractor. The substitution shall be reviewed by the consulting engineer and the client for consideration. Unless approved by the consulting engineer and the client, the substitution will not be acceptable as an equal or approved approach to the specification.

1.7 ASSOCIATED WORKS

The following works related to the Hydraulic Services installation shall be carried out under other trade packages at the direction of the head contractor unless otherwise indicated. Cabling is to be terminated by the trade responsible for running the cable. Coordinate all cable locations, runs / routes, terminal strip locations and ensure that information is provided to other trades to facilitate cabling and termination.

Electrical Services Trade

- Provision of 415 volt 3 phase power supply and connection to Drinkable Cold Water Pressure Pumpset controller located on Basement Level.
- Provision of 240V single phase power supply to Central Gas Fired Domestic Hot Water Plant and connection to pre-wired assembly via a weatherproof isolating switch.
- Provision of power supply and connection to Drinkable Hot Water Return Pumpset controller located within Ground Floor Plantroom.
- Provision of 415 volt 3 phase power supply and connection to Basement Sewer Ejector Pit controller located in lower basement.
- 240 volt GPO located adjacent to each dishwasher within cupboard space adjacent dishwasher recess, within each apartment. Arrange with Joiner for cable and plug access via joinery divider.
- 240 volt GPO located under gas hot plate within each apartment.

Mechanical Services Trade

- Extension of condensate drains to discharge over tundishes complete with air gap.

Fire Protection Services

- Sprinkler drain point to discharge over tundish with associated air gap.
- Sprinkler control valve discharge over tundish with associated air gap.
- Fire tank overflow discharge over tundish with associated air gap.

Structural Services

- Provision of rebate in Ground Floor Slab to allow for installation of incoming 'APA Group' Gas Pipework.
- Penetration of pipework through structural slabs, beams and walls.
- Coordination of pipework installed cast into structural beams and footings.

Builders Related Trades

- Construction of non-fire rated plumbing ducts with slab 'block-outs' for services reticulation and subsequent re-grouting of penetration to maintain floor fire rating.
- Construction of 'APA Group' gas meter enclosure including louvered doors.
- Provision of rebates in Ground Floor Slab for installation of incoming gas service.
- Supply and installation of Bathroom Hardware i.e. towel rails, soap holders etc.
- Construction of POD Bathrooms including all internal cold and warm water reticulation pipework, above slab drainage pipework, sanitary fixtures and tapware, and associated hardware e.g. handrails, towel racks. Construction of POD bathroom shall include all commissioning and testing of all system and services in accordance with AS/NZS3500 for each POD bathroom prior to installation on site.
- Installation of roof membrane and roof pipe penetration up stands.
- Supply and installation of access panels.

Embedded Network Provider

- Supply and Install of Central Hot Water Plant as specified.
- Supply of Pulse Output Hot and Cold Water Meters for installation by plumber.

1.8 STANDARDS

GENERAL REQUIREMENTS

Comply in all respects with the requirements of the current standards applicable to the works in respect to equipment, material, workmanship and installation techniques.

Comply with the following standards and regulations:

- Building Code of Australia
- Australian Standards
- SA Water Corporation Regulations
- SA Water Corporation Trade Waste Guidelines
- Office of the Technical Regulator (OTR) Regulations
- APA Group
- Guidelines for Non-drinking Water in South Australia
- SA Health Department
- Work Health and Safety Regulations
- SA Power Networks Supply Regulations
- SA Government Acts governing the works
- Local Council
- Occupational Health, Welfare and Safety Regulations
- SA 76 – Ministers Specification – testing and maintenance of essential safety provisions

Note - The whole of the sanitary plumbing and water supply shall be carried out by, or under the direct supervision of, a registered fully Licensed Contractor Plumber and licensed Gas Fitter. All work shall be done in accordance with the relevant provisions of AS/NZS3500, AS/NZS5601:2013, the regulations and directions of the SA Water Corporation, Office of the Technical Regulator (OTR) and to the complete satisfaction of the Superintendent.

Approvals

The documents evidencing approval of such authorities, which are to be forwarded to the Superintendent before final payments and the notice of Practical Completion is issues, shall include the SA Water Corporation and OTR Certificates of Compliance which shall be completed and issued by the contractor.

Works by Authority

If the responsible authority is required to or, pursuant to the statutory powers vested in it, elects to perform or supply part of the works or to inspect or test the Works during construction, make the necessary arrangements with the authority and pay and bear the fees payable in connection therewith.

Australian Standards and Codes

Australian Standards, Codes and Statutory Authority Requirements current at the date of tendering are applicable in respect of all workmanship except where they conflict with the provisions of this Specification.

The following codes which specifically form part of this specification insofar as they are appropriate together with such other codes as required by the Authorities having jurisdiction shall be complied with:

Hot Water, Cold Water and Natural Gas Services	
AS1345	Identification of the contents of piping, conduits and ducts.
AS1432	Copper tubes for water, gas and sanitation.
AS1585	Capillary and brazing fittings of copper and copper alloy.
AS1590	Copper alloy threaded pipe fittings for use with tubes threaded with pipe threads of Whitworth form.
AS1628	Copper alloy gate valves and non-return valves for use in water supply and hot water services.
AS1645	Copper and copper alloy compression fittings for use in water supply and hot water services.
AS1718	Copper alloy draw-off taps, stop taps, and ferrule or main taps for use in water supply and hot water services.
AS2129	Flanges for pipes, valves and fittings.
AS2845	Water Supply backflow prevention devices.
AS/NZS3500-1	Water Supply – acceptable solutions.
AS2492	Crosslinked polyethylene (XLPE) pipe for hot and cold water applications.
AS2537	Mechanical jointing fittings for use with crosslinked polyethylene (XLPE) pipe for hot and cold water applications.
Sanitary Plumbing and Drainage	
AS1260	Unplasticised PVC (UPVC) pipes and fittings for sewerage applications.
AS1289	Methods of testing soils for engineering purposes.
AS1304	Welded wire reinforcing fabric for concrete.
AS1415	Unplasticised PVC (UPVC) pipes and fittings for soil, waste and vent (SWV) applications.
AS1432	Copper tubes for water, gas and sanitation.
AS1589	Copper and copper based alloy fittings for use in sanitary plumbing installations.
AS1650	Galvanised coatings.
AS2032	Code of practice for installation of UPVC pipe systems.
AS2129	Flanges for pipes, valves and fittings.
AS2870-2011	drainage Design Requirements, Residential Slabs and Footings

AS2887	Plastic waste traps.
AS/NZS3500-2	National Plumbing and Drainage Code.
AS3879	Solvent - welding cements for use with rigid PVC pipe and fittings.
Trade Waste Drainage	
	SA Water Corporation Trade Waste Guidelines.
Water Heating	
AS1308	Thermostats and over-temperature energy cut-outs for automatic electric water heaters (metric units).
AS/NZS3500.4	Hot Water Supply Systems.
Natural Gas Service	
AS/NZS5601	Gas Installation Code.

2 CONTRACT SUBMISSIONS

2.1 GENERAL

The contractor shall prepare and submit the items in each section identified below to the consulting engineer for approval.

2.2 TENDER SUBMISSONS

The submissions required at Tender shall incorporate, as a minimum, all information defined within the Appendices of this Specification. Any appendices not completely filled out will be rejected.

In addition to the Appendices the Manufacturer's selections data shall be provided incorporating the following:

- Electrical full load amps, voltage and phase data
- Performance data relevant to the equipment specification clause
- Size and weight information including maintenance clearance

Identical equipment to that approved by the consulting engineer must be installed on site. Equipment will only be considered "equal approved" if it has been approved by the consulting engineer. Approval of equipment does not override the requirement to comply with the requirements of the specification.

Select manufacturers with local representation, technical support and expertise, proven local long-term performance and readily-available spare parts.

2.3 PRE-CONSTRUCTION SUBMISSIONS

2.3.1 SAMPLES

Submit the following sample fittings and accessories to obtain approval prior to ordering:

Note: Samples to be provided upon contract commencement

- Sanitary Fixtures/Tapware - A4 colour print out showing items specified including product codes. Physical samples may be requested and supplied at Nil cost.
- Cabinets Housing Hydraulic Services – A4 shop drawing including all dimensions.
- Identification Labels and Stickers – A4 colour print including product codes.
- Valve/Equipment Tags – A4 colour print including product codes.
- Bracketing Systems – A4 colour print including product codes.
- Inground Soil, Waste and Vent Pipework – A4 colour print including product codes.
- Suspended Soil, Waste and Vent Pipework – A4 colour print including product codes.
- Trade Waste Pipework – A4 colour print including product codes.
- Acoustic Rated Pipework – A4 colour print including product codes.
- DCW/DHW Pipework Mains – A4 colour print including product codes.
- DCW/DHW Pipework Branches – A4 colour print including product codes.

- Non-Drinkable Water Reticulation Pipework – A4 colour print including product codes.
- Natural Gas Pipework Mains – A4 colour print including product codes.
- Natural Gas Pipework Branches – A4 colour print including product codes.
- Acoustic Lagging – A4 colour print including product codes.
- Thermal Lagging – A4 colour print including product codes.
- Internal Inspection Opening Cover – A4 colour print including product codes.
- External Inspection Opening Cover – A4 colour print including product codes.
- Serviceable Reflux Valve – A4 colour print including product codes.
- Tundish Boxes – A4 colour print including product codes.
- In-Wall Tundish – A4 colour print including product codes.
- Waterless Trap – A4 colour print including product codes.
- Air Admittance Valve – A4 colour print including product codes.
- Isolation Valves (DCW/DHW) – A4 colour print including product codes.
- Isolation Valves (NG) – A4 colour print including product codes.
- Testable Double Check Valves – A4 colour print including product codes.
- Pressure Reducing Valves – A4 colour print including product codes.
- Thermostatic Mixing Valves – A4 colour print including product codes.
- Tempering Valves – A4 colour print including product codes.
- Hot Water Balance Valves – A4 colour print including product codes.
- Hot Water Circulating Pumpset – A4 colour print including product codes.
- Cold Water Pressure Pumpset – A4 colour print including product codes.
- Cold Water Storage Tanks – A4 colour print including product codes.
- Inground Pump Chamber – A4 colour print including product codes.
- Grease Arrestors – A4 colour print including product codes.
- Emergency Shower and Eye/Face Wash – A4 colour print including product codes.
- Fire Collars – A4 colour print including product codes.

Deliver the samples to the project site office at least 14 days before approval is required and notify the Head Contractor of their arrival.

2.3.2 SHOP DRAWINGS

Prepare and submit for approval before commencing manufacture or installation, 1 copy of shop drawings from which the contract works shall be built to be provided within 2 working weeks of contract commencement. Further copies shall be required upon review of the preliminary issue of workshop drawings

Shop drawings shall all be on the same size drawings sheets and shall be of a scale not less than 1:100 and larger where necessary.

Prepare and submit for approval before commencing manufacture or installation, 1 copy of shop drawings from which the contract works shall be built to be provided within 2 working weeks of contract commencement. Further copies shall be required upon review of the preliminary issue of workshop drawings.

A 3-dimension REVIT Design Model shall be made available via a request to the head contractor. The REVIT Model shall be used as an interpretation tool only for co-ordination with structure and other services. Under no circumstances shall it remove obligation from the contractor to produce a construction set of documents for the proposed installation as nominated within this specification.

Shop drawings shall cover the following parts of the work.

- Dimensioned layout of all wall, floor and roof pipework penetrations
- Location of ceiling access panels including full dimensions.
- Plant and pipework layouts including manufacturer equipment details.
- Major equipment support details including loads imposed on building structure.
- Location of other building engineering services for coordination purposes.
- 1:50 scale Shop Drawing of Plant Equipment and Pipework Arrangement.

Examination of shop drawings shall not remove from the Contractor the responsibility for the correctness of the dimensions on such drawings nor compliance with Statutory Regulations.

The Hydraulic Services Contractor shall supply Drawings in up-to-date CAD files to the Mechanical Services contractor to ensure coordination so that non-clashes of services.

The Mechanical Services Contractor shall take the lead role in the shop drawings process and produce a combined services formed slab and pre-cast wall penetration drawing for review and use by the concrete trade contractor.

Submit shop drawings with due account for the construction programme. Allow for 5 working days for the return of such drawings. Complete shop drawings ordering of equipment and accept responsibility for dimensions and configuration of equipment ordered to suit the spatial restrictions of the project.

2.3.3 MANUFACTURERS TEST CERTIFICATION

Provide manufacturers test certificates for the following:

- Central Hot Water Plant
- Hot Water Circulating Pumpset
- Drinkable Cold Water Pumpset
- Sewer Ejector Pump Chamber
- Fire Collars.

2.3.4 AUTHORITIES, PERMITS, FEES, CERTIFICATES AND APPROVALS

Make applications, obtain all permits, and arrange testing, as necessary for the installation and placing into operation of the works where required by any Authority including:

- SA Water Corporation
- Worksafe SA
- Office of the Technical Regulator
- APA Group
- Local Council Authority

Provide all associated documentation required for the applications and pay all associated fees.

2.4 CONSTRUCTION SUBMISSIONS

General

The Contractor shall instruct the Proprietor's representative in the correct practice, routine adjustment and maintenance of the installation before it has reached practical completion.

Instructions shall continue as required during the period of operation preceding the date of issue of the Certificate of Practical Completion during which time the Contractor shall be responsible for operation supervision and correcting faults.

2.4.1 OPERATING AND MAINTENANCE INSTRUCTIONS

General

The Contractor shall instruct the Proprietor's representative in the correct practice, routine adjustment and maintenance of the installation before it has reached practical completion.

The contractor shall confirm instruction of Proprietor's representative by completing training record and incorporating into Operating and Maintenance manual.

Instructions shall continue as required during the period of operation preceding the date of issue of the Certificate of Practical Completion during which time the Contractor shall be responsible for operation supervision and correcting faults.

Maintenance and Operating Manuals

Within 30 days prior to reaching Practical Completion, submit three (3) copies of an Operating and Maintenance Manual. Initially one copy shall be prepared and submitted to the Consulting Engineer for review and comment The Manual shall contain the following items:

- Index
- General Description of Hydraulic Services Installation
- Operating Instructions for Equipment Installed
- Maintenance Instructions (Routine/Preventative)
- List of Equipment Suppliers, including supplier literature
- Schedule of Technical Data
- Acceptance Certificates, Commissioning Certificates, eCOCs
- As-Built Drawings
- Copy of completed training record

- USB with the full PDF copy of Operating and Maintenance manual (including CAD 'As-Installed' drawings)

The manual shall be professionally prepared and bound in a vinyl hard-back folder with insert sleeves on the front to an approved format. In addition, the project title and "Hydraulic Services" shall be inserted vertically along the spine insert sleeve of the folder. The manual cover format shall be considered with the other services trades and shall be submitted for approval prior to ordering. The Plumbing Contractor should note that the certificates of practical completion will not be issued and final payment will not be made until the above requirements have been complied with.

In addition to the above, the Plumbing Contractor shall allow to laminate the buildings hot water, cold water, and natural gas schematic diagrams, and mount the schematics where directed on site.

Operating Instruction Summary

Provide a brief summary of plant operating instructions including project specific features and control procedures on a single laminated card to be handed to the client's representative. Submit a draft of the Operating Instruction summary with the Installation Manual.

Equipment Registration

Ensure registration and certification of all equipment as required. As a minimum comply with the following:

- Grease Arrestors – Registration with the authority
- Pump packages – Certification

Provide all associated documentation required for the applications and pay all associated fees.

2.4.2 USER TRAINING

Carry out training on systems as nominated within this specification with user groups and other parties as nominated by the Superintendent. Provide a program for user training for approval by the Superintendent and Building Services Consulting Engineer.

The contractor shall confirm instruction of Proprietor's representative by completing training record and incorporating into Operating and Maintenance manual.

2.4.3 COMMISSIONING & WITNESSING PLANS

The contractor shall submit for approval a detailed commissioning plan indicating step by step testing strategy for all equipment. The commissioning plan shall be developed in conjunction with the building trade construction programme and shall be required to be submitted to the head contractor and consulting engineer for review prior to any commencement of commissioning. The hydraulic services contractor shall be responsible for providing commissioning duration period to head contractor for inclusion in the construction programme.

Any witnessing of commissioning required by the consulting engineer, prior to practical completion, shall be allowed for within the commissioning plan. The consulting engineer will

hold the right to refuse witnessing any plant until the Hydraulic contractor provides all commissioning results in accordance with Section x of this specification.

2.4.4 AS-INSTALLED DRAWINGS

Prior to the date of practical completion "as-installed" drawings shall be provided with the installation manuals. These drawings are to be prepared on AutoCAD computer aided drafting system version 2009 or later. Hard copies of the work-as-executed drawings along with copies of the AutoCAD Drawings are to be included on CD within the Operation and Maintenance Instructions. The work-as-executed drawings must indicate the full installation within the area of the works as it exists at the completion of the project including any design modifications which occurred during the project and any existing equipment.

The following minimum shall be included in the As-Installed drawings by modifying the Consultant's "For Construction "drawings:

- Location of all authority connection and meter locations.
- All set ups and set downs, including invert levels and locations, for underfloor drains.
- Location of all above ground piping and drains, including installed grades.
- Locations of all isolating valves, pulse output water meters, thermostatic mixing valves and tempering valves installed within ceilings.
- Locations of all backflow prevention devices.
- Locations of all major plant equipment and associated control panels.
- Piping schematics for the buildings sanitary drainage, hot water, cold water and natural gas pipework reticulation systems.

3 WORKMANSHIP

3.1 GENERAL

This section of the Specification shall be read in conjunction with all other sections of this specification and the drawings. Workmanship shall be of a high standard and each section of the work shall be properly and neatly executed to the best trade practice. Untidy work whether exposed to view or concealed will not be accepted and rectified at nil cost.

3.2 QUALITY ASSURANCE

Implement a Quality Assurance System for the works in accordance with the following Australian Standards:

- ISO9001 – Quality Management Systems.
- ISO14001:2004 – Environmental Management Systems.
- OHSAS18001:2007 – Occupational Health and Safety Management Systems.
- ISO26000:2010 – Guidance on Social Responsibility.
- Building Code of Australia (previously the National Code of Practice for the Construction Industry)

The Quality Assurance System shall cover the following minimum aspects:

- Detailed plan setting out supervision
- Quality control and checking (witness point) procedures.

Details of the Plumbing Contractor's Quality Assurance Plan shall be submitted to the Superintendent upon request.

3.3 EXISTING SITE CONDITIONS

The Plumbing Contractor shall check with all relevant authorities as to possible locations of any underground services in adjacent footpaths and locate same before commencing excavation.

The Contractor shall also carry out their own investigations of the existing services reticulation to verify the details indicated on the tender drawings.

The contractor shall visit the site to familiarize himself with the extent of work. No extras shall be considered arising from neglect of this provision.

Any loss or damage arising from negligence in not carrying out the above requirements shall be made good in a manner acceptable to the proprietor and no claim shall be made for costs incurred due to this negligence.

The Contractor shall allow for satisfactory supervision on site to prevent any damage to new or existing (still in use) plumbing services as a result of the contract works.

3.4 WARRANTIES

Warranties shall extend for a minimum of 12 months. All equipment and workmanship shall be provided with a warranty. Warranties shall commence at date of practical completion, not the date of installation.

3.5 INSTALLATION COORDINATION

Check on site at regular intervals the building working dimensions, tolerances and the setting out of the associated works. Immediately report any discrepancy.

General

The positions of equipment shown on Drawings accompanying the Specification are for Tender purposes and are diagrammatic only. Check on site for positions and obtain approval and verification of all locations with the Principal prior to installation.

When any relocating is required to conform to the above, undertake such relocation without additional costs to the Principal. Allow relocation of accessories and equipment a distance of 5.0m without variation to the contract.

Verify locations of all equipment, including controls to ensure:-

- Coordination with final layouts;
- Coordination with other trades construction workshop drawings;
- The work of any other trade does not interfere with the hydraulic installation;
- Equipment is not obstructed by door swings and tracks, furniture or equipment;
- Full compliance with relevant Authorities and Australian Standards.

Discrepancies

Promptly report any discrepancies, for consideration and instructions. Work proceeding without obtaining approval, and subsequently rejected by the Superintendent shall be made good at nil additional expense to the Principal.

Coordination

Ensure all equipment has been coordinated with other trades and reviewed by the consulting engineer and architect before placing orders and before commencement of the relevant trade construction workshop drawings.

3.6 INSTALLATION REQUIREMENTS

The following clauses set out the general requirements for the works. These requirements are not intended to cover all aspects of the installation and must be read in conjunction with the Conditions of Contract, Special Conditions of Contract, other sections of the Specification and the drawings.

Working Dimensions and Tolerances

Check on site at regular intervals the building working dimensions, tolerances and the setting out of the associated works. Immediately report any discrepancy.

Core Holes and Penetrations Set out

Set out and provide all sleeving and/or core holes as required for the passage of pipes and/or conduits throughout the structure.

NOTE: Coring and cutting of concrete elements to be approved by structural engineer.

Equipment, Materials and Installation

Obtain approval for and maintain uniformity of the manufacturer and type of all materials and equipment. Use only new, current manufacture, first quality materials and equipment.

Comply with the manufacturer's recommendations in respect to installation techniques and the requirements for associated materials, access clearances, equipment, components and devices.

Ensure compatibility of materials and equipment with the installed environment in respect of ambient temperatures, utilities supplies and vibration.

Support all Hydraulic services equipment including pipework, cabling and the like, independently of other services and/or non-structural building elements.

Electrical Interference

Design and use electrical equipment which will not cause interference with electronic and electrical equipment in the vicinity. In the event that the inherent characteristics of equipment make interference possible, fit effective suppressors to eliminate the interference.

Maintain radio and television interference level within the limits set out in AS/NZS1044. Maintain electrical disturbances within the limits set out in AS2279. Comply with AS4252.

Balancing and Phase Rotation

Balance each section of the installation evenly over all phases and ensure that phase rotation is correct throughout.

3.7 PENETRATIONS

Provide treatment to the penetrations as follows. Refer to architectural drawings for indication of all fire walls, floors ceilings, and the like, for allowance required to fire rated penetrations throughout:-

Penetrating Fire Rated Walls and Floors

Provide fire rated insulation to pipework or equipment and the like, where installed within fire rated wall as applicable, with an approved fire retardant insulation as required to maintain the fire wall/floor integrity. Maintain vapour seal to pipework insulation in accordance with the "Pipework" section of this specification. Pack around the insulation at both sides of the penetration with an approved fire resistant joint filler equal to "Hilti CP620" and or approved fire collar. Extent of filler (depth) or fire collar shall be appropriate to maintain the integrity of the fire barrier. Obtain certification from manufacturer for the installation on completion. Refer to treatment of penetrations in this section for further details.

Flashing Through Roof

Supply and install weatherproof under flashing and over flashing to all penetrations. The over flashing shall be of the same material as the pipe passing through the roof and shall be securely fixed to it. On completion the Plumbing Services Contractor shall test all penetrations for leaks to the satisfaction of the Architect.

Exposed Penetrations

In addition to the above, flash pipework and penetrations where exposed to view with colourbond sheet metal escutcheon plates. Sheet metal shall be to the architects approved colour

Protection of Penetrations

All floor and wall penetrations shall be protected to ensure no personnel can fall through or be injured from the penetration at all times during works.

Concealed Services

Conceal all services in areas other than plant or utility areas. Install services as follows:

- Cavity walls, hollow block and dry walls – install services concealed within cavity.
- Single leaf brickwork, concrete – surface mounted conduit or "mini-duct" and seek approval prior to installation.
- Do not chase walls or floors without prior approval from structural engineer.

3.8 PROTECTION

All pipework shall be protected against the entry of foreign matter at all times. Temporarily seal wastes, open ends of pipes, tundishes with fitted covers of pressed steel or UPVC. Rags, paper or wood plugs are not acceptable.

Sanitary fixtures are to be adequately protected against damage. Any item not considered to be in first class condition at the completion of the work shall be removed and replaced at no additional cost upon receipt of notice from the Architect.

3.9 FLUSHING OF SERVICES

All hydraulic services shall be thoroughly flushed to remove all foreign matter including silt, metal particles, etc. Valves, taps and washers shall be inspected and repacked or rewashed if necessary.

- Sewer service – ensure floor traps and waste drainage pipes are clear of debris and construction material during and upon practical completion of the project. Floor trap shall be tested to ensure they run at full volume.
- CCTV inspection of sewer may be requested during construction or upon practical completion of the project if sewer blockages occur, work shall be carried out and NIL cost to rectify the pipework
- Water service – ensure all services are flushed and made clear of debris prior to commissioning of equipment. Ensure all aerators, strainers and filters have been cleaned prior to final handover.

- Flushing of water services shall be carried out according to volume capacity
- Gas service – ensure all services are flushed and made clear of debris prior to commissioning of equipment.

3.10 CLEANING UP

Thoroughly clean all fixtures and fittings and leave the installation in a first class working condition. Remove all floor grates and inspection covers, clean all threads, grease and refit.

3.11 SEISMIC RESTRAINT, EARTHQUAKE BRACING, FIXINGS AND SUPPORTS

All plant, equipment and piping systems, shall comply with the requirements of Australian Standard 1170.4 – SAA Loading Code – Earthquake, AS2670 – Vibration, AS2625

Where greater incorporate the Design, Selection and Installation with requirements of ASHRAE Handbook 2011, Applications Chapter 48.

For further information regarding earthquake restraining, refer to following:-

- Gripple Seismic Installation Manual
- Tyco flow control, 2002 seismic bracing systems
- Fema e-74, January 2011, reducing the risks of non-structural earthquake damage – a practical guide.

Provide restraints and supports designed and certified by a structural engineer, to all plant, equipment, tanks pipework and isolation mounts in accordance with Australian Standard 1170.4-2007 Section 8, incorporating the following:-

Criteria	**Unit**	**Factor**
Importance Level	I	3
Soil Classification		De
Hazard Factor	Z	0.1
Probability Factor	Kp	1.3
Structural Classification	EDC	II < 25m

All restraints and supports shall be issued to the structural engineer to review the adequacy of the structure to support the services loads, including seismic forces.

The following do not require seismic bracing:

- Piping less than 32mm internal diameter in plant rooms.
- All other piping less than 64mm internal diameter
- All piping suspended by individual hangers 300mm or less in length from the top of the pipe to the bottom of the support for the hanger

Spacing of the bracing may need to be reduced for example:

- Brace both sides of piping, conduit at flexible connections
- Brace to avoid collision between piping, conduit and other non-structural components

- Brace within 600mm of changes in direction, whether it be horizontal or vertical changes
- Brace where components penetrate floors or ceilings
- Brace in both directions at the top of all risers where risers exceed 900mm

The spacing of bracing along a run of piping, conduit should not vary greatly in order to ensure uniform deflection and loading.

Equipment connected to a run of piping, conduit shall be individually and independently braced. Thermal expansion and contraction forces, where present, must be considered in the layout of transverse and longitudinal braces. Flexibility should be provided where pipes pass through seismic or expansion joints or connect to equipment with vibration isolators.

Bracing of pipework shall be at every second support.

Services braced in accordance with AS1170.1-2007 section 8 shall have a minimum of 50mm clearance from all ceiling hangers and the ceiling grid.

Do not core through, cut through or otherwise damage steel reinforcement in concrete slabs, beams or columns when installing seismic bracing.

3.12 GENERAL PIPING INSTALLATION REQUIREMENTS

All screwed joints shall be made with the best quality pipe jointing compound, carefully placed on the threads of the pipe and not through fittings.

All cut and threaded pipe shall have the cutting burrs and sharp edges reamed out.

When erecting pipework, care shall be taken to protect the pipe. Dented or otherwise damaged pipework shall be replaced at the Contractors expense.

The general pipework arrangements shall be as indicated on the Drawings.

Pipework shall be installed as directly as possible between connecting points and run parallel to walls or ceilings.

All connections between pipework and isolation valves and balance, pressure limiting valves shall be provided with flared compression joint unions or barrel unions for ease of removal.

Provide flared compression joint unions on all connections to equipment and plant.

3.13 PIPE SUPPORTS

All pipes shall be adequately supported and appropriately restrained by proprietary hangers and brackets designed to suit the requirements of each piping system. All pipework shall be fixed clear of each other with galvanised or stainless steel pipe clamps fitted with 4mm thick uni-cushion or equal approved. Between pipe clamps and copper tube, wrap tube with approved EPDM rubber.

PVC coated steel pipe clamps shall not be approved for use.

All piping concealed in roof spaces or above ceilings shall be supported from common supports where practicable and shall be run in neat pipe groups.

Pipework must be free to move without causing stresses in the pipework or pipe joints. Where provision has been made for movement in mains, the branch lines shall be unrestrained and in the case of copper tube, annealed for a minimum of 1800mm from the main. Where this is not achieved, some other approved provision for movement shall be made. Vertical pipes passing through floors shall be supported at a maximum of 1800mm centres.

Any noise from movement shall be rectified during the maintenance period.

All steel supports and associated fittings exposed to moisture, condensation or external elements shall be hot dip galvanised after fabrication. Dissimilar metals shall be isolated from one another as specified elsewhere in this specification.

3.14 INSTALLATION REQUIREMENTS FOR PVC PIPING AND FITTINGS

The installation of UPVC pipe and fittings shall be in accordance with Office of the Technical Regulator requirements and AS/NZS 3500 as amended and AS2032.

Pipes and fittings must not be stressed by straining into grade or alignment. Pipe ends must be cut square. Butts and swarf shall be removed.

Care must be taken to ensure that the end of the pipe is entered into the socket squarely and in correct alignment to match the grade of the preceding pipes or fittings.

Joints shall be solvent welded joint to AS2032 and in accordance with manufacturer's specifications and recommendations.

Surplus solvent cement is to be cleaned off.

All UPVC pipes cast in concrete shall be wrapped in 40mm thick minimum FORMFLEX polyethylene foam expansion material and shall be over wrapped in plastic surround.

3.15 INSTALLATION REQUIREMENTS FOR HDPE/PVC PIPING AND FITTINGS INGROUND

All HDPE/UPVC pipes cast in concrete shall be wrapped in 40mm thick FORMFLEX polyethylene foam expansion material and shall be wrapped in plastic surround.

Where HDPE/UPVC Piping and Fittings are installed in soils of moderately, highly or extremely reactive classification the following shall apply:

- The base of trenches shall be sloped away from the building. Trenches shall be backfilled with clay in the top 300 mm within 1.5 m of the building. The clay used for backfilling shall be compacted.
- Where pipes pass under the footing system, the trench shall be backfilled full depth with clay or concrete to restrict the ingress of water beneath the footing system.
- Where pipes pass under the footing system, the trench shall be backfilled full depth with clay to act as a barrier to the ingress of water beneath the footing system. Alternatively, a plastic membrane across the cross-section of the trench, taped to the pipe and keyed into the sides and base of the trench may be used.
- Penetrations of the edge beams of a raft and perimeter strip footings shall be avoided where practicable, but where necessary shall be detailed to allow for movement. Closed-cell polyethylene lagging shall be used around all sanitary plumbing drainpipe penetrations through footings. The lagging shall be a minimum of 20 mm thick on Class

H1 sites and 40 mm thick on Class H2 and Class E sites. Vertical penetrations do not require lagging. NOTE: Sleeves allowing equivalent movements may be used as an alternative to the lagging.

- Drains attached to or emerging from underneath the building shall incorporate flexible joints immediately outside the footing and commencing within 1 m of the building perimeter to accommodate a total range of differential movement in any direction equal to the estimated characteristic surface movement of the site (ys). In the absence of specific design guidance, the fittings or other devices that are provided to allow for the movement shall be set at the mid-position of their range of possible movement at the time of installation, so as to allow for movement equal to 0.5ys in any direction from the initial setting. This requirement applies to all sanitary plumbing and discharge pipes.
- Drainage risers under slab shall be provided with Swivel/expansion joints. Where piping systems are reduced below slab, 100mm long expansion joints shall be fitted.
- HDPE pipes may be encased in concrete or in recesses in the slab when provided with 40mm lagging and flexible joints at the exterior of the slab and lagged for entire length encased. Methods used should comply with AS/NZS3500.

3.16 ELECTROFUSION JOINTING REQUIREMENTS FOR POLYETHYLENE PRESSURE PIPEWORK

All pipework to be jointed shall be new, current manufacture, first quality materials and equipment.

Preparation:

- Ensure hands and tools are free from surface contaminants, including creams oils, detergents and surfactants.
- Equipment shall be in suitable working order protected from inclement weather.
- Trenches shall be excavated to ensure a minimum clearance of 150mm surrounding the pipework.
- The pipe to be fusion jointed may be washed with clean water if necessary and dried with lint free material.
- Pipe ends shall be cut square to the axis and burrs and swarf shall be removed.
- Clean the fitting and bore the external surface of the pipe to be jointed with clean manufacturer approved alcohol wipes to remove traces of dirt and other contaminants. Do not use detergent or surfactants to clean the pipe surfaces.
- Fittings shall remain in the bag, place along the pipe and insert first witness mark on the pipe at half the fitting length with additional secondary witness mark placed 40mm further along pipework to enable visual checking of scrapped area after jointing is complete.
- Ensure pipe clamps are the correct size for the pipes to be jointed.
- Jointing tools shall be clean of dirt prior to use.
- Using a manufacturer approved peeling tool remove the surface of the pipe to the first witness mark. Note: Metal files, rasps, emery papers or handheld scrapers shall not be approved for use.
- Jointing process shall be undertaken at temperatures within the range of -10˚C to +45˚C.

Jointing Method:

- Ensure the prepared surfaces are completely dry before proceeding.
- Wipe the prepared surface with only the manufacturer approved alcohol wipe to the area about to be welded to remove any dust residue and contaminants. Methyl ethyl ketone or other solvents including rags are not approved for use. Note: one alcohol wipe shall be used per joint to avoid contamination of the fusion zone area.
- Remove the fitting from its packaging and check the bore of the fitting is clean. Wipe with an approved isopropyl wipe as necessary.
- Ensure all surfaces are clean and dry before fitting the pipe ends with fittings in place.
- Insert the pipe on to the fitting and align with the first witness mark.
- The pipe end must be correctly aligned and free from any bending stress.
- Install pipe clamps to ensure the pipework cannot move and the fitting is satisfactory supported to prevent sagging during the fusion procedure.
- Fit the control box output leads to the fitting terminals ensuring they are fully inserted
- Where automatic or manual control boxes are used and fusion times are entered or barcode scanners are provided jointing times shall be as per manufacturer's data.
- Press the start button on the control panel and check that the heating cycle is proceeding as indicated on the display.
- On completion of the heating cycle both melt indicators within the processed part of the fitting should have risen.
- Where indicator pins have not risen the contractor shall refer to the manufacturer's guidelines or control box indicators for faults. Re-welding the fitting after the cooling off period shall be only as recommended by the manufacturer.
- The complete joint should be left in the clamps for cooling. The time needed will be specific on the fitting, or by its manufacturer data, or in the display of the automatic control box.
- When the joint has cooled remove clamps from the pipework.

Equipment:

- Equipment shall be well maintained and cleaned at all times.
- The welding apparatus should be serviced and calibrated regularly and should not exceed 12 months from last calibration.
- The sharpness of the peeling tool cutter head shall be checked on a monthly basis or as required to ensure even removal of piping services.

3.17 INSTALLATION REQUIREMENTS FOR 'REHAU RAUPIANO' DRAINAGE PIPEWORK

The contractor may supply and install "REHAU RAUPIANO" acoustic rated pipework system for suspended sewer drainage pipework in lieu of acoustic wrapped UPVC in acoustic areas as listed in this specification. Pipework shall be installed in accordance with AS/NZS3500 and the manufacturers installation guidelines.

3.18 INSTALLATION REQUIREMENTS FOR COPPER PIPES

Copper pipework shall be installed in accordance with AS4809.

The copper tube system shall comprise of MM Kembla Copper Tube, MM Kembla Copper Brazed Fittings and MM Kembla KemPress® Copper Press-Fittings or equivalent, for use in plumbing and drainage applications for the transfer of water, gas and other manufacturer approved media. Installation shall be in accordance with current versions of AS/NZS3500, AS4809, and MM Kembla KemPress® Copper Design and Installation guidelines.

The copper tubes shall be seamless MM Kembla Copper tube or equivalent, complying with AS1432, made from high residual phosphorous deoxidised copper classified as C12200 Alloy, Watermark approved and supplied as straight 6m lengths or annealed coils with nominal outside diameters in the range DN15-DN250.

Pipes and fittings must not be stressed by straining into grade or alignment. Copper pipe runs shall be fabricated from the longest possible lengths and building up sections with short lengths will not be accepted. Where copper pipes terminate in walls, e.g. at taps or traps, a suitable anchor is to be used to securely fasten the fitting in position.

All copper pipes and fittings installed below building footprint, and where penetrating footings up to 2.0m in length, shall be wrapped with two layers of Denso Type 600 tape and 10mm formflex or equal approved unless otherwise noted to allow vertical and lateral movement. Pipework installed more than 2.0m below building footprint shall be placed within PVC sleeve.

All drinkable water pipes and fittings installed underground shall be protected from corrosion by encasing in polyethylene sleeving. Refer Piping and Materials section for details. Incoming building services shall be provided with approved flexible expansion loops to withstand potential soil movement.

Heated water piping shall be installed in accordance with AS3500 including provisions for expansion loops, offset or bends.

The supplier shall have a system of manufacturing and quality control traceability for individual tubes and fittings, including the ability to trace back to base material via mill test certificates.

The supplier shall operate a Quality Management System which is certified to comply with the requirements of ISO9001.

The supplier shall provide documented competency-based training to the installer and regular on-site verification to ensure the system is installed as required by manufacturer to meet warranty requirements.

A written 25-year warranty, specific to this project, including full conditions, shall be provided by the one supplier for tube and fittings. This warranty documented shall consider the medium, pressures, temperatures and operating environment for the particular application.

3.19 INSTALLATION REQUIREMENTS FOR CROSS LINKED POLYETHYLENE PIPES

Supporting of pipework in both horizontal and vertical direction shall be in accordance with manufacturer's recommendations and in any case shall not exceed AS/NZS3500. Pipework and fittings shall be mechanically joined by proprietary compression sleeves. Bends shall be formed and held utilising proprietary bend bracket (bending radius = 8 x outer diameter).

Note that all PEX pipework installed through fire rated walls shall be installed with fire collars tested and certified for use with the particular manufacturers pipe. Otherwise, copper pipe shall be used for the portion of pipework penetrating the fire rated wall.

Note: The pipework supplier's representative shall be required to inspect the first fix installation and certify in writing that the system has been installed to their recommendations.

3.20 SLEEVES

All service piping passing through walls, floors and footings shall be provided with sleeves, the location of which shall be accurately determined and installed to the approval of the Structural Engineer during construction. Provide shop drawings indicating location and size of all service penetrations for approval by the Structural Engineer.

3.21 BRAZING

At completion of all joints, residual flux shall be removed by quenching in water and cleaning with a steel wire brush.

3.22 CHROMIUM PLATING

Any pipes exposed within buildings excluding storerooms, are to be heavily nickel plated and then chromium plated. Where such pipes pass through walls or floors, a chromium plated wall plate is to be fitted unless otherwise detailed. All basin wastes and traps are to be chrome plated where exposed.

Chromium plating not required to specialised fixture such as laboratory sinks etc as nominated.

Chromium plated pipework shall be secured by chromium plated clips. Screws and bolts shall be chromium plated brass or be manufactured from 316 gauge stainless steel. Trade waste system pipework and traps shall be HDPE where exposed and not in the view of public.

3.23 DISSIMILAR METALS

Where clips, brackets, and pipe supports are of dissimilar metal to the actual piping used, completely insulate the piping at all fixing points with at least four layers of 50mm wide black polyethylene tape wrapped around the pipe prior to fixing in position.

3.24 JOINTS IN PIPEWORK

COPPER PIPING

All joints in copper pipework shall be made by brazing with low temperature silver brazing alloy containing not less than 5% silver. Use oxy-acetylene heating for all low temperature brazing.

Flux shall be as recommended by brazing alloy manufacturer. Slip joints shall be permitted to join lengths of copper pipes and shall be made by annealing and expanding ends with a proper tool to form a slip (capillary) joint in accordance with the following table.

Pipe Size OD	Min Length of Slip Joint
15mm to 20mm	10mm
25mm to 32mm	15mm
40mm to 65mm	15mm

80mm to 100mm	20mm

Where straight sections of pipe of different diameter are to be joined, proprietary reducer fittings shall be utilised. Crimped joints will not be permitted.

Fabricated tees or junctions in copper pipes will not be permitted.

The copper brazed fittings shall be MM Kembla Copper Brazed Fittings or equivalent complying with AS3688 and shall have the Watermark approval. The copper tube system used shall be from the one supplier only.

Valves shall not be brazed direct onto pipes. Valves shall be indirectly joined to the pipes by the use of flanged or screwed adaptors, which shall be silver brazed onto the pipe and then screwed to the valve. Care shall be taken to prevent distortion to the valve and/or valve seat.

PRESSFIT JOINTS

All pressfit jointing shall be in accordance with manufacturer's guidelines and requirements. Contractor shall ensure fittings used are suitable for the fluid or gas to be transported. Contractor shall request manufacturer certificate of installation on completion.

The copper press-fittings shall be KemPress® Copper or equivalent, be of press fit type, complying with AS3688. All fittings, excluding GAS fittings with HNBR type o-rings, shall have Watermark approval.

3.25 GRADES

All grades and inverts indicated on the drawings shall be established with the use of approved surveying instruments. Check the topography and finished floor elevations before commencing any excavation work.

The setting of all inverts, etc. at correct elevations is a prime and definite requirement of this Specification. Grades to drains shall generally be as shown on the drawings or where this information is not provided, as required by the relevant authorities and plumbing standards.

3.26 INSPECTION AND TESTS

During Manufacture

- Every facility is to be afforded the authorities and/or the Superintendent's representative for the inspection of any part of the work or apparatus during the course of manufacture and, upon completion, testing is to be undertaken in the manufacturers workshop if applicable.

Hydrostatic Tests – Water Services

- All pipework shall be hydrostatically tested to a head of one and a half times the working head and not less than 1500kPa. Hydraulic (testing) pumps shall be disconnected immediately after pressurisation and all test heads shall be maintained until the Superintendent's representative or Regulatory Authority has satisfied himself as to the soundness of the pipework and equipment.

In no case shall the period of test be less than 2 hours.

Before applying specified test head, all air shall be expelled from the piping being tested.

Equipment is not to be connected to the respective services while hydrostatic tests are being carried out.

Provide a suitable pump and gauge and do all necessary work for carrying out the tests.

All testing of pipework is to be carried out before:

- Ceilings are installed.
- Service ducts are clad.
- Pipework insulated prior to testing shall have the ability to inspect joints to confirm compliance.

At completion of testing cold water lines shall always be kept charged full of water.

Air Testing – Sewer Services

Air testing of drains shall or may be carried out to all drainage pipework where Drinkable mains water used for a hydrostatic test is not available or stored on site for reuse. Contractor shall perform an air pressure test by pressurising the drains as follows:

- The sewer drainage pipework shall be pressurised to the initial pressure of 20kPa for sewer drains up to 1.5m in depth, and 25kPa for sewer drains 1.5m – 3.0m in depth, for a minimum of 3 minutes to stabilise the temperature.
- After the 3 minute stabilisation period, the pressure shall be dropped to the test pressure of 15kPa for sewer drains up to 1.5m in depth, and 20kPa for sewer drains 1.5m – 3.0m in depth. The test timing for the particular sewer shall then commence.
- A pressure drop of no more than 5kPa over 3 minutes shall be achieved prior to the test procedure being passed.
- All pressure tests to be inspected and passed in accordance with AS/NZS3500 and the requirements of the Office of the Technical Regulator.

All drainage pipework above ground shall be tested at a test pressure of 15kPa.

Hydrostatic Tests – Sanitary Services

All sanitary drains shall be water tested by plugging at the lowest or other approved positions, and filling with water to the overflow level, minimum 1 metre head above the highest point of the graded drain.

Tests shall be maintained until the authorities, including Architect, have satisfied themselves to the soundness of the pipework.

In no case shall the period of test be less than one hour.

Fixtures are not to be connected to the respective services while tests are being carried out.

Provide all necessary plugs and do all necessary work for the carrying out of these tests.

All testing of the above systems shall be carried out before:

- Finishing trades have commenced their work.

- Concealing of pipework.

Gas Pipework Pressure Testing

All gas services are to be tested in accordance with AS5601.2013 Section 2 and table E.

Tests shall be maintained until the authorities, including Superintendent, have satisfied themselves to the soundness of the pipework.

In no case shall the period of test be less than one hour.

Fixtures are not to be connected to the respective services while tests are being carried out.

Provide all necessary plugs and do all necessary work for the carrying out of these tests.

All testing of the above systems shall be carried out before:

- Finishing trades have commenced their work.
- Backfilling has commenced.
- Appliances are connected.

Fixtures

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

Test of Completion

Upon completion the Hydraulic works shall be tested under normal working conditions and as directed by the Superintendent's representative. Such tests shall continue until Superintendent's representative is satisfied that the terms of this specification has been complied with and that the Hydraulic works are capable of meeting all requirements.

All defects disclosed during the tests shall be remedied immediately and, if required by the Architect, additional tests shall be carried out.

The duration of the tests will be decided by the Superintendent's representative and the maximum duration of any one test will not exceed eight hours.

The Superintendent's representative shall be given two (2) days clear notice that any system is ready for test.

Provide all equipment and labour required for tests.

The Superintendent reserves the right to check any aspect with his own equipment.

All tests shall be carried out in the presence of, and to the satisfaction of, all local authorities, as well as the Superintendent's representative.

Record Keeping

Contractor shall keep a record of all tests completed and inspection requested by the Local Technical Regulator with dates the tests were performed, pressure applied to the relevant pipe being tested and end result as a pass or fail. Records shall include the name of the operator

performing the test and witness of the result. Records shall be inserted within manuals for future reference.

3.27 TRENCH EXCAVATION, BACKFILLING AND COMPACTION

Trench Excavation

The Contractor shall do all excavation of whatever substances encountered to the required depths, lengths, breadths, grades and alignment as may be necessary for the construction of the pipe drains in accordance with the Drawings.

Where trenches are to be in bitumen or concrete paving, the surface shall be saw-cut where paving consists of unit pavers, blocks shall be removed.

Trenches are to be excavated to the correct line and level with vertical sides at least 300 mm wider (150 mm on each side) than the external diameter of the pipes to be laid in them. Sufficient extra width and depth is to be excavated at each joint to allow the pipes to be properly jointed. Excavation shall be 75mm lower than required for 75mm thick compacted sand base or 10mm sieve metal screenings for pipework bedding.

Trenches must be kept clear of water at all times and timbered where necessary to prevent collapse. They shall be excavated only sufficiently in advance of pipe laying to allow that work to proceed without delay.

Excess excavation below the required level shall be backfilled at the Plumbing Contractor's expense with sand, gravel or other material as directed by the Superintendent, and thoroughly compacted. Any soft or yielding material shall be removed and replaced with sound material and compacted to the satisfaction of the Superintendent.

Suitable safety barriers shall be provided around the excavation at all times. The barriers shall be suitably defined by approved lighting during the appropriate light up time for the area.

The barriers shall not be removed until completion of all work.

Excavated material shall be removed off site. All cartage costs and tipping fees shall be paid by the Plumbing Contractor.

Pipe Bedding/Support

Pipes shall have a minimum 75mm bed of compacted sand base or 10mm sieve metal screening provided in accordance with AS3500.

The bedding surface shall provide a firm foundation, carefully shaped true to line and grade.

Laying Pipes

Pipes shall bear evenly on the bed prepared as specified above and laid with the sockets pointed up-grade. All pipes shall be laid in straight lines, to true invert levels.

Trench Backfilling

No joints shall be covered or trench backfilled until pipe laying and jointing has been approved by Superintendent's representative.

It shall be the Plumbing Contractor's responsibility to ensure the inspection and approval of the pipe drains prior to the backfilling.

Failure to observe this clause shall render the Plumbing Contractor liable for re-opening at his own expense any trench backfilled without approval.

Backfill material shall comply with the relevant services specification section. Generally backfill, including the overlay zone shall be:

- In paved areas or under buildings – quarry sand

Backfill shall be placed in layers not greater than 150 mm thick and compacted to:

- In paved areas or under buildings – 98% Modified Compaction Maximum Dry Density
- Note: Contractor shall engage independent engineer to perform compaction testing of trenches on completion. Test results shall confirm 95% compaction has been achieved. A minimum of 4 compaction tests are required for the ground floor drainage with test sheets inserted within manuals for review.

Weather Damage and Flooding of Excavations

Keep excavations free from water and seepage and take all necessary precautions throughout the duration of the Contract to maintain the safety and stability of the excavation.

Over Excavation

Backfill over-excavated trenching with approved granular material or concrete as directed by Superintendent's representative and/or the Local Technical Regulator.

Barriers and Accessibility

Provide all necessary barricades and lighting to excavations to protect the public, as well as the work during the course of all excavations.

All necessary arrangements for access over trenches and safety lighting shall be made so that paths and doorways are trafficable at all times.

Shoring of Trenches

Where necessary and/or required by the Authorities for safe and efficient completion of the work, supply, erect shoring, timbering, planking, etc. of sufficient strength and quality to prevent earth and other materials entering the excavations, tunnels, etc.

Work shall be carried out in accordance with Local Authority Safe Work requirements.

Remove all shoring and timbering in an approved manner on completion of the work and after the inspections have taken place.

Minimum Cover to All Pipes

All service pipes shall be installed with the minimum cover as noted hereafter or in excess of these as noted on the drawings or specified elsewhere.

Sewer	600mm minimum in areas subject to vehicular traffic

	450mm minimum elsewhere
Water	450mm minimum
Natural Gas	600mm minimum
Separation	100mm minimum for services up to and equal to 50mm nominal bore
	300mm minimum for services greater than 65mm nominal bore

3.28 TREATMENT OF PIPEWORK PENETRATIONS

Where hot and cold water pipework penetrates fire rated walls or plumbing ducts, penetrations shall be fire stopped, utilising a resilient gunnable compound to comply with the minimum requirements specified in the Building Certifiers/Surveyors report. Where no report has been made available during the tender period, a minimum -/180/180 minute fire rating is to be included.

Where hot and cold water pipework penetrates non fire rated bounding walls or plumbing ducts, penetrations shall be sealed utilising a resilient gunnable compound.

Where copper hot and cold water pipework penetrates concrete floor slabs the fire rating of the floor shall be maintained. The annular space between the outside of the pipe and the floor penetrations shall therefore be filled with a fire rated grout, fire rated mastic or IBS foam strip. Note: All copper pipework shall be spirally wrapped with plastic film through penetration to prevent contact with fire rated grout.

Where UPVC, HDPE, CROSS LINKED POLYETHYLENE or any plastic pipework penetrates fire rated bounding stud walls or plumbing ducts, penetrations shall be fire stopped utilising an approved Retro-fit fire stop collar.

Where UPVC, HDPE, CROSS LINKED POLYETHYLENE or any plastic pipework penetrates concrete floor slabs the fire rating of the floor shall be maintained. The penetration shall be fire stopped utilising an approved fire stop collar.

Note: Any pipe penetrations with an open floor grate above, must be protected with an approved floor waste fire stop collar in accordance with the BCA and AS1530.4

All pipework penetrations must be treated utilising a fire rated product designed for the application. The contractor is required for the fire stop manufacturer's representative to inspect the installation and certify in writing that the correct product has been installed to their recommendations.

All pipework installed within fire rated walls shall be fire rated with approved insulation or collar as directed by manufacturer to maintain the integrity of the wall.

3.29 ACOUSTIC REQUIREMENTS

Refer to Specification for details of approved proprietary acoustic pipe lagging systems.

Support of Pipework

Drainage pipework in ceilings must be supported off the slab above and must not contact any lightweight ceiling support members, stud wall framing or other services.

Drainage pipes in plumbing ducts must be fixed with approved isolations pipe clamps and gaskets. Approved isolated pipe clamps and gasket systems include:

- "Kwik-smart" pipe clips by Binder Engineering
- "Ezyclip" pipe clamps by Flexistrut
- Rehau raupiano bracketing system for acoustic piping.

Hot and Cold-Water Pipes and Plumbing Fittings

To control structure borne sound from water supply pipes, flexible water supply pipe such as "Rehau" or similar product shall be used.

The flexible pipework can be fixed direct to the slab soffit or be run in wall cavities without special acoustic treatment, except at the metal connectors. Where the pipe is fixed to a common partition such as the slab soffit or within a bounding wall, the metal connectors must be isolated using non-setting flexible acoustic sealant.

Flexible connections are required to be fitted to drainpipes serving dishwashers, washing machines, etc.

4 PIPING AND MATERIALS

4.1 GENERAL MATERIALS

Type	Application	Jointing	Bracketing	Insulation	Location
UPVC: Ø100 – SN6 Ø150 -SN8	Sewer	Cleaning Fluid. Solvent cement. (Type N).	Hanging/ offset brackets.	Acoustically wrapped	Internal, external, suspended, inground
HDPE: PN6 (Ø40-Ø56) PN4 (Ø63-Ø110)	Trade Waste	Electrofusion welded coupling	Hanging/ offset brackets.	Acoustically wrapped	Internal, external, suspended, inground
Copper – Type B Minimum	Drinkable Cold and Hot Water, Natural Gas, Sanitary Drainage	Welded or Compression	Hanging/ offset/ Unistrut system.	Thermal/ acoustic as required	Internal, external, suspended, inground
Cross Linked Polyethylene (PEX): PN20	Drinkable Cold and Hot Water, Non-Drinkable Cold Water	compression	As per the manufacturer bracketing system.	Thermal/ acoustic as required	Suspended, internal in concealed areas only
Cross Linked Polyethylene (PEX): Aluminium Lined	Natural Gas	Compression	As per the manufactured bracketing system.		Suspended, internal in concealed areas only.
Polypropylene	Waste Fixture traps only		As per the manufactured bracketing system.		
Acoustic Drainage	Suspended drainage	Rubber ring	As per the manufactured bracketing system.	N/A	Internal

4.2 UNIFORMITY AND QUALITY

Obtain approval for and maintain uniformity of the manufacturer and type of all materials and equipment. Use only new, current manufacture, first quality materials and equipment.

Comply with the manufacturer's recommendations in respect to installation techniques and the requirements for associated materials, access clearances, equipment, components and devices.

Ensure compatibility of materials and equipment with the installed environment in respect of ambient temperatures, utilities supplies and vibration.

Support all equipment including pipework, cabling and the like, independently of other services and/or non-structural building elements.

Copper Pipes – Soil, Waste and Vent Pipes, Drinkable Hot/Cold Water, Natural Gas

Copper pipes are to be solid drawn tubes, manufactured in accordance with AS1432-1973, and to be of the gauges specified or as shown. The use of Table 5 copper tube will NOT be permitted. Type 'B' tube or heavier shall be used below ground and above ground. Copper pipework and fittings shall be "Kembla" as indicated in Section 3.

Wall thickness for hot water pipes shall be the same as those required for the cold water piping but shall be not less than Table 'B' in AS1432-1973 with a minimum wall thickness of 1.0mm.

Fittings shall be approved by the Local Technical Regulator and all joints shall be silver soldered.

Fittings for copper tubing shall be used in accordance with the following schedule:

- For Sanitary Plumbing – Brass or equal approved as approved for use by the Local Technical Regulator, AS/NZS3500 and the Local Authority.
- For Hot and Cold Water – Brass or copper acceptable to the tapware manufacturer in order to maintain tapware guarantees and suitable for silver soldering.

All brazing shall be carried out with a suitable silver brazing alloy containing not less than 2% silver and 6% phosphorous such as S.B.A. No. 115 or Handley's No 15. Only one brand may be used throughout the job. Bronze welding will NOT be permitted. Remove all flux on completion of brazing.

Cross Linked Polyethylene – Drinkable Hot/Cold Water, Non-Drinkable Cold Water (extending from isolation valves and where concealed within wall frames/ceiling space)

Cross linked polyethylene equal to 'Rehau HIS311' system PN20. Cross linked polyethylene pipework and fittings shall conform to AS2492 and AS2537 respectively.

Pipe materials shall be PE-Xa/PE construction, consisting of PE-Xa inner layer and a PE outer marking layer Minimum design service life of 50 years at 70°C and 1000kPa.

Compression sleeves of sizes between 16mm and 40mm shall be bidirectional polymer sleeves manufactured from PVDF. Brass fittings quality shall have a permitted dezincification depth of no greater than 100µm.

The pipes shall have a fire resistance level (FRL) rating of up to 240 minutes on the integrity and up to 180 minutes on insulation using PROMAT Unicollar.

Note: Pipe sizes nominated on drawings are equivalent copper sizes. Where PEX is used, the internal bore of the pipework shall be equal to or larger than that of the nominal bore indicated on the drawings.

Supporting of pipework in both horizontal and vertical direction shall be in accordance with manufacturer's recommendations and in any case shall not exceed AS/NZS3500.

Pipework and fittings shall be mechanically joined by proprietary compression sleeves. Bends shall be formed and held utilising proprietary bend bracket (bending radius = 8 x outer diameter).

Note: The pipework supplier's representative shall be required to inspect the first fix installation and certify in writing that the system has been installed to their recommendations.

Resilient gunnable compound or fire rated grouts are not permitted to contact PE-X pipework or polymer fittings regardless of the reticulation system. Contractor shall use an approved fire collar installed as per the manufacturers requirements on PE-X pipework penetrating fire wall and fire rated elements.

Natural Gas Pipework Above Ground (Internal)

Cross linked polyethylene aluminium polyethylene multilayer pipe complying with AS4176.8 RAUTITAN gas stabil gas pipe, Rautitan gas fittings and compression sleeves or equal approved and installed in compliance with AS5601.

Where pipework is installed within wall cavities and inaccessible areas Rauguard flexible metal conduit shall be placed over the pipe for protection.

UPVC Pipes – Soil, Waste and Vent Pipes (in non-acoustic areas)

All unplasticised polyvinyl chloride pipes and fittings shall conform with AS1415 and the type 'N' heavy duty non-pressure pipe and shall conform with the requirements of Local Technical Regulator, and be as manufactured by "Iplex Plastics" or equal approved, and shall be installed in accordance with AS2032.

Fittings shall be by the same manufacturer as the pipe and shall be compatible in every respect and be in accordance with AS1260-Moulded Rigid UPVC Fittings and be certified in accordance with the NCPDP scheme.

All UPVC pipes cast in concrete where permitted shall be wrapped in polyethylene foam and all shall be wrapped in plastic surround.

Jointing Method: Solvent Cement Joints to AS2032

High Density Polyethylene (HDPE) Pipework – Trade Waste Drainage

The installation of all HDPE pipes and fittings shall be in accordance with AS4130. Pipework shall be HDPE Type 50 with electrofusion joints.

Acoustic Rated Pipework – Suspended Sanitary Drainage

The piping shall conform to the following criteria:

Polypropylene (PP-MD), mineral-filled, halogen free

Pipe materials shall be composite polypropylene, consisting of polypropylene inner layer, mineral-filled polypropylene middle layer and UV-stabilized polypropylene outer layer, complying with AS/NZS 7671 for gravity drainage and storm water drainage system in residential and commercial applications, colour white (RAL 9003).

The pipes shall be designed for a temperature of 90°C and can temporarily withstand temperatures of up to 95°C and marked with ice crystal to indicated suitability for installations under extreme low temperatures up to -10°C. The pipes shall have excellent chemical resistance, withstanding acidity level from pH 2 – 12.

The pipes shall be certified under WaterMark scheme for dimensions

DN (OD) 40 – 50 – 75 – 90 – 110 – 125 – 160 – 200mm.

Available lengths shall be from 150 to 3000 mm.

Ring stiffness: > 4 KN / m^2 Mean elongation: 0.09 mm / (m.K) Resistant: up to 100kPa = 10m water column (pressure test certificate on request)

The pipe materials shall be packaged to reduce UV-radiation effect to the pipe materials themselves and to protect the pipe materials from dirt and other foreign materials.

Fitting – Polypropylene (RAU-PP), mineral-filled

Fitting materials shall be mineral-filled polypropylene for acoustic performance enhancement, complying with AS/NZS 7671 for gravity drainage and storm water drainage system in residential and commercial applications, colour white (RAL 9003). The fittings shall have an inserted SBR sealing ring

The fittings shall be designed for a temperature of 90°C and can temporarily withstand temperatures of up to 95°C and suitable for installations under extreme low temperatures up to -10°C. The fittings shall have excellent chemical resistance, withstanding acidity level from pH 2 – 12.

The fitting materials shall be certified under Standards Mark scheme for dimensions

DN (OD) 40 – 50 – 75 – 90 – 110 – 125 – 160 – 200mm.

Floor-gully – Acrylonitrile Butadiene Styrene (RAU-ABS)

Floor gully material shall be the Acrylonitrile Butadiene Styrene. The floor gully shall have 1 main inlet in dimension DN (OD) 110mm and 3 additional inlets in dimension DN (OD) 50mm. The outlet shall be of dimension DN (OD) 75mm. Each inlet and outlet shall have an inserted SBR sealing ring. The floor gully shall have a removable access plug. The height shall be 250 mm.

Floor-gully – Polypropylene (RAU-PP), mineral-filled

Floor gully material shall be the Polypropylene. The floor gully shall have 1 main inlet in dimension DN (OD) 110mm and 3 additional inlets in dimension DN (OD) 50mm. The outlet shall be of dimension DN (OD) 75mm. The main inlet (DN 110mm) shall have an inserted SBR sealing ring. All other inlet and outlets shall be male connector type. The floor gully shall have a removable inserted trap. The height shall be 222 mm minimum.

Sound-dampening bracket

Sound-dampening bracket shall be rubber-lined with vibration-decoupling system to reduce the structure-borne noise transmitted from the DWV system. Material shall be galvanized steel, including hanger bolt.

Hot and Warm Water Piping Insulation

All internal hot water flow and return mains, including riser pipework, shall be insulated with 19mm thick (minimum) 'Armaflex' or equal approved thermal insulation fitted in accordance with the manufacturer's installation instructions.

All hot water and warm water branch piping (dead legs) shall be insulated with 13mm thick (minimum) 'Armaflex' or equal approved thermal insulation fitted in accordance with the manufacturer's installation instructions.

Insulation shall possess the following characteristics as a minimum:

- Spread of Flame Index – 0.
- Smoke Developed Index – 3.
- Thermal Conductivity – 0.038w/mk at 0°C mean temperature.

Note: All sealants and adhesives used on insulation where PEX piping is utilised shall be a neutral cure sealant only- Acetone based adhesives or sealants shall not be approved for use.

Cold Water Insulation

Drinkable cold water services pipework mains traversing in Penthouse ceilings and where exposed externally shall be provided with thermal lagging as indicated above for hot and warm water pipework to minimise the effect of changes to the ambient temperature on the temperature of the cold water pipework.

Valves – General

Provide and install all valves indicated on the plans and as required for correct operation and drainage of all systems. All valves shall be of approved types suitable for the temperature, working pressure, testing pressure and, particular service in which they are installed. Where possible all valves shall be by the same manufacturer and one type of valve shall be used for different systems.

Valves 50mm or less shall have screwed ends, unless otherwise specified. Valves installed in the Hydraulic Services shall be approved by the local Authorities. All stop and check valves shall have an arrow cast into the body to indicate direction of flow.

All isolation valves sized 15mm > 50mm installed above ground shall be ISIS D.R ball valves with Stainless steel handles or similar approved.

All isolation valves sized 15mm> 50mm installed below ground shall be Stainless Steel Fratelli ball valves or similar approved.

Supply and install "Wilkins" (model BR4) or equal approved Pressure Reduction Valves where supply pressures exceed 500kPa complete with integral bypass, check valve and strainer.

Valves – Copper Pipe Services

- General: All valves shall be of all brass or stainless steel construction unless otherwise specified tested and stamped for the duty.
- Cold Water: Full bore D.R. brass or stainless steel ball valves less than 65mm the same nominal diameter as the pipe to which they are fitted. Valves to be installed with a brass tube bush brazed to the pipe on the inlet side with a flared type K.G.L. union connection on the outlet side. Valves 65mm and greater shall be flanged butterfly type.
- Hot Water Units: Refer to manufacturer's schematic diagram and installation guide for details on valves and fittings associated with hot water systems.
- Check Valves: Zinc free bronze spring loaded check valves shall be fitted to hot water units. Check valves to other equipment up to and including 50mm NB shall be Johns spring loaded type or approved equivalent.
- Hose Cocks: Hose cocks shall be 20mm chrome plated brass with flanged bib extension fitted with hose connection vacuum breaker devices. Refer to drawings for locations.
- WC Cisterns shall have 15mm right angle cistern cock with chrome plated wall plate and chrome plated copper connector, unless noted otherwise. Note: Exposed stainless steel braided hose connections shall not be approved for use.
- All concrete used in plumbing work shall conform to the requirements of the Structural engineer and as listed in AS3500 or as indicated on the drawings.
- Should the Plumbing Services Contractor wish to consider alternative materials or equipment to specified requirements, details of same shall be included in the tender offer for consideration. The alternative material or equipment shall not be built into the works unless written approval for its use has been received from the Superintendent. Approval for use of an alternate product shall include certification from the manufacturer the piping system has been installed in accordance with manufacturer guidelines and the contractor is sufficiently trained in the use of the product.

4.3 PIPE AND ISOLATION VALVE/METER IDENTIFICATION

Pipework

All accessible and exposed pipework shall be identified and colour coded by colour bands fitted at 3000mm intervals. Coloured bands shall be located in a visible position, with a corresponding arrow indicating the direction of flow and label identifying the services. Pipe identification colour code shall be in accordance with AS1345.

All inground pipework shall be provided with detectable identification tape identifying the service. Detectable tape shall be minimum 75mm wide.

Valves and meters

All isolation valves and meters installed in the hydraulic services installation shall be identified with engraved plates (white lettering on black background fixed to hand wheel). Submit samples of all labelling and engraved plates for approval prior to ordering.

5 SANITARY FIXTURES AND TAPWARE

5.1 GENERAL

Supply and install sanitary fixtures and tapware, complete with chrome plated on brass outlet, brackets, fixing bolts and screws as required to complete the installation. All fixing shall be plumb and level, neatly finished in a tradesmanlike manner and without damage. Upon taking delivery, if any of the Sanitary fixtures are damaged during installation, the Hydraulic Services Trade shall replace the fixture at no expense to the proprietor. White sanitary fixtures where inset or vanity shall be finished with white non-setting mastic.

Note that all baths and hand basins shall be supplied with internal overflow to ensure compliance with National Construction Code (NCC).

Fixing of Fixtures and Fittings in Cupboards etc

Where fittings and fixtures are fixed in vanity units, cupboards etc, the Contractor shall cooperate with and allow for attendance of the Joiner to ensure:

- The fixtures, fittings and taps are on site to allow the Joiner to cut holes in the bench tops before the benches or cupboards are permanently fixed and sealed in position.
- That the fixtures are fixed and sealed as recommended by the manufacturer and to the satisfaction of Superintendent's representative.
- That no sealant shall be visible beyond the sealing rim of the fixture.

Note: Sanitary grade sealants shall be utilised where approved by manufacturers in lieu of neutral grade sealants.

Fixing of Fixtures to Walls

Supply and install timber trimmers as necessary for the fixing of sanitary fixtures to walls.

Fixing of Tapware

All equipment and tapware shall be fitted with individual isolation valves in accessible locations. All isolation valves shall be chrome plated or stainless steel where visible and watermarked approval. Stainless steel braided hoses shall be watermarked approval and not concealed in walls or ceilings.

Sanitary Fixtures and Tapware Schedule

Refer to Architectural Sanitary Fixtures and Tapware Schedules for details of fixtures to be supplied as part of these works. Install Sanitary fixtures where shown ready for connection to drainage system. The Plumbing Contractor shall allow to provide suitable secure storage on site for same.

5.2 EMERGENCY SHOWER AND EYE/FACE WASH

Supply and install "Enware" combination stainless steel free standing hand operated emergency shower and eye/face wash (Model ECE240) complete with water and drainage connections in accordance with manufacturers installation instructions . Provide associated affixed signage to emergency shower and eye/face wash in accordance with AS1319, including identification label to isolation valve "DO NOT CLOSE – SERVICES SAFETY SHOWER."

6 SOIL, WASTE & VENT PIPES

6.1 GENERAL

Supply and install all soil, waste and vent pipes as detailed on the drawings, in accordance with the Directions of the Office of the Technical Regulator AS/NZS3500.2, and as specified in Materials and Workmanship Subsections.

The whole of the work shall be carried out by, or under the direct supervision of a Fully Licenced Plumber in strict accordance with the regulations and requirements of the Local Technical Regulator, Local Authorities and to the entire satisfaction of the Architect.

The systems shall be complete with all necessary bends, junctions, expansion joints, traps, fixed points, clips, bolts and inspection openings provided with screwed or bolted covers.

Set all floor traps, inspection openings tops and gully grates flush with the finished floor level or as indicated on the drawings.

6.2 PIPEWORK AND FITTINGS

Material Types

Install all pipework as shown as drawings and as scheduled.

Waste Pipes

Provide and fix waste branch lines, which shall be in UPVC to all sanitary fixtures, except where noted otherwise. All waste pipe risers within all wet areas through all floors shall be fitted with approved puddle floor flange, fully sealed to riser and structural floor.

Plug and Washers

Provide plug and washers to fixtures in accordance with the manufactures requirements and ad required to ensure correction operation of the fixture

- Hand Basin – chrome plated brass plug and washer, unless integral or stated otherwise.
- Kitchen Sink – stainless steel to manufacturers requirements.
- Cleaners sink – chrome plated brass plug and washer

Floor Wastes

Provide floor wastes adjacent to sanitary fixtures of the sizes indicated on architectural drawings and provide risers as required to accommodate the wastes shown discharging into riser. Riser shall be complete with 10mm chrome plated brass grating unless otherwise indicated on architectural drawings. Grates shall be set at a level to enable floor to be graded to same. The set-out of the floor wastes shall be closely coordinated with the tiling layout. Refer Architectural Drawings for specific set-out requirements.

Floor Grates – HDPE

All floor grates shall be connected to drainage pipework utilising approved connections, puddle flanges and provide watertight seal.

Floor Grates – Vinyl:

All floor grates used covered with vinyl shall be provided with approved clamping and grate.

Vent Pipes

Vents where applicable shall be UPVC unless otherwise indicated. All roof penetrations shall be sealed waterproofed utilising 'Dektite' over flashing or zincalume/lead approved flashing suitable for roof type. On completion, the Plumbing Contractor shall test all penetrations for leaks to the satisfaction of the Superintendent.

Tundishes

Inwall tundishes to serve air conditioning discharges as indicated shall be of 'Stratco' or equal approved manufacture comprising copper, stainless steel or polypropylene in-wall section with removable flush mounted powder coated stainless steel cover plate. Contractor shall ensure Colour selection of cover panel shall match tiled or painted wall surround. Cover plate shall be fixed in place with powder coated stainless steel screws. Cover plate shall be vented type to allow overflow to discharge through fascia in the event of blockage. Submit sample of cover plate prior to ordering.

Box type tundishes for receipt of mechanical, fire and hydraulic services shall be of copper or stainless steel construction and set at 50mm above finished surface level with rolled edge grooves and bevelled edges.

Tundishes located in joinery cupboards may be PVC complete with cone opening and waterless trap located in the vertical plane at a minimum 150mm below tundish. Fix tundish securely in joinery cupboard complete with air gap to mechanical services condensate drain.

Provide tundishes to the following items

- Mechanical Services Plant
- Central Hot Water Plant
- Drinkable Cold Water Tank Overflows
- Fire Sprinkler and Hydrant Test Drains
- Mechanical Services Condensate Drains

Note that the final location of all tundishes shall be coordinated on site with the relevant Services Trade prior to first fix installation.

Waterless Traps

Supply and Install "Hepvo" or equal approved 40mm waterless traps on outlet of tundishes as indicated on drawings. Tundishes shall be installed in vertical plane at minimum 150mm below outlet of tundish in accordance with manufacturers installation instructions.

Inspection Points

Inspection points shall be approved chrome plated brass or cast iron suitable for application required. In the following positions these shall be:

a) 150mm brass traps screws where set in external concrete paving and subject to foot traffic only. Non slip type shall be provided in locations that are susceptible to water.

b) 100mm chrome plated non-slip trap screws in internal tiled floor areas, with cover set flush with finished surface level.

c) Non-slip Vinyl Clamp type where located within vinyl surface areas.

d) Heavy Duty Class 'D' Cast Iron where located externally in carparks, roadways, landscape areas, gardens areas, or areas subject to vehicular traffic (Marked 'S').

Note that concrete type covers shall not be permitted under any circumstance.

6.3 MATERIALS

Materials supplied and installed shall be as noted on drawings and as follows:

- All soil, waste and vent pipework installed below ground shall be UPVC.
- All suspended soil, waste and vent pipework installed above ground shall be acoustically wrapped UPVC or acoustic rated pipework.
- Fixture traps to hand basins, shall be 40mm polypropylene P-Trap or S-Trap where concealed and chrome plated copper traps and waste pipes where visible.
- Fixture traps to sinks, etc. shall be 50mm Polypropylene where concealed and chrome plated copper traps and waste pipes where visible.
- All trade waste pipework shall be HDPE as shown on drawings.

6.4 PIPEWORK FINISHES

In addition to the protective coating specified in the Materials and Workmanship Subsection of this Section provide the following:

Pipework Finishes Schedule

Specification Cross Reference: PAINTING

There is no requirement to paint exposed pipework in carpark.

6.5 FIRE STOP COLLARS

Provide 'PROMASEAL' (as supplied by Promat) or equal approved fire stop collars to all UPVC pipework penetrations through floors and plumbing ducts throughout the building. Fire collars must be tested and approved for use with UPVC. For HDPE, the fire stop collars must be a Drop In, Cast In or Retrofit type that has been tested and approved with HDPE (as supplied by Promat). All fire stop collars must be installed to manufacturer's specification.

Contractor shall refer to the architectural drawings for details on fire rating requirements for floor /walls at individual floors. Note: Any pipe penetrations with an open floor grate above, must be protected with an approved floor waste fire stop collar in accordance with the BCA and AS1530.4

All pipework penetrations must be treated utilising a fire rated product designed for the application. The contractor is required for the fire stop manufacturer's representative to inspect the installation and certify in writing that the correct product has been installed to their

recommendations. Only one off manufacturer shall be permitted for project. Manufacturer to provide all required testing and support systems for all types of fire services penetrations.

The contractor shall request the fire collar manufacturer to undertake a training session for the project to instruct correct installation techniques and relay information for incompatible systems and provide certificate on completion for each person undertaking course.

6.6 ACOUSTIC INSULATION TO ALL SUSPENDED DRAINAGE

Sanitary drainage pipework shall be acoustically treated where installed within ceilings above the locations scheduled below. Contractor shall supply and install 'SOUNDLAG 4525C' or equal approved acoustic lagging comprising of 25mm thick convoluted hydrolysis-resistant foam acoustic insulating material, with a flexible loaded vinyl (5kg/m2 unless otherwise noted below) and protective layer of reinforced foil with a Four Zero fire rating to AS1530.3.

The acoustic insulation to the suspended 65mm kitchen sink waste pipe that traverses from the sink outlet to over the wet area ceiling over the apartment bathroom below, shall be increased in density to two layers of Sound/AG 4525C, in order to meet the BCA Clause F5.6 requirement, i.e. the pipe must be separated from the room of any sole occupancy unit by construction with Rw + Ctr (airborne) not less than 40 if the adjacent room is a habitable room.

The Hydraulics Services Trades shall arrange for the Acoustic Insulation Manufacturer's Technical Representative to attend site prior to ceilings being installed and provide written confirmation that the insulation has been installed in accordance with the product requirements.

Schedule of Areas/Pipework Sections which require Acoustic Lagging installed

- Soil and Waste Drainage Pipework suspended over the Ground Floor Commercial Tenancy and Lobby Areas.
- Soil and Waste Drainage Pipework installed within ceiling spaces above apartments for Level 1 to Level 5, including all soil and waste stacks installed within plumbing ducts.

6.7 AIR ADMITTANCE VALVES

Supply and install 'Studor' or equal approved Air Admittance Valves where indicated on drawings for venting of branch drainage. The Air Admittance Valves must be installed vertically in accessible locations and strictly in accordance with AS/NZS3500 and the manufacturers installation instructions.

6.8 TRADE WASTE SYSTEMS

Trade Waste Drainage systems shall be installed for future provisions to Ground Floor Commercial Tenancies in accordance with AS/NZS3500 and SA Water Corporation Trade Waste Requirements. Two (2) off grease arrestors shall be installed in a location which is:

- Accessible for inspection, service and maintenance operations with adequate clearance space above and around the device.
- Free of obstructions and potential damage.
- Not able to be damaged by vehicles or traffic.
- Safe for the trade waste officers performing auditing or sampling functions e.g. not in a roadway.

The proposed grease arrestors shall be located as indicated on the drawings within the basement. The vertical clearance above the grease arrestor shall be equal to the maximum depth of the arrestor/pit. Adequate clearance around each grease arrestor of 1.0m minimum shall be provided.

A cold water tap with a testable double check valve shall be installed within 5m of each grease arrestor for cleaning and maintenance purposes – refer to drawings for further details.

All grease arrestor covers and lids must conform to AS3996-2006 and comply with the required design loading. The design of lids shall comply with the National Standard for Manual Handling published in February 1990 by the National Occupational Health and Safety Commission.

Wherever the lid of a pre-treatment device is found to be too heavy to be lifted by one person, in order to minimise the risk of injury to SA Water's employees, the trade waste customer will be required to change the lid with a lighter lid (if applicable) or with a better designed lid. All lids shall incorporate portholes (minimum size 200mm) to manufacturer approval.

7 COLD WATER SERVICE

7.1 GENERAL

Make application to SA Water Corporation and pay all associated fees for the following works:

- For a new 50mm water meter connection off Unley Road serving the apartment building, with the water meter install within a cast iron footpath box.
- For the installation of three (3) new below ground 20mm water meter connections off Opey Avenue within inground cast iron valve boxes complete with heavy duty lid to service Townhouses A, B and C.
- For the installation of a meter manifold off Opey Avenue consisting of three (3) new above ground 20mm water meters to service Townhouses D, E and F.

The incoming cold water supply serving the apartment building shall be fitted with a testable double check valve and extend to the storage tanks and pressure pumpset located within the Basement to provide drinkable cold water to the buildings apartments, commercial tenancies and base building.

Multiple cold water risers shall extend within the building plumbing risers to reticulate cold water to each floor. The cold water branch feed off the riser shall reticulate to a cold water isolation located within the ceiling space of the area it services adjacent an access panel. A pulse output water meter shall be provided downstream of the isolation valve for cold water supplies to apartments and commercial tenancies.

Pressure reducing valves shall be installed to cold water branch take-offs to floors indicated on schematic diagram to limit the maximum water supply pressure to a maximum 500kPa (approx.). Flow device shall ensure that equal flows are maintained to hot and cold water inlet point for each fixture. Each flow device shall be rated at the static pressure (of each floor level) to ensure that the correct flows as stated above are maintained.

General

Not more than one outlet shall be taken from a 15mm supply branch and no service pipe shall reduce to 15mm diameter in excess of 2m of the fitting it is to serve.

With the exception of chromium plated connections to fixtures, no other water pipes are to be exposed within the Buildings (unless otherwise noted on drawings).

The cold water system shall be complete with connection to new water meter, piping, fittings, valves etc, and as further specified under this part and as generally shown on the drawings.

Label all accessible water pipework with an approved self-adhesive marker, at not greater than 3 metres centres indicating the nature of the service and the direction of flow.

7.2 TAPS AND VALVES

Generally

Provide and fix taps and valves to all cold water points and as scheduled elsewhere in this specification. All taps and valves are to be of the same nominal diameter as the pipes to which they are fitted and to be tested and stamped by water mark approval.

Tapsets, Cocks and Outlets

Unless specifically stated otherwise all taps, tapsets and associated fittings shall be of manufacture as nominated in Tapware Schedule. Water cocks shall be high pressure type unless otherwise specified, and of approved manufacture with brass bodies.

External hose cocks shall be polished brass keyed head type. All cocks shall be of the same nominal diameter as the pipes to which they are fitted. The cocks shall be tested, approved and stamped by the water marked approval and manufactured in accordance with AS1628 and AS1718.

Tapsets shall be complete with concealed breeching pieces. All tapsets built in walls to have fluid aprons fitted at wall junction and installed as per manufacturer requirements.

Cocks and outlets serving fixtures shall be chromium plated with vandal-proof heads and colour coded (hot and cold) buttons as applicable. Outlets shall match cocks.

7.3 TESTING

Allow for subjecting the drinkable water service to a pressure test as previously specified. Provide test sheets recording section tested, date of test, and pressure to which pipework is tested. Test sheets shall be included in the Operating and Maintenance Manual.

7.4 VALVE IDENTIFICATION

All isolating valves shall be clearly marked by service and function served. Labels shall be black on white engraved laminated plastic labels securely attached to the valve.

7.5 BACKFLOW PREVENTION VALVES

Provide approved backflow prevention devices to all equipment scheduled for backflow prevention valves as included in the tapware schedule and below, or as shown on the drawings.

Location	Type
Incoming Water Supply	50mm Zurn Wilkins 350XLCLU Testable Double Check Valve Assembly
Irrigation Water Supply	25mm Zurn Wilkins 350XLCLU Testable Double Check Valve Assembly
Washdown Tap Water Supply (Grease Arrestor/Pump Chamber)	20mm Zurn Wilkins 350XLCLU Testable Double Check Valve Assembly (one per tap)
Bin Washdown Tap Water Supply	20mm Zurn Wilkins 350XLCLU Testable Double Check Valve Assembly
Bin Chute Washdown Water Supply	20mm Zurn Wilkins 350XLCLU Testable Double Check Valve Assembly
Pool Plant Water Supply	20mm Zurn Wilkins 375XLC Reduced Pressure Zone Device Assembly

All backflow prevention devices shall be installed in accordance with AS/NZS3500.1 complete with isolating valves to inlet and outlet, strainer to inlet and test cocks complete to accept hose kit connections. All backflow prevention valves are to be tested and commissioned prior to

practical completion by an appropriately licensed person. Test certificates to be included within Operating and Maintenance Manual. Testing shall be repeated at the end of the Defects Liability period and the relevant documentation lodged with Office of the Technical Regulator and copied to the Proprietor. In addition, all screw nose hose cocks shall be fitted with hose connector type syphon breakers.

7.6 PURGING

Every care shall be taken during the installation to minimise the entrance of sand, grit or foreign matter in the supply piping. Cold water supply pipes to hot water heaters are to be purged prior to the installation of the heater and all hot water supply pipes from the heater to hot water draw off points are to be purged prior to installation of tapsets, cocks, etc. The installation to be left charged and ready for use when occupied.

7.7 NON-DRINKABLE COLD WATER

Contractor shall allow for the supply and install of a non-drinkable cold water pipework system for the supply of water for irrigation to base building planters. Works shall include provision of 300mm straight piece of pipework to allow for future installation of solenoid valve on water supply to each floor located in accessible location – coordinate with electrical services trade on site for final location of power supply.

8 HOT WATER SERVICE

8.1 GENERAL

The works shall include the whole of the Drinkable Hot Water Service to the outlets where shown, including the supply, installation and connection of hot water plant.

8.2 HOT WATER PIPING INSULATION

All hot water pipework shall be insulated as specified in the 'Materials' clause of this section of this Specification.

8.3 TAPS AND VALVES

Refer to "COLD WATER SERVICE" clauses for details.

8.4 TESTING

Allow for subjecting the hot water system to a pressure test as previously specified. Isolate the water heater from the hot water service being tested.

8.5 TEMPERING VALVES AND THERMOSTATIC MIXING VALVES

Supply and Install "RMC Model Heat Guard HP Green Cap" or equal approved adjustable type tempering valve and sized to suit pipework as indicated on drawings. Tempering Valves shall be supplied with check valve and stainless steel disc strainers on both hot and cold water inlets.

Supply and Install "Enware Aquablend 1500" or equal approved thermostatic mixing valves as indicated on drawings. Thermostatic Mixing Valves shall be installed with combination isolating ball valve, non-return and dual stage strainer assemblies which incorporate water pressure/temperature test ports.

Tempering Valves and Thermostatic Mixing Valves shall be installed on hot water supplies to each apartment and base building amenity area as indicated on drawings in accordance with manufacturers installation instructions. Valves shall be installed in ceiling space adjacent access panel in accessible location unless otherwise indicated.

8.6 HOT WATER BALANCING VALVES

Supply and Install "Caleffi" (model number 116050) or equal approved watermarked hot water thermostatic balance valves. Valves to be fitted to each hot water return pipework branch as indicated on drawings and commissioned to the manufacturers requirements. Balance valves shall be automatic type to enable dynamic balancing of each circuit provided with manual bypass set return temperature and fitted with temperature gauge. Provide technical data for review prior to order.

Allow to fully commission the hot water recirculation system making require valve adjustments in accordance with the valve manufacturers' instructions. All balancing valves shall be fitted with isolation valves either side of the valve with barrel unions or compression joints fitted to permit easy removal. Provide commissioning certificate on completion for insertion into manuals.

Contractor shall confirm final size of the hot water balance valve prior to order to suit the required hot water return flow rate. Contractor shall confirm flow rates prior to commissioning.

8.7 CENTRAL HOT WATER PLANT

Refer to Equipment section of this specification – to be supplied and installed by Embedded Network Provider.

8.8 HOT WATER CIRCULATING PUMPS

Refer to Equipment section of this specification.

8.9 PURGING

Refer to "COLD WATER SERVICE" clauses for details.

9 NATURAL GAS SERVICE

9.1 GENERAL

Make Application and Pay Associated Fees to 'APA Group' for the installation of a new gas connection to the site off Opey Avenue serving the following gas meters – note that the gas meters shall be installed within a combined fire rated enclosure complete with louvered doors:

- One (1) off Gas Meter serving the apartment building capable of 1750MJ/hr at 2.75kPa.
- One (1) off Gas Meters for future café tenancies capable of 500MJ/hr at 2.75kPa.
- One (1) off Gas Meter for future restaurant tenancy capable of 1000MJ/hr at 2.75kPa.

Make Application and Pay Associated Fees to 'APA Group' for the installation for the following works servicing the proposed townhouses:

- Three (1) off Gas Meters each capable of 260MJ/hr at 2.75kPa servicing Townhouses A, B and C within individual gas meter boxes off Opey Avenue.
- Three (1) off Gas Meters each capable of 260MJ/hr at 2.75kPa servicing Townhouses D, E and F within a common fire rated gas meter enclosure complete with louvered doors.

Gas meters shall be installed within one hour fire rated enclosures complete with louvered doors in accordance with AS/NZS5601 and APA Group requirements. Refer to architectural documentation on further details of gas meter enclosure.

Gas pipework shall reticulate from each meter to service the Ground Floor Commercial Tenancies, Central Hot Water Plant and Apartments as indicated on drawings. Natural gas Installation shall be in accordance with AS/NZS5601.

9.2 INSTALLATION

General

Refer Workmanship Subsection.

Labelling

Label all accessible or exposed natural gas pipework with an approved self-adhesive marker, at not greater than 3 metre centres. Labels to comply with AS1345.

9.3 TESTING

Allow for subjecting the gas pipework installation to pressure tests. Provide test sheets recording section tested, date and pressure to which pipework tested.

9.4 COMPLETION

On completion of installation and testing, turn on isolating and control valves and purge and charge the installation.

10 EQUIPMENT

10.1 CENTRAL HOT WATER PLANT

General

The central hot water plant shall be supplied and installed by Embedded Network Provider as coordinated by and in accordance with agreement with the developer. The hydraulic services contractor shall provide incoming hot water, cold water and natural gas supplies to the assembly, terminating with isolation valves as directed by the installer. Embedded Network Provider shall provide final connection to plant equipment in accordance with the manufacturers installation instructions.

Central Hot Water System

Embedded Network Provider shall supply and install a "Rheem Tankpak" (Model No. TPI05NFD/2430) gas fired internal hot water system. The system shall have a thermal input of 1025MJ/hr and shall consist of five (5) off "Rheem" 27L outdoor continuous flow water heaters mounted and pre-plumbed on a free standing frame complete with a "Grundfos CM 5-2" primary hot water pump and associated piping, fittings and controls.

The system shall be connected to two (2) off "Rheem" 430L (model number 61043050) storage tanks. Contractor shall include all necessary incoming connections and valves to complete the system in accordance with the manufacturers installation instructions.

System shall be include the necessary proprietary coaxial flueing required extending from each burner to outside and installed in accordance with the manufactures installation instructions.

It shall be a pre-requisite for the Embedded Network Provider to engage and pay all associated costs for the manufacturer to attend site before installation of the systems, instruct the method and piping sequence of installation and commission the systems on completion.

The hydraulic services contractor shall provide stainless steel straps and fixings to secure the hot water tanks to a galvanised support frame to comply with AS1170.

System Requirement

The system shall be capable of delivering at a minimum 4935L of hot water over a one hour peak period at 50°C riser in temperature (65°C delivery temperature).

Electrical Services Trade

The electrical services trade shall provide a 240V 10amp general power outlet for connection to plug and lead provided with factory assembled manifold for power supply to heaters. Coordinate final location of GPO on site with electrical services trade.

10.2 CENTRAL HOT WATER PLANT CIRCULATING PUMPS

The drinkable hot water system circulating pump assembly shall be supplied and installed by the hydraulic services contractor and shall comprise of a twin pump assembly configured as duty/stand-by operation. The pump assembly shall be supplied pre-plumbed including pipework, fittings, check valves, valves, etc. as necessary, ready to connect to the hot water

return pipework. The system controller shall automatically alternate duty pumps on a weekly basis.

The hot water circulating pump assembly shall be "Rheem Rediset (model number 890667)" or equal approved standard dual pump set incorporating two "Grundfos UPS32-80N" circulators with auto changeover and mounted on a galvanised factory manifolded base frame with non-return and shut off valves. The assembly shall be provided with a manufacturer approved cover to protect the pumps.

The pump assembly shall be provided with a weatherproof vented colour bond cover to protect pumps from weather – colour of cover to be confirmed with architect prior to order. Contractor shall provide galvanised support stand to pump package and fix to roof plant platform.

Pumps shall be mounted strictly in accordance with manufacturers recommendations. Contractor shall engage manufacturer for final commissioning and pay associated costs.

Pump duty for each pump estimated at 0.54L/s @ 80kPa. Hydraulic trade shall confirm final duties prior to pump order.

Electrical Services Trade

The electrical services contractor shall supply a weatherproof 240V single phase isolator capable of 10amps adjacent circulating pumps. Coordinate final location of isolator on site with electrical services contractor.

10.3 PULSE OUTPUT WATER METERS

Contractor shall install pulse output hot and cold water meters as supplied by Embedded Network Provider on hot water supplies to apartments, base building amenities and Commercial Tenancies in accordance with manufacturer installation instructions.

10.4 DRINKABLE COLD WATER PRESSURE PUMPSET

Contractor shall supply and install "Global Water E-Boost Triple Booster Set" or equal approved triple pressure pump system (Model number EBBS.V.3.10.10) factory mounted and manifolded on a stainless-steel skid with "Grundfos" or equal approved pumps set at duty/assist/standby. Pumpset to be located as indicated on hydraulic services drawings complying with the following performance and construction criteria:

Packaged automatic booster pump sets complete with pumps, suction and discharge manifolds mounted on a common base with the control panel pre-wired to the pumps. Duty and standby pumps which have been sized for 3 x 50% duty shall be controlled by variable frequency invertor through a pressure transducer. Pumps to be vertical multi-staged centrifugal pumps fitted with cast iron body, stainless steel impeller, and stainless steel shaft, stainless steel suction and discharge manifolds with brass suction and discharge ball valves. Provide KWIKSTART variable speed Control Panel which incorporates the following:

- Main switch for isolation of incoming power supply.
- Fuse protection for each pump.
- Self-contained programming.
- Auto/off/manual selector switch.

- Run and fault lights including display for pressure, flow, frequency and temperature.
- TOL and electronic motor protection.
- Fully synchronised starting and stopping of pump for constant pressure operation.
- Switchboard colour to be manufacturer's standard colour.
- Low water lockout.
- Hour run meters for each pump.
- Common Kwhr meter for the complete pump assembly.
- Protection features including Dry Running, Over current, Thermal Overload.

In addition to the above specified features, the control panel shall incorporate a liquid level control system with the following visual alarm indicators:

- Power light fail
- Power available light
- Storage Tank low level alarm
- Storage Tank high level alarm

Panel shall incorporate auto/off/manual switch for each pump, control fuse, motor circuit breaker, alarm mute switch on fascia and all necessary relays all mounted in a lockable dust and waterproof metal cabinet (IP 56 rating).

All switches shall be incorporated on the control panel fascia together with all indicating lights. A remote mounted flashing red smoke visual alarm light with buzzer with suitably engraved signage below shall be mounted at high level in Lift Lobby to inform when an error occurs.

The panel shall control the operation of the pressure pump in response to signal from tank multi-probe liquid level controller. ON/OFF and high and low-level alarm detection shall be means of a stainless steel probe. "Omron" or equal.

The system shall be commissioned by the supplier and correct operation confirmed in writing together with submission of commissioning results. Note, the Electrical Trade shall provide three phase power unterminated in tails adjacent to Pump Panel; hence wiring from control panel to pump and to level controller shall be the Hydraulic Services Trade's responsibility.

The system shall be commissioned by the manufacturer and test certificate included with the Operating and Maintenance manuals.

System Operation

The installation pressure shall be monitored continuously via a pressure transducer mounted in the system discharge manifold.

The frequency invertor shall be programmed to switch the first pump on at a predetermined pressure, to be set on commissioning. As the demand increases and the first pump has reached full speed, the second pump shall start, whilst simultaneously the first pump is ramped down to ensure that the pressure variations are kept to a minimum. As demand continues to increase both pumps ramp up until they are both at full speed, then the third pump is started as the first two pumps are ramped down, and the process repeats itself until all available pumps have been started on system water demands.

The shutdown procedure is a reversal of the start-up procedure as water demand decreases all the pumps ramp down and up as the other pumps switch off to maintain constant pressure.

Automatic Sequence Change

To ensure equal operating hours for each pump and to reduce the number of starts per hour for each pump, the system shall automatically alternate the sequence of the pumps used each time the system is called to operate.

Additionally, should the system demand not allow the first pump set to completely shut down over a 24-hour period, the controller will stop the pumps that are running and start the remaining pumps at a predetermined time of the day.

The controller shall also start each pump for one second each day, if there has been no demand to ensure that all rotating elements do not bind.

Construction Details

The common base plate which supports the pumps shall be fabricated from 304 stainless steel.

Manifolds will be fabricated from 316 stainless steel.

Pumps shall have screwed CAD plated brass ball valves fitted on both sides of each main booster pump. Check valves shall also be fitted to the suction side of each main booster pump.

A pressure tank shall be fitted to facilitate shut down and reduce the cycling of pumps. The pressure tank shall be mounted directly on the discharge manifold.

The estimated duty for each individual pump is 3..0L/s @ 700kPa (total duty = 6.0L/s). Pump duties are estimated only and shall be adjusted as required to suit final pipework arrangement. Final pump outlet pressure shall be confirmed with the Consultant during the commissioning of the system.

The Hydraulic trade shall allow for the pump manufacturer to commission the pump system and provide a commissioning certificate upon completion.

The system shall be commissioned by the manufacturer and test certificate included with the Operating and Maintenance manuals.

The Electrical Services Trade shall provide minor works for the installation of an isolator located in the basement adjacent the control panel capable of 8.0 Amp three phase power supply.

Performance criteria:

Designation	**DCWBP01**
No. of pumps	3
Capacity - L/s	3.0L/s per pump
Estimated duty - kPa	700kPa
Maximum operating power - kW	3.0
Motor type - volts/phase	400/3
Motor speed controller	VSD

10.5 DRINKABLE COLD WATER STORAGE TANKS

Supply and install two (2) off "Bushmans TSL1100" or equal approved slimline polyethylene water storage tanks with nominal capacity of 500 0Lminimum and approximate dimensions 2100mm high, 3340mm long and 1060mm wide. Each tank shall be constructed from food grade polyethylene and shall be suitable for storage of drinkable water.

Each storage tank shall include one (1) off FRP manhole cover, water level indicator and all necessary reinforcements, and shall be installed in accordance with the manufacturers installation instructions.

The tank shall be supplied complete with four (4) off connection flanges; outlet connection, inlet connection, drain connection and overflow connection. The sizes of the connections shall be as indicated on the drawings or as noted. Coordinate locations of connections with manufacturer and provide shop drawings for review prior to order.

Each tank inlet shall be installed with two (2) off 40mm 'Philmac' servo type float valves. Tanks to have 50mm overflow, 40mm drain valve, and one (1) off 40mm ball valve both at low level for connection to pump suction point and drain pipe point.

The tanks shall be installed and commissioned as per manufacturer specifications.

Performance criteria:

Designation	**DCWT1**	**DCWT2**
Storage capacity - L	5000	5000
Tank length (approximate) - mm	3340	3340
Tank width (approximate) - mm	1060	1060
Tank height (approximate) - mm	2100	2100

10.6 DRINKABLE COLD WATER STORAGE TANK LEVEL CONTROL SYSTEM

Provide a Pump Control Panel incorporating liquid level control system as specified above as part of the pressure pumpset. The Control Panel shall be located adjacent transfer pump and incorporate in addition to the above specified features the following visual alarm indicators:

- Power light fail
- Power available light
- Storage Tank low level alarm
- Storage Tank high level alarm

Panel shall incorporate auto/off/manual switch for each pump, control fuse, motor circuit breaker, alarm mute switch on fascia and all necessary relays all mounted in a lockable dust and waterproof metal cabinet (IP 56 rating).

All switches shall be incorporated on the control panel fascia together with all indicating lights. A remote mounted flashing red smoke visual alarm light with buzzer with suitably engraved signage below shall be mounted at high level in Lift Lobby to inform when an error occurs.

The panel shall control the operation of the transfer pump in response to signal from tank multi-probe liquid level controller.

ON/OFF and high and low level alarm detection shall be means of a stainless steel probe. "Omron" or equal.

The system shall be commissioned by the supplier and correct operation confirmed in writing together with submission of commissioning results. Note, the Electrical Trade shall provide three phase power unterminated in tails adjacent to Pump Panel; hence wiring from control panel to pump and to level controller shall be the Hydraulic Services Trade's responsibility.

The system shall be commissioned by the manufacturer and test certificate included with the Operating and Maintenance manuals.

10.7 INGROUND GREASE ARRESTOR

Provide two (2) off 'Cooke Precast Concrete' or equal approved 5000L trade waste arrestors complete with Class D Heavy Duty Cast Iron Gatic covers raised to surface level to match surrounding concrete and floor finish as indicated. Note that cast iron lids to be visible only on completion.

Trade waste arrestors to be coated with 2 coats of epoxy treatment to all internal surfaces. Contractor shall request from manufacturer a certificate of confirmation for application off epoxy coating to trade waste arrestor as part of works. All trade waste arrestors shall be manufactured and installed in accordance with SA Water Corporation Trade Waste Department and OTR requirements and regulations. Extend 100mm trade waste vent to outlet of grease arrestors and extend to above roof complete with wind driven turbo vent. Provide flexible joints to all trade waste connections as required.

10.8 INGROUND PUMP CHAMBER

Supply and install "Global Pumps DrainAce Concrete" or equal approved Dual Pump Sewer Station for receipt of drainage on outlet of grease arrestors capable of 1.0L/s at 8 metres total head complete with 2 x 'Global Pump' Model GPG32-90 three phase submersible grinder pumps with freestanding skid base.

The pump station is to be located inground in Basement Carpark within a 3340mm diameter x 2700mm deep polyethylene pump pit with a total capacity of 23,500L complete with a 600mm x 900mm Class 'D' heavy duty cast iron cover and frame supplied loose. Internal pipework, check valve, vent, gate valve and quick release connector is to be supplied as part of the pump package. The pumps shall be provided with a K312A Kwikstart Twin Pump Controller with start/stop and high level floats/alarms.

Contractor shall allow for the supply and installation of 2 x 50mm electrical conduits between the pumps and monitor panel location. The monitor panel location is to be determined on site mounted to adjacent column complete with vandal proof enclosure to prevent tampering. The builder shall provide a stand post for the control panel if necessary.

The Electrical Services Trade shall provide minor works for the installation of an isolator located in the basement on column adjacent the control panel capable of 4.6 Amp three phase power supply.

11 HANDING OVER AND PRINCIPALS INSTRUCTION

Complete the testing balancing and commissioning of all systems, provide all commissioning and performance data and provide the installation manuals including post contract drawings prior to handing over the installation.

Completion will not be granted until the above requirements have been met.

Provide the services of the Site Hydraulics Project Manager to instruct the Principal's Representative in all details of the plant operation.

11.1 TIMING OF SUBMISSIONS

The submission documentation described above is required to be submitted:-

- With each claim for progress payments.
- At end of practical completion.

11.2 MAINTENANCE AND GUARANTEE PERIOD

A minimum of four (4) maintenance inspections shall be carried out during the defects period. Maintenance inspections shall be limited to inspection of the various pump assemblies and hot water equipment installations in the building.

The routine maintenance inspections to the pump assemblies shall be carried out strictly in accordance with the manufacturer's recommendations. Allow for the respective pump manufacturer's technical representative/maintenance personnel to carry out the maintenance works during the defects liability period. At the end of the 12 month defects period the manufacturer's shall provide a written statement that all systems have been satisfactorily maintained and are operating correctly. All system set-points shall be recorded in the maintenance log sheets for each system including details of any adjustments made during the maintenance period.

Systems to be maintained include the following:

- Central Hot Water Plant
- Hot Water Circulating Pumpset
- Drinkable Cold Water Pressure Pumpset
- Grease Arrestors
- Inground Sewer Ejector Pump Chamber
- Testable Double Check Valves
- Thermostatic Mixing Valves and Tempering Valves

Prior to commencement of the defects period, The Hydraulic Services Trade shall prepare sample log sheets for the project which outline the scope of activities to be carried out during this period.

During this period the Plumbing Services Contractor shall at his own expense attend to any work which proves defective due to faulty workmanship, materials or design.

The responsibility shall include provision of labour and all incidental costs necessary for the removal and replacement of all defective parts and components.

All works must be executed by properly qualified Plumbing Services tradesman.

11.3 INSPECTIONS

Notice: Give sufficient notice to the Main Contractor's site representative and/or the Superintendent so that inspection may be made at the following minimum stages:

- Excavated surfaces prior to placing pipe bedding material.
- Works ready for specified testing.
- Testing of the installation.
- Concealed and underground work prior to covering, concealing or backfilling.

Minimum notice required for all required inspections, 2 working days.

11.4 TESTING

Requirement

Carry out required tests. Supply the apparatus and materials necessary. Submit the test results in writing.

Preparation for Testing

Seal off items of equipment not designed to withstand the test pressure. Securely anchor pipes and fittings in position to prevent movement during the tests.

Concealed Work

Do not cover or conceal work until it has been tested. Leave pipe joints exposed to enable observation during the test.

APPENDIX A – SECTION COSTS AND UNIT RATES – SANITARY AND HYDRAULIC SERVICES

This schedule is to be completed and submitted with Tender submissions. The amounts indicated in the total tender price including administration costs and profit for sections of the work are as follows:

ITEM		AMOUNT TENDERED
Common Services		
Site Establishment and Preliminaries	$	
Authority Fees	$	
Apartment Building		
Inground Soil, Waste and Vent Pipework	$	
Suspended Soil, Waste and Vent Pipework in Basement Areas	$	
Soil Stacks, Waste Stacks and Vent Pipework serving apartments	$	
Trade Waste Drainage Pipework	$	
Drinkable Cold Water Reticulation Pipework extending from authority meter to service apartments, commercial tenancies and base building including testable double check valves	$	
Drinkable Hot Water Flow and Return Reticulation Pipework extending from Central Hot Water Plant to service apartments and commercial tenancies including thermostatic mixing valves and tempering valves	$	
Natural Gas Reticulation Pipework extending from authority meters to service commercial tenancies, apartments and Central Hot Water Plant	$	
Supply and Install of Hot Water Circulating Pumpset	$	
Supply and Install of Drinkable Cold Water Pumpset and Storage Tanks	$	
Supply and Install of Inground Sewer Ejector Pump Chamber	$	
Supply and Install of Inground Grease Arrestors	$	
Supply and Install of Sanitary Fixtures and Tapware	$	
Supply and Install of Emergency Shower and Eye/Face Wash	$	
Install of Pulse Output Water Meters (supplied by Embedded Network Provider)	$	
Townhouses		
Suspended Soil, Waste and Vent Pipework in Basement Carpark	$	
Drinkable Cold Water and Natural Gas Reticulation extending from authority meters within Basement Carpark to each townhouse	$	
Internal Soil, Waste and Vent Pipework	$	
Internal Drinkable Cold Water, Drinkable Hot Water and Natural Gas Pipework	$	

ITEM		AMOUNT TENDERED
General		
Maintenance and Defects Liability Period	$	
Shop Drawings	$	
Work-as-executed Drawings and O&M Manuals	$	
Miscellaneous (specify)	$	
GST 10%	$	
TOTAL TENDER AMOUNT INCLUDING GST	**$**	

Rates

Plumber	Per/hr	$
4th Yr Apprentice	Per/hr	$
Backhoe	Per/hr	$
Gas Fitter	Per/hr	$
65mm Inground Soil, Waste and Vent Pipework	Per/m	$
100mm Inground Soil, Waste and Vent Pipework	Per/m	$
65mm Suspended Drainage Pipework	Per/m	$
100mm Suspended Drainage Pipework	Per/m	$
150mm Suspended Drainage Pipework	Per/m	$
75mm Trade Waste Pipework	Per/m	$
110mm Trade Waste Pipework	Per/m	$
75mm Acoustic Rated Drainage Pipework	Per/m	$
110mm Acoustic Rated Drainage Pipework	Per/m	$
160mm Acoustic Rated Drainage Pipework	Per/m	$
20mm DCW/DHW PEX	Per/m	$
25mm DCW/DHW PEX	Per/m	$
32mm DCW/DHW PEX	Per/m	$
40mm DCW/DHW PEX	Per/m	$
50mm DCW/DHW PEX	Per/m	$
20mm DCW/DHW Copper	Per/m	$
25mm DCW/DHW Copper	Per/m	$
32mm DCW/DHW Copper	Per/m	$
40mm DCW/DHW Copper	Per/m	$
50mm DCW/DHW Copper	Per/m	$
65mm DCW/DHW Copper	Per/m	$
80mm DCW/DHW Copper	Per/m	$
20mm NG Copper	Per/m	$
25mm NG Copper	Per/m	$
32mm NG Copper	Per/m	$
40mm NG Copper	Per/m	$
50mm NG Copper	Per/m	$
65mm NG Copper	Per/m	$

APPENDIX B – TECHNICAL DATA SCHEDULES – HYDRAULIC SERVICES

The following schedule is to be completed at time of tender submission.

IDENTIFICATION LABELS

Make/Material .....

VALVE AND EQUIPMENT TAGS

Make/Material .....

BRACKETING SYSTEMS

Make/Material .....

INGROUND SOIL, WASTE AND VENT PIPEWORK

Manufacturer .....

Material .....

Nominal Size .....

SUSPENDED SOIL, WASTE AND VENT PIPEWORK

Manufacturer .....

Material .....

Nominal Size .....

TRADE WASTE PIPEWORK

Manufacturer .....

Material .....

Nominal Size .....

ACOUSTIC RATED DRAINAGE PIPEWORK

Manufacturer .....

Material .....

Nominal Size .....

DRINKABLE COLD WATER AND HOT WATER PIPEWORK – RETICULATION MAINS

Manufacturer .....

Material .....

Nominal Size .....

DRINKABLE COLD WATER AND HOT WATER PIPEWORK – RETICULATION BRANCHES

Manufacturer .....

Material .....

Nominal Size .....

NATURAL GAS PIPEWORK – RETICULATION MAINS

Manufacturer .....

Material .....

Nominal Size .....

NATURAL GAS PIPEWORK – RETICULATION BRANCHES

Manufacturer .....

Material .....

Nominal Size .....

ACOUSTIC LAGGING

Manufacturer .....

Material Thickness .....

THERMAL LAGGING

Manufacturer .....

Material Thickness .....

NON-SLIP INSPECTION OPENING COVER

Manufacturer .....

Cover Material .....

HEAVY DUTY INSPECTION OPENING COVER

Manufacturer .....

Cover Material .....

REFLUX VALVE

Manufacturer .....

Nominal Size .....

Material .....

WATERLESS TRAP

Manufacturer/Model .....

Nominal Size .....

AIR ADMITTANCE VALVE

Manufacturer/Model .....

Nominal Size .....

COLD/HOT WATER ISOLATION VALVES

Manufacturer/Model .....

Material .....

Nominal Size .....

NATURAL GAS ISOLATION VALVES

Manufacturer/Model .....

Material .....

Nominal Size .....

TESTABLE DOUBLE CHECK VALVE

Manufacturer/Model .....

Nominal Sizes .....

REDUCED PRESSURE ZONE DEVICE ASSEMBLY

Manufacturer/Model .....

Nominal Size .....

IN-WALL TUNDISH

Manufacturer/Model .....

Material .....

Cover Plate Finish .....

PRESSURE REDUCING VALVES

Manufacturer/Model .....

Nominal Size .....

THERMOSTATIC MIXING VALVES

Manufacturer/Model .....

Nominal Size .....

TEMPERING VALVES

Manufacturer/Model .....

Nominal Size .....

BALANCING VALVES

Manufacturer/Model .....

Nominal Size .....

HOT WATER CIRCULATING PUMPSET

Manufacturer/Model .....

Number of Pumps .....

Pump Material .....

Pump Duty (L/s) .....

Pump Duty (kPa) .....

Electrical Supply (V, Phase, Amps) .....

DRINKABLE COLD WATER PRESSURE PUMPSET

Manufacturer/Model .....

Number of Pumps .....

Pump Material .....

Pump Duty (L/s, kPa) .....

Electrical Supply (V, Phase, Amps) .....

DRINKABLE COLD WATER STORAGE TANKS

Manufacturer/Model .....

Tank Material .....

Tank Capacity .....

Number of Inlets/Outlets .....

Size of Inlets/Outlets .....

INGROUND SEWER EJECTOR PUMP CHAMBER

Manufacturer/Model .....

Number of Pumps .....

Pump Material .....

Pump Chamber Material .....

Pump Duty (L/s, kPa) .....

Electrical Supply (V, Phase, Amps) .....

EMERGENCY SHOWER AND EYE/FACE WASH

Manufacturer/Model .....

Material .....

GREASE ARRESTOR

Manufacturer/Model .....

Arrestor Material .....

Arrestor Capacity .....

Cover Material .....