

**“BIG SHED”**  
**SOUTH WESTERN HIGHWAY**  
**WAROONA**

.....

**HYDRAULIC SERVICES SPECIFICATION**

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HYDRAULIC SERVICES CONSULTANTS

**Hutchinson Associates**

First Floor

Unit 1 / 22 Milford Street

EAST VICTORIA PARK WA 6101

Phone: 9328 9155

Email: mah@hutchass.com.au

ARCHITECT

**MCG Architects Pty Ltd**

62 Wittenoon Street

BUNBURY WA 6230

Phone: 9791 6993

Email: [desmond@mcgarchitects.com.au](mailto:desmond@mcgarchitects.com.au)

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# HYDRAULIC SERVICES

## 1 GENERAL CONDITIONS

Attention is directed to the head contract preliminaries section, all conditions of which form an integral part of this section and are equally binding and applicable to all sections of this specification.

### 1.1 Scope of Work

The work included in this section is the supply of all labour and material for the execution of Hydraulic Services work indicated on the contract issue drawings and or specified herein.

- Sanitary Fixtures
- Taps and Valves
- Soil, Wastes and Vent Pipes
- Domestic Cold Water Service
- Non-Potable Water Service
- Domestic Hot Water Service
- Sanitary Drainage
- LP Gas Service

### 1.2 Drawings

#### a) Contract Drawings

A set of contract issue drawings detailing the principles of the Hydraulic Services scope in section 1.1 above to this specification will be issued with the head contract issue drawings.

These drawings are to be read in conjunction with Architectural, structural and all other relevant contract issue drawings including preliminary and final shop drawings prepared by other trades. Ensure all reference drawings utilised are of current issue during the execution of these works.

**Take Note:** The details of hydraulic services shown on the contract issue drawings indicate the principles of design and design co-ordinated routes of piping. These drawings are not 'Shop Drawings' and do not show all services in infinite detail. Notwithstanding the information shown on these drawings or specified herein, co-ordinate the installation of all hydraulic services without conflict with structural elements or the services of other trades and in complete accordance with the requirements of the National Construction Code (NCC) all current Australian Standards requirements, all relevant Authorities requirements and the requirements of the Plumbers Licensing Board.

Any discrepancies between the relevant drawings which may affect the Hydraulic Services installation shall be reported to the Superintendent before the work proceeds.

Deviation from the drawings will not be permitted unless approval from the Superintendents representative is obtained in writing.

#### b) 'As Constructed' Drawings

During the course of construction, accurately record on an original set of construction issue drawings all variations to the installed work including recording by figured dimensions the locations and invert levels of all concealed services relative to building walls and project datum. The contractor shall engage the services of a qualified licensed surveyor to undertake this work prior to trenches / excavations being backfilled. Non-compliance with this requirement will delay processing of the hydraulic services component of the building contractors final progress claim.

These drawings are to be kept on site, shall not be used for any other purpose, shall be available for inspection by the Superintendents representative at all times and variations to the documentation shall be recorded as they occur.

On completion of the whole installation transpose the 'As Constructed' information **onto computer disc compatible with AutoCAD Version 2014** by a qualified computer drafting person and hand the completed disc to the Superintendent together with **printed hard copies** of each drawing and copies of the operating manuals specified hereafter. Refer to the head contract document for the number of copies (minimum of two (2)) to be provided.

Final payment for this Sub-Contract shall be conditional upon draft copies of these drawings signed off by a licensed surveyor and draft copies of the operating manuals being handed over to the Superintendent one (1) month prior to practical completion being achieved. A practical completion certificate will not be issued to the builder / contractor until final as constructed drawings and manuals have been provided.

### **1.3 Regulations**

The whole of the Hydraulic Services installation shall be carried out by or under the direct supervision of a fully licensed Sanitary Plumber in strict accordance with all relevant Australian Standards requirements, the Water Services Licensing (Plumbers Licensing and Plumbing Standards) Regulations 2000 (the Regulations), the National Construction Code (NCC), the Department of Fire & Emergency Services Authority of WA (DFES), the Gas Supply Authority, the Local Authority Council, Public Health Department requirements and the requirements of any other relevant Authority. Notwithstanding the foregoing, the whole of the Hydraulic Services installation shall be to the entire satisfaction of the Superintendent and the Plumbers Licensing Board Inspectors and the Gas Supply Authority Inspectors.

### **1.4 Permits**

Make application, pay all fees including WCWA headworks charges and obtain all necessary permits, required to execute the installation of the Hydraulic Services.

### **1.5 Certificates**

Certificates of satisfactory completion must be obtained from the Plumbing Licensing Board, the Local Authority, Health Department, DFES, the Gas Supply Authority and any other Authority having jurisdiction over any of the Hydraulic Services. Original copies shall be forwarded to the Superintendent together with photocopies of each, for inclusion within the operating manuals specified hereafter.

### **1.6 Foreman**

A competent Foreman Plumber with documented accreditation of previous experience as a Foreman Plumber on projects of a similar nature, empowered to receive and carry out instructions from the Superintendent, must be employed on the site.

It is an essential requirement of this specification that the Foreman Plumber be **fully conversant** with **all** Australian Standards and Plumbers Licensing Board requirements governing **all** aspects of the design and installation of the Hydraulic Services, has a **working** knowledge of building construction methods and an **appreciation** of the requirements of all other trades involved in this project.

### **1.7 Australian Standards**

The installation of all hydraulic services shall be in accordance with the requirements of all current and relevant Australian Standards and Plumbing Licensing Board requirements.

The contractor is to provide and maintain on site, a copy of each applicable Australian Standard for the purpose of ensuring that the installation of all parts of the hydraulic services installation is in full compliance with the relevant Australian Standard.

### **1.8 Liaison**

Maintain continuous liaison with all trades involved in the construction of this project to ensure that possible problems arising from the conflict with structural elements or other services are minimised and can be resolved before any of the work is committed or installed.

Liaison includes lodging notice of interest including a standing request to all trades to be included as recipient for all issues of preliminary and final shop drawings, checking and commenting in reply.

Similarly issue and receive reply in respect of any Hydraulic Services shop drawings.

## **1.9 Existing Services**

Existing services indicated on the contract drawings are shown in approximate / assumed locations only. Allow for all necessary onsite investigative work to accurately locate and identify all existing services prior to commencing any committing work.

If existing services cannot be located the contractor shall immediately notify the superintendent for direction. Any costs associated with non-compliance with this requirement will be at the contractors' expense.

Where it is necessary to shut down existing services to make connections there to liaise with the Superintendent to ensure that such works cause the least disruption to the activities / operation of the complex.

## **1.10 Setting Out**

Physically check and confirm all details pertaining to main services connections before commencing any committing work. Any claim for costs associated with non-compliance with this requirement will not be considered.

Establish an early on-site liaison with Authorities Inspectors for the purpose of identifying any aspect of the design documents, which, in the opinion of the particular Inspector, is not in accordance with relevant regulations or current Australian Standards.

Where discrepancies are established and proven to be insurmountable the matter shall be referred to the Superintendent for clarification and direction.

Set out the pipe runs including consideration for co-ordination with all aspects of the structure and services of other trades. Before the pouring of concrete provide all necessary block-outs 'Cast In' fire stop collars and sleeves required to avoid cutting holes in the finished work.

Should any penetration sleeve or 'Fire Stop' collar be inadvertently omitted all holes required shall be diamond saw core hole drilled. Take all necessary precautions to retain water adjacent to hole being drilled and prevent damage elsewhere.

All penetrations shall be 10mm oversized and made good to maintain watertightness. Cast in type fire stop collars shall be supplied and installed to all penetrations through fire rated elements.

## **1.11 Protection**

All items supplied and installed in the execution of the hydraulic services installation are to be adequately protected against damage and any item not considered in first class condition on completion of the work shall be removed and replaced upon receipt of notice from the Superintendent at no expense to the Principal.

Pipe ends and openings into pipes shall be provided with adequate temporary end closures maintained during the full term of construction.

All drainage inlets and similar fittings cast flush with floor level are to be sealed and adequately protected.

## **1.12 Identification of Services**

Provide permanent identification of all Hydraulic Services in accordance with Australian Standard 1345. Identification may be of applied durable proprietary adhesive labels or hand applied painted signwriting on background colours. All external non-metallic mains and pressure services shall have an approved buried 75mm wide identification tape suitable for metal detection located 300mm above the service.



## **1.13 Testing**

All pipework is to be tested at regular intervals during the installation of all services.

Carry out all testing in accordance with Australian Standards requirements and as required by the Plumbing Licensing Board, Local Authority, DFES, the Gas Code and any other Authorities having jurisdiction over the work.

Sections of work not covered by Authorities shall be tested in accordance with relevant Australian Standards and to the satisfaction of the Superintendent.

Provide all equipment necessary to satisfactorily perform each testing operation and provide all necessary personnel to assist in executing tests.

## **1.14 On Completion and Cleaning Up**

On completion of the work all pipe lines and drains shall be flushed until clear. Taps, outlets and the like and sanitary fixtures shall be cleaned and polished, tap buttons shall be tightened, cistern flushes adjusted and pan seats tightened.

Mechanical equipment shall be tested and commissioned, services performance balancing shall be completed and the whole of the work shall be left in perfect condition to the satisfaction of the Plumbers Licensing Board Inspectors, relevant Authorities and the Superintendent.

## **1.15 Operating Manuals**

Provide professional quality prepared operating manuals in A4 size bound hard covers labelled on the outside face with the name of the project and titled 'Hydraulic Services Operating Manual'. Refer to the head contract preliminaries document for the number of copies to be provided.

The flyleaf shall nominate the dates of Practical Completion and defects Liability termination and shall bear the names and addresses of the:

Project Hydraulic Services Consultant  
Head Contractor  
Installing Sub-Contractors

The preface sheet shall bear the names, addresses and telephone numbers of emergency contact persons (for 24 hour contact) in the event of warranty attendance during the Defects Liability Period.

The manuals shall contain (in order):

Schedule resume of maintenance procedures (weekly / monthly / annually / seasonally, etc.)  
As Constructed drawing prints  
Warranty for each item of equipment installed  
Operating and maintenance instructions for each item of equipment installed  
Schedule resume of names and addresses for all suppliers of equipment  
Certificates of satisfactory completion from Authorities

Following the date of Practical Completion and before handing over to the Principal, instruct the Principal (or nominee) in the presence of the Superintendent and by practical demonstration all aspects of operation and maintenance, general preventive maintenance and emergency shutdown procedures. Hand to the Principal all copies of the operating manual.

## **1.16 Warranties**

Warranties for items of equipment supplied and installed in the execution of the Hydraulic Services installation shall date from the date of Practical Completion and this fact shall be stated in all orders placed for equipment. In the event of any warranty claim the Practical Completion date reckoning will be applied at no cost to the principal.

## 1.17 Visiting Site

Tenderers are required to visit the site (by arrangement) during the tender period to fully acquaint themselves with the site and the conditions under which the works are to be executed. Any claim for costs resulting in failure to comply with this requirement will not be considered.

## 2 WORKMANSHIP

### 2.1 Generally

Workmanship shall be of a **high** standard and each section of the work shall be properly and neatly executed to the best current trade practice.

Basic and finished workmanship shall at all times compliment that of adjacent trades.

Untidy work whether **exposed** or **concealed** will not be accepted.

### 2.2 Concealment

Wherever possible pipework is to be concealed in ducts, ceiling spaces, cupboards, cavities, behind wall cladding or by chasing into walls, where walls are not load bearing as defined by the Superintendent.

Pipes concealed in wall chases shall be recessed to a depth providing not less than 10mm cover to pipe barrel from rough face of wall.

Pipes concealed in wall chases shall be spiral wrapped in approved insulation not less than 3mm thick and fully mortar grouted.

Water supply pipework installed within light weight framed walls shall have anti-vibration fixings and rubber grommets at penetrations through framework to prevent dissimilar metal contact.

### 2.3 Fixing

All pipework shall be fixed clear of walls and each other with appropriate clips securely fixed to structural elements.

Fixings shall be provided and spaced in accordance with appropriate Authority or code requirements but at not more than 1800mm centres. Notwithstanding, all fixings shall be spaced at such lesser centres required to adequately support the particular pipe including content and hydraulic performance without deflection.

Pressure services shall be securely clipped at all changes of direction to adequately restrain the service against thrust.

Fixing anchorages shall be non-corrosive in the environment, suitably sized for the duty required.

Clips used for copper or brass pipes and formed of any material other than that of copper or brass shall have a full plastic insert between the pipe and clip.

Clips used for plastic pipes shall be plastic or plastic coated.

Steel clips, unless hot dip galvanised or 'Rilsan' coated shall not be used.

Chrome-plated clips shall be chrome-plated on brass or copper. All clips applied to 'Live' services (eg soil / waste / water service) shall include a suitable full circumferential resilient acoustic isolation insert between pipe and clip / clip and wall to prevent pipework transmitted noise transfer to the building structure.

Brazing of pipes to each other or nail driven fixings in lieu of clips will not be accepted.

### 2.4 Brazing

All brazing shall be done with suitable silver brazing alloy containing not less than 15% silver and 6% phosphorous. Bronze welding will not be permitted.

## 2.5 Pipe Runs

Pipe runs shall be fabricated with the longest possible lengths and building up sections with short offcuts will not be accepted.

## 2.6 Copper Pipes

Where copper pipes terminate in walls, eg. at taps or traps, a suitable anchor is to be brazed to pipe and securely cemented in.

Where pipes terminate behind wall cladding or within lightweight stud walls, a suitable anchor is to be brazed to the pipe or fitting and secured to the wall / wall framing with suitable fasteners.

Bends are to be preformed type and junctions are to be fabricated in the tube.

All copper pipes laid underground are to be fully painted with two coats of **ORMONOID** bitumen paint, with surfaces prepared and paint applied in strict accordance with the manufacturer's instructions **before** installation. Alternatively, pipes may be single layer spiral wrapped in petrolatum coated fabric base carrier tape in accordance with manufacturer's instructions.

Water services may not under any circumstances be cast into or laid under concrete floor slabs unless they are installed within a suitably sized PVC conduit having a large radius bend each end through which pipework is laid in straight lengths permitting withdrawal and replacement.

## 2.7 UPVC Pipes

UPVC pipes shall be installed in accordance with the requirements of Australian Standards AS 2032 and AS 2566.

## 2.8 Excavation

All excavations shall be performed in strict observance of sound engineering principles with consideration for the preservation of adjacent structures and services and where necessary adequate sheet piling shall be provided to maintain such structures or services.

All excavations shall be surrounded by adequate barricades for protection of the public or site workers and clearly defined by illuminated lanterns. Excavations shall be performed, serviced and backfilled in the shortest possible period and none shall be left open unnecessarily.

The prepared base of all excavations shall be of clean sharp sand imported, if necessary, free of stones and not less than 100mm depth, true to line and grade and of density equal to that required by relevant regulation where appropriate but in no case less than that of the natural unexcavated material.

Where it is found necessary to excavate adjacent to or below the level of adjacent footings, obtain approval from the Superintendent / Structural Engineer as to the method of excavation and protection of footings and method of backfill to be used prior to starting such excavations. Excavation by mechanical means shall not continue to a depth of more than 100mm above the invert level of the pipe at any point.

## 2.9 Dewatering

Allow for all necessary dewatering.

Dewatering for any reason arising shall be in continuous operation implemented to preserve prepared excavations and installed services from the consequences of flooding.

Dewatering discharge shall be controlled, directed clear of the site for disposal in a manner not causing interference with adjacent property or the public and to the entire satisfaction of the relevant Authorities.

Excavations which have been flooded shall not be utilised until completely dried out and the base re-consolidated. Where the consequential delay of drying out cannot be tolerated or where drying out is not possible the matter shall be referred for instruction before proceeding further.

## **2.10 Backfill**

Backfill surrounding the installed service shall be of clean, sharp sand, imported if necessary, free of stones to depth of 300mm over the service pipe barrel. Backfill above this level may be original material granulated, free of stones and machine placed in layers not exceeding 150mm depth before compaction.

## **2.11 Consolidation**

Backfill to excavations in areas where consolidated fill is specified shall be consolidated to the requirements of the structural specification.

Vibrating rollers shall not be used for consolidation of backfill over services for the first 600mm minimum above pipe barrel. Consolidation to this depth shall be done with a mechanical hand tamper of approved type.

Consolidation shall be performed on backfill in layers not exceeding 150mm depth.

Installed services over which consolidation of backfill or surface consolidation has been performed shall be re-tested to the satisfaction of the relevant Statutory Authority and the Superintendents representatives.

# **3 MATERIALS**

## **3.1 Generally**

Materials used shall be the best of their respective kinds manufactured in accordance with the relevant Australian Standard Specification or in its absence the relevant British Standard Specification and/or Australian Water mark and approved for use in Australia.

The nomination 'or similar approved' means approved in writing by the Superintendent before order is placed. Submit samples for approval prior to procurement.

All materials shall be checked for quality after delivery to site and before installation. Any defective material is to be rejected and removed from the site.

## **3.2 Australian Standard Specification Etc.**

Where specified, or implied, Australian Codes of Practice and similar recognised standard references shall be of the latest revision.

## **3.3 Copper Pipes and Fittings**

Copper pipes are to be solid drawn tubes manufactured in accordance with the Australian Standard Specification 1432 or any subsequent revision thereof and of gauges as required by the Water Services Licensing (Plumbers Licensing and Plumbing Standards) Regulations 2000 (the Regulations) and the Australian Gas Code (AS 5601) except the minimum acceptable copper tube used shall be Type 'B'.

## **3.4 PVC Pipes and Fittings**

Unplasticised polyvinyl chloride pipes and fittings shall be manufactured in accordance with Australian Standard AS 1260 for soil, waste and vent applications, sewer and stormwater drains and AS 1464 Type 2, Class 100 for gas installations.

## **3.5 HDPE Drainage Pipes and Fittings**

All HDPE drainage pipes and fittings shall be **Costilen** or similar. Method of joining is to be by socket electro-fusion.

## **3.6 Polyethylene Pressure Piping**

All polyethylene pressure piping shall be **PE100 PN 12.5 BlueLine** for potable water and **PE100 PN 16 Redline** for Fire Service.

### **3.7 Cross Linked Polyethylene Pressure Piping**

All cross linked Polyethylene (PEX) piping shall be **Pexal** (or equal approved)-for internal hot and cold water use only for sizes up to 25mm.

### **3.8 Fire Service (Above Ground)**

Galvanised UL approved roll grooved pipe and fittings to ASTM A135.

### **3.9 Precast Concrete Drainage Pipes**

Precast concrete drainage pipes shall be manufactured in accordance with Australian Standard AS 1342.

### **3.10 Cement**

Cement shall be 'Portland' cement of approved local manufacture conforming to Australian Standard AS 1315.

The cement shall be supplied and delivered to the site in the manufacturer's branded and sealed bags. Arrange for adequate protective cover and storage to prevent deterioration.

Cement which does not comply with the required standards or has been adversely affected in storage shall be removed from the site.

### **3.11 Sand**

Sand shall be clean sharp pit sand, screened if necessary, free from all foreign or organic matter and conforming in cleanliness with the requirements of Australia Standard AS 1465.

### **3.12 Coarse Aggregate**

Shall be nominal 19mm graded sharp bluestone or other approved screenings of hard durable uncoated particles free from all foreign or organic matter and conforming in cleanliness with the requirements of Australian Standard AS 1465.

### **3.13 Water**

Water shall be fresh, clean and free from all impurities and fit for human consumption.

## **4 SANITARY FIXTURES**

### **4.1 Generally**

Provide and fix sanitary fixtures as scheduled on the construction issue drawings. All fixtures shall be first quality '**Water Mark**' approved and shall be approved for use in Australia. Submit samples for approval before procurement.

All fixtures shall be complete with all necessary fixing bolts, screws, brackets and waste outlets with rubber stoppers where required and shall be connected to all services as specified hereafter. Fixtures shall incorporate overflow outlets where required by regulations.

Refer to Architectural drawings for specific fixing locations and heights of all fixtures above finished floor level.

### **4.2 Fixing of Fixtures and Fittings in Cupboards, Etc.**

Where fixtures and fittings are to be installed in vanity units, cupboards, etc., allow for liaison and attendance on the 'Joiner' to ensure:

- a) The correct location, size, etc. of holes for taps and fixtures in bench tops;
- b) Samples of taps and fixtures are made available as requested by the 'Joiner'.

Notwithstanding the above fixtures and fittings shall be fixed and sealed as recommended by the manufacturer and in accordance with the requirements of current Regulations.

### **4.3 Fixing of Fixtures to Walls**

Allow for liaison and attendance of the bricklayer and lightweight walling contractor to ensure that solid bricks and noggins are provided in walls wherever required to provide a satisfactory area for the mounting of fixtures, fittings and tapware.

## **5 TAPS AND VALVES**

### **5.1 Generally**

Provide and install taps, spouts, outlets and valves as scheduled on the construction issue drawings. All taps, spouts, outlets and valves shall be first quality **'Water Mark'** approved and shall be approved for use in Australia. Submit samples for approval prior to procurement.

Refer to Architectural drawings and details for specific fixing locations and heights of all taps, spouts and outlets above finished floor level. Set out for taps, spouts and outlets, occurring in tiled walls, shall be **precise** (including relocation if necessary) to occur on tile joint intersections.

All assembly components shall be set level, with spindle axis 90 degrees to finished wall face of correct and same length.

All anchorages and fixings shall be solid grouted or tightened to prevent movement occasioned by repeated use.

### **5.2 Valve Boxes**

Provide and install 'Galvin' (or equal approved) 250 x 250 nominal cast iron meter boxes with hinged lids to all valves located below ground level. Valve box lid is to finish flush with surrounding ground / paving level and have the words 'WATER' or 'FIRE' cast into the lid, as appropriate.

## **6 SOIL, WASTE AND VENT PIPES**

### **6.1 Generally**

All soil, waste and vent pipes shall be of UPVC, DWV class piping, unless otherwise specified on drawings or specified hereafter. Exposed drop wastes shall (where specified) be fabricated from copper or brass piping, chrome-plate finished after fabrication.

All soil, waste and vent pipes shall be complete with all bends, junctions, reducers, expansion joints and anchors and shall be fitted with bolted or screwed inspection openings as required for testing and maintenance in accordance with the requirements of the Water Services Licensing (Plumbers Licensing and Plumbing Standards) Regulations 2000 (the Regulations).

Notwithstanding any design feature, the entire soil, waste and vent pipe installation shall be installed strictly in accordance with the requirements of AS 3500 and the Water Services Licensing (Plumbers Licensing and Plumbing Standards) Regulations 2000 (the Regulations).

### **6.2 Fixture Wastes**

Provide and install waste pipes of sizes as set out in AS3500 and located in positions indicated on the drawings. Connect waste pipes to fixture outlet traps of type and finish scheduled hereafter and extend to combine with floor waste gullies, vented graded pipes or disconnecter gullies.

Exposed drop wastes (where specified) shall be purpose fabricated from one piece copper piping without joints, including union at trap and floor level and chrome plate finished after fabrication. Union at floor level shall comprise a PVC male iron adaptor solvent welded to waste pipe below floor level.

Secure drop wastes to wall with matching chrome plate standoff style clip.

### **6.3 Floor Waste Gullies**

Provide and install all floor waste gullies with stainless steel grates as shown on drawings. Floor waste gullies shall be of size as required by Regulations complete with riser and removable grating. Floor fitting for floor waste gullies in areas with vinyl floor coverings, shall be stainless steel clamp-ring type. The riser shall include branches for waste pipes as required of correct angle entry and invert and the grating shall be set at the correct level to suit floor finish and grade.

Joint between gully and grating is to be made only at time of tiling/vinyl laying to ensure grating is at correct level for floor gradients and perfectly level with tiling.

Refer to previous clauses regarding protection of floor waste gullies and similar fittings during construction.

### **6.4 Internal Cleanouts**

Provide and install 'Galvin' (or equal approved) internal flat top stainless steel non-slip cleanouts of sizes as required and in positions as nominated on drawings. Cleanouts in areas with vinyl floor coverings, shall be clamp-ring type.

### **6.5 Flashing**

Provide sheet lead flashings to all vent pipes penetrating tiled rooves. Flashings shall be dressed up around vent pipe and dressed down and weathered to roof tiles.

Provide cover flashing, cone-shaped and solvent welded to vent pipe and fitted down over sheet lead flashing up stand.

Provide 'Dektite' (or equal approved) nitrile rubber flashings to all vent pipes penetrating metal deck rooves. Flashings shall be dressed down and silicone sealed and screw fixed to roof deck.

All vents are to terminate within approved proximity to windows / parapets / air intakes and extracts, etc. and be a minimum of 150mm above roof.

### **6.6 Testing**

Subject all waste pipes to visual sighting, hydrostatic, smoke or other tests progressively and before concealment in accordance with the requirements of AS 3500 and as required by the Statutory Authority.

Subject all vent pipes to visual sighting, hydrostatic, smoke or other tests progressively and before concealment as required by the statutory authority.

Test all flashings for watertightness by physical flooding.

## **7 TRAPS**

### **7.1 Generally**

Traps to fixture outlets and floor fittings shall be as scheduled on drawings. All traps shall be double union type except where otherwise noted. Like traps shall be of the same brand and style throughout. Chrome plating shall be of even thickness, dense and without defect and all unions and inspection openings shall be brass with chrome plate finish where appropriate.

### **7.2 Mechanical Services Drains**

In positions indicated in mechanical plant rooms and elsewhere as shown on drawings, provide and install floor wastes, tundishes and condensate drains of diameter nominated and generally as previously specified, connect with wastes of diameters noted and extend to and connect to waste stacks, rainwater pipes and stormwater drains. Minimum trap seal depth to be 75mm.

**Note** that positions of all plant room drains and air conditioning condensate drains shown on hydraulic services drawings for mechanical service equipment are indicative only. Actual installation positions are to be determined from mechanical services shop drawings in conjunction and liaison with mechanical services sub-contractor.

## 8 COLD WATER SERVICE

### 8.1 Generally

The cold water service shall be of PE100 PN12.5 BlueLine polyethylene pressure piping below ground level externally of buildings and of solid drawn copper piping and/or PEX piping above ground level as previously specified.

Unions fitted are to be flare / compression type. The use of loose compression ring or grommet fittings or sand cast fittings will not be permitted.

Whenever possible water pipes are to be concealed in ceiling spaces, cupboards, ducts, within light weight stud walls, behind wall cladding, within wall cavities or by chasing into walls.

### 8.2 Testing

Subject all water pipes to visual sighting, hydrostatic or other tests progressively and before concealment in accordance with the requirements of AS 3500 and as required by the Statutory Authority.

## 9 HOT WATER SERVICE

### 9.1 Generally

Pipework and general preamble shall be as previously specified for 'Cold Water Service'.

Pipework shall be securely fixed but in a manner permitting adequate thermal movement of pipework.

Pipework shall include thermal insulation in ceiling spaces.

### 9.2 Hot Water Unit

Refer to the drawings for hot water unit designation.

### 9.3 Hot Water Branch Service

Take off from hot water units and/or circuit pipe with branch services of diameter nominated and extend through ducts, cavities, ceiling spaces, behind wall cladding, within wall chases etc. as shown, to connect with each point in **not less than 15mm** diameter spur.

### 9.4 Testing

Subject all hot water pipes to visual sighting, hydrostatic or other tests progressively and before concealment in accordance with the requirements of AS 3500 and as required by the Statutory Authority.

### 9.5 Insulation

Apply 25mm thick '**Thermobreak**' preformed or similar tubular non-flammable foam rubber pipe thermal insulation to the whole of the hot water pipework in ceiling spaces, ducts, cupboards, under benches etc. Where insulation is installed in exposed areas, finish to insulation shall be 'Aluminium Wrapped'.

Insulation shall have same internal bore as pipe OD and shall be applied progressively in maximum continuous length as pipes are installed. All bends and junctions shall be purpose-formed knife cut with hand-trimmed mitres and all joints shall be fully sealed with an approved liquid adhesive applied in strict accordance with the manufacturer's instructions supplied.

Pressure tape **will not** be permitted as a jointing medium. On completion all joints are to be true to shape and profile of the original material. Where clips occur, the clip is to be placed over the insulation with a 150mm long x 1mm thick PGI full circumferential sleeve placed between clip and insulation.



## 10 SEWER DRAINS

### 10.1 Generally

All drains shall be in straight lines to an even grade with barrel of pipe firmly bedded along bottom of trench.

Provide all planking and strutting or sheet piling to the satisfaction of the Superintendent to retain sides of excavations as previously specified. Provide pumping or bailing as necessary to keep excavations dry from whatever cause arising as previously specified.

Provide all barricades and temporary lighting required as previously specified.

Backfill to trenches and consolidation shall be performed in layers as previously specified.

### 10.2 Sanitary Drainer

Excavate for, provide and lay all necessary sanitary drains of diameters indicated, complete with all necessary bends, junctions, cleaning, testing and inspection openings, clean-out risers with access covers and the like, whether shown on drawing or not but required in accordance with the requirements of AS 3500 and the Water Services Licensing (Plumbers Licensing and Plumbing Standards) Regulations 2000 (the Regulations).

Relief disconnecter gully grating must be set at correct height to comply with Water Services Licensing (Plumbers Licensing and Plumbing Standards) Regulations 2000 (the Regulations).

Sanitary drains shall be of Sewer Class UPVC.

### 10.3 Concrete

Concrete for drainage work shall be mixed in the following proportions by volume:

Cement	1 part
Aggregate	2 parts
Sand	4 parts

The foot of all upturned bends shall be supported on a concrete base of at least 0.05m<sup>3</sup> and disconnecter gullies shall be set on a concrete pad 150mm thick.

### 10.4 External Cleanouts

Provide and install meter boxes over all plastic cleanouts in positions as nominated on drawings. Pits shall consist of 'Galvin' 250 x 250 nominal cast iron meter boxes having hinged lids.

All meter boxes are to have the word 'SEWER' cast into their lids.

### 10.5 Testing

Subject the sanitary drainage system installation to visual sighting, hydrostatic or other tests progressively and before concealment in accordance with the requirements of AS 3500 and as required by the Statutory Authority.

## 11 STORMWATER DRAINS

### 11.1 Generally

Refer to Civil drawings for stormwater design.

## 12 CONCRETE CUTTING

Refer all penetrations required to be cut through existing structure to the structural engineer for approval prior to cutting any penetration. All penetrations required shall be cut only with a diamond drill.

## 13 GAS SERVICE – LPG

### 13.1 Generally

All underground gas service pipework externally of buildings shall be of solid drawn copper piping or extruded rigid UPVC of gauges / class as required by the Statutory Authority. All internal pipework shall be copper. Refer to 'Materials' section for minimum gauges and classes, etc.

Unions fitted are to be flare type. The use of loose compression ring or grommet fittings or sand cast fittings will not be permitted.

Wherever possible, gas pipes are to be concealed in ceiling spaces, cupboards, ducts, behind wall cladding, within cavities or by chasing into walls.

Pipes required in finished face or load bearing walls shall **not be chased** but shall be built in progressively in conjunction with wall construction or by other method to Superintendent approval.

The whole of the Gas Service installation shall be undertaken **only by Licensed Gas Fitters**, in strict accordance with the current requirements of AS 5601 and to the satisfaction of the Gas Supply Authority.

### 13.2 Testing

Allow for all progressive and final testing of the gas installation in accordance with the requirements of AS 5601.

Provide all necessary testing equipment and personnel and obtain Certificate of Satisfactory Completion.

Thoroughly flush all lines with compressed air before charging the system with gas and before final connection to any appliance.

## 14 RESTORATION

All existing concrete bitumen and paved areas shall be restored to the levels and surfaces finish existing prior to commencement of the Hydraulic Services and to a condition deemed satisfactory by the Superintendent.

All lawns, gardens and undeveloped surfaces shall be restored with excavated materials made good to the satisfaction of the Superintendent.

At all times keep the Superintendent informed of any damage to existing services and the action taken to repair or make good such damage.

## 15 WAIT UPON AND ON COMPLETION

### 15.1 Generally

Wait upon and making good after all other trades.

Prior to the date of practical completion all access pits are to be cleared of any debris which may have accumulated. All soil, waste pipes and drains are to be checked by flushing and cleared of blockages.

Water services are to be flushed clear. Filters are to be cleaned. Taps and valve washers are to be checked and replaced if required. Fixtures and fittings are to be cleaned and polished. Fixings are to be tightened.

The complete Hydraulic Services installation is to be checked and the whole left in perfect condition to the entire satisfaction of all relevant Statutory Authorities, the Superintendent and the Principal.