

SPECIFICATION

of

HYDRAULIC SERVICES

for

PROPOSED FIRE SERVICES UPGRADE TO

TAYLOR VILLAGE

at

156 OCEAN STREET, NARRABEEN NSW

for

WESLEY MISSION

TENDER ISSUE
Date: 26/03/2014

NIVEN DONNELLY & PARTNERS PTY LTD

**PROPOSED FIRE SERVICES UPGRADE TO
TAYLOR VILLAGE
156 OCEAN STREET, NARRABEEN NSW**

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of
HYDRAULIC SERVICES**

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HYDRAULIC SERVICES

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HYDRAULIC SERVICES**A. GENERAL CLAUSES****A.1 GENERAL**

This Hydraulic Services Specification is to be read in conjunction with the General Conditions of Contract prepared by the Architect and other Technical Specifications such as the Fire Sprinkler and Electrical Services Specification including addendums and annexures thereto

A.2 SITE VISIT

Notwithstanding the exhibition of the Plans to the Tenderer, it will be presumed that the tenderer has visited the site and has acquired such information as may be necessary for the purpose of this work and has verified such dimensions as are relative to the work by actual measurements taken on site

A.3 EXTENT OF WORK

The Plumber shall be responsible for the provision of all labour, materials, plant and equipment necessary for the construction, testing, commissioning and subsequent maintenance during the defects liability period of the following systems

- a Fire Hydrant service
- b Cold water service
- c Stormwater drainage
- d Sub-soil drainage

Note.

The Client intends to continue occupation of the existing facility throughout the fire upgrade and building works and therefore requires all services to be maintained in operating order at all times except for minimum periods for connections or change-overs which shall be at a convenient time agreed with senior staff in writing/email and by phone a minimum of 24 hours prior to the proposed shutdown. To achieve a mutually agreeable time for shut-downs, out of hours work may be required. Any out of hours work required shall be at no additional cost to the Client

A.4 WORKMANSHIP AND MATERIALS

The whole of the work is to be carried out by or under the supervision of a fully licensed plumber and drainer in accordance with the drawings, the specification and the requirements of

- The Plumbing Code of Australia
- National Construction Code Series 2013
- AS/NZS 3500 – Plumbing & Drainage Series of Documents
- Sydney Water
- Warringah Shire Council
- Fire & Rescue NSW
- All other Authorities having jurisdiction over the work

The Plumber shall provide all necessary fixtures and appliances, piping, fittings, tools, plant and all other incidental materials and accessories necessary for the satisfactory installation, testing and completion of the work, all to the satisfaction of the authorities, the Architect and the consultants

The work described in this section shall be fully co-ordinated with the work of other trades

All materials shall be new and the best of their respective kinds and the whole of the work shall be carried out in a tradesmanlike manner and a first class finish obtained

From the agreed date of Practical Completion, the whole of the work herein specified shall be guaranteed for a period of 52 weeks, during which time any defective construction caused by either faulty material or workmanship shall be replaced at no additional cost or inconvenience to the proprietor

A 5 CERTIFICATES AND FEES

Prior to commencement of work, make application for, pay all fees and obtain approvals and permits from the respective authorities for the work involved. On completion and before practical completion issue certificates of compliance and obtain certificates of satisfactory completion of the work from the Council and other authorities having jurisdiction and supply one copy of each to the Architect

All associated fees and charges shall be paid by the Plumbing Contractor as part of this contract

A 6 DRAWINGS

The drawings show the general layout of the services and except for detail drawings are diagrammatic only

When setting out the services, the location of the sanitary fixtures, equipment, tapware, etc shall be obtained from the largest scale dimensioned architectural drawing

Where required to convey information between trades or the Builder & Architect/Consultant, the Plumber shall prepare 'workshop drawings' of adequate detail and scale to clearly convey the information required. These drawings shall be submitted to the consultant for comment after which prints of each shall be issued to the various trades concerned

A 7 WORK AS EXECUTED DRAWINGS

During installation of the services, the Plumber shall keep a complete and comprehensive record of the installed levels and the location of all pipelines, elbows, bends, tees, junctions, cleaning eyes, etc

On completion of the work, the Plumber shall prepare from the records kept, work as executed drawings showing all the above information

Two prints of each drawing shall be submitted to the consultant for review. Following review, the Plumber shall deliver to the project manager two A1 paper computer plots and a CD containing digital files of each drawing in both DWG and PDF format before final payment is made

A.8 DIMENSIONS

The Plumber shall be responsible for taking all dimensions on site, checking finished levels for correct cover, clearance from beams and position of all lines and checking levels of existing mains before commencing work, fabrication or placing orders

A 9 EXISTING SERVICES

Before proceeding with the work, check by excavation, the location and levels of all existing services and advise the Architect/Consultant immediately of any discrepancies encountered

Where connections are made to existing services, make good all damage and restore the service to its original condition

Make good any adjacent services damaged during the progress of the works to the complete satisfaction of the Architect/Consultant and any authority having jurisdiction over the service damaged

A 10 EXCAVATION

Allow for all excavation to be in materials as found. A copy of the Bore Logs from the Site Geotechnical Investigation Report are available for viewing at the office of the Architect

Note Also comply with Civil Works Specification requirements

Excavation shall be in the form of trenches to enable the various pipelines to be laid in the locations generally as shown on the drawings

Excavated material shall be stacked at least 600mm clear from the edge of the trench. The minimum width of the trench shall not be less than the external diameter of the pipe plus 300mm

Within the existing building, obtain approval in writing from the structural engineer and Architect for the location of each core hole to be saw-cut in an existing floor or wall. Provide drawings setting out the location and size of all coreholes in the floors and beams for approval of the structural engineer

Upon completion and installation of pipework install compacted backfill as specified in Clause A 13 below

Should the trench be excavated to a greater depth than required, the trench shall be backfilled to the required level with approved fine crushed rock compacted to 98% of standard density in accordance with AS 1289

Where unsound ground or previous excavations are encountered or where a drainage line crosses another pipeline or conduit, the backfill to the lower line or the unsound material shall be removed for the width of the trench and replaced with compacted coarse sand or fine crushed rock up to the underside of the pipe bedding

A 11 TIMBERING OF EXCAVATION

Where necessary, for safe and efficient completion of the work, the Plumber shall erect shoring, timbering, etc of sufficient strength and quality to prevent earth and other material slipping or falling in, or being shaken from the sides of the excavation

As the work proceeds, all shoring and timbering shall be withdrawn, except in cases where the project manager has directed in writing that it shall be left in position

The Plumber shall keep adequate de-watering equipment on the site at all times and keep excavations free of water

A 12 PRECAUTIONS AND SAFEGUARDS

Carry out the work in a careful, secure, safe and tidy manner and take all precautions against accidents or damage, whether arising from bad workmanship, breakage of machinery or plant, inefficient timbering, flooding or any other cause whatsoever

Provide, erect and maintain warning signs, temporary barriers, fences and night lights adjacent to any works such as trenches and excavations or stacks of materials which could be a danger to persons or traffic of any kind

All roadways shall remain operational to permit a minimum of one lane of traffic at all times

The contractor shall obey any directions given to him with regard to the provisions of lighting and barriers but shall not thereby be relieved of responsibility of any accident or damage

A 13 BACKFILLING

After inspection, testing and approval, backfill the trench with fine granular material equal to fine crushed rock or filling sand and carefully deposit in the trench so as not to disturb the pipes Place and compact the backfill in 150mm layers evenly on both sides of the pipe to 150mm above the top of the pipe barrel

Where services are laid in a public roadway, they shall be laid in accordance with the Council's civil construction specification Where laid under a private road or driveway, backfill to the underside of the road pavement with fine granular material or road base compacted to not less than 98% of standard density in accordance with AS 1289

Elsewhere, backfill the remainder of the trench above the backfill in 150mm layers with approved excavated or fill material having a maximum size not exceeding 75mm and compact to not less than 98% of standard density in accordance with AS 1289 **Note** Also comply with the requirements of the Civil Works Specification

Remove from site, the excavated material which has not been approved for use as backfill or which is surplus after backfilling has been completed

A 14 RESTORATION OF SURFACES

The Plumber shall restore any road, footpath, driveway paving or finishes, kerb and guttering, or landscaping, removed or damaged as a result of this plumbing contract with materials of the same nature and equal quality as those it replaces

The restoration shall be to the same standards of construction and same depth so as to produce a finished surface at least equal in all respects to that existing before commencement of the work

A 15 CLEANING OF DRAINS

At the completion of the whole of the drainage system, clean out all formwork, timber, Builder's debris, sand and silt, etc from the pits, manholes and drainage lines to the Architect's/Consultant's satisfaction before permanently fixing all covers and gratings

A.16 VALVE BOXES

Supply and install over all underground valves, heavy duty road pattern cast iron stop valve boxes with hinged lids The valve box lids shall have the letters 'S V ' cast integrally

The valve boxes shall be set over the valves on 150mm diameter concrete pipe risers which shall be supported on a concrete base below the valve

Valve boxes shall be set flush with the adjacent finished surface and where located other than in a concrete slab shall be provided with 150mm wide concrete surround trowelled smooth and having a 150mm minimum depth

A 17 SET OUT

All pipework shall be constructed and positioned after co-ordination with other trades concerned in a neat and workmanlike manner Groups of pipes shall be run parallel to each other, to adjacent walls, beams and fittings and unless falls are specified or necessary, they shall be truly horizontal

A 18 CONCEALING OF PIPES

Unless otherwise noted, piping generally shall be concealed from view by being located below ground, in piping ducts, bulkheads, false ceiling spaces and wall chases

Pipework shall only be exposed to view where indicated in the Pump room, valve room and access passage and in the immediate vicinity of fixtures or plant items, from where it shall rise or drop vertically

A.19 ACCESS TO PIPES

Piping in ducts, false ceilings, etc shall be so arranged as to provide easy access to cleaning eyes, valves, etc The pipes shall be fixed clear of each other and be easily replaceable for their full length

The Plumber shall be responsible for ensuring that all pipes are provided with access openings or panels required by the authorities and shall advise the Architect of any location where additional access is required prior to erecting walls, or commencing finishing trades

A 20 COREHOLES

The Plumber shall be responsible for setting out and cutting all coreholes and sumps in floors, roofs, walls, beams, etc and prior to placing of any reinforcement and concrete

A.21 SLEEVES FOR PIPES

All pipes shall be sleeved where they pass through masonry walls and suspended floors. Sleeves shall be of 1.2mm thick copper piping of suitable bore to allow a minimum of 5mm clearance all around the service pipe.

Sleeves shall be made watertight in external walls, floors and roof slabs, cast in with the pouring of new slabs. The space between the service pipe and the sleeve shall be fully caulked with an approved fireproof caulking material and shall be sealed watertight at the upper end with a 10mm deep silicone rubber sealant filled joint.

A 22 INTUMESCENT SEALS

Where non-metallic pipes or fittings penetrate a component of the building which is required to have a fire resistance rating, the penetration shall be fitted with an intumescent seal (fire stop collar) through which the pipe and/or fittings must pass. The intumescent seals shall be sized to fit neatly to the pipe, shall have a Fire Resistance Level equal to or greater than the component being penetrated and be manufactured in conformity with relevant Australian Standards.

A.23 FIXING AND SUPPORTING OF PIPEWORK

All pipework shall be fixed with all necessary brackets, supports and hangers to support same without sagging or deflection to meet the requirements of AS 3500, all authorities and this specification.

All pipes shall be installed to allow for expansion and contraction wherever necessary and shall include appropriate expansion devices.

Where a pipe is one of a group running parallel, it shall be supported at each support it passes.

Brackets, supports and clamps shall be an approved proprietary design equal to 'Unistrut' or 'Abbey', manufactured from mild steel and be of the heavy duty type for pipework 75mm and over. Fixings and supports for all locations shall be hot dip galvanised after manufacture. Where practical, clips and clamps for small bore pipe may be fabricated from heavy gauge sheet copper.

Fixings to masonry walls or floor slabs shall be approved masonry anchors equal to 'Loxin' or 'Rawlock'.

All copper piping shall be isolated from galvanised wall structure, supports and clamps by special rubber grommets and rubber or neoprene inserts.

Pipework shall be supported within 700mm of changes of direction in both horizontal and vertical runs and shall be supported adjacent to each valve or fitting

A 24 CHROMIUM PLATING

Wherever the words 'chromium plated' or the initials 'CP' have been previously or are hereafter specified or referred to in connection with an item, it shall mean 'bright chromium plated' in the best manner

All exposed metal piping in wastes and water connections to sanitary fixtures and equipment shall be chromium plated and finished with chromium plated spun copper cover plates fitted to the finished wall or floor surface

A 25 IDENTIFICATION OF PIPEWORK

All pipework specified in this specification shall be identified in accordance with AS1345 as applicable. Identification shall take the form of proprietary brand self-adhesive labels with colour coding and 20mm high minimum lettering in accordance with the standard

Locate labels so they are easily seen through the entire length of the pipe runs, including in concealed spaces

A 26 TESTING

Carry out all tests to the services, fixtures and equipment specified in accordance with the methods and requirements as described hereinafter and as required by the respective authorities

Supply all labour, plugs, apparatus and ancillary equipment necessary for the tests. Underground or enclosed work shall not be covered or concealed from view until it has been inspected, tested and approved by the Architect/Consultant and the authorities concerned

A 27 OPERATING AND MAINTENANCE INSTRUCTION MANUALS

At the completion of the work, the builder shall supply to the Hydraulic Services Consultant three hard covered operating and maintenance instruction manuals for all services, fixtures, fittings and equipment specified in this section of the specification

The manual shall include

1 A schedule of all systems and materials

The schedule shall include all piping systems and list the type of material and manufacturer of the piping and fittings for each system

2 Schedule of equipment, fixtures, valves and fittings

To include make, type, supplier, etc., and supplier's address and telephone numbers

3 Maintenance of systems and equipment:

Include a schedule of maintenance duties in general, daily and other periodic maintenance for all systems, equipment and fixtures

4 As Installed Drawings

Each manual shall include one set of full size prints and a C D containing pdf and dwg files of the work as executed drawings. The drawings contained in the manuals shall be in addition to those specified elsewhere in this specification.

B FIRE HYDRANT SERVICE**B.1 SCOPE**

This section of the specification covers the alterations to the existing fire hydrant service and includes deletion of the existing booster assembly, installation of a backflow prevention valve assembly, diversion of the incoming hydrant water supply to the new fire water storage tanks to be constructed by the builder, supply and installation of new fire hydrant pumps, supply & installation of a new booster assembly in a sheet metal enclosure, relocation of the existing underground hydrant service to clear the new fire tanks, supply & installation of all associated pipework and valves and reconnection to the existing hydrant system pipework generally as indicated on the drawings

The new fire services shall comply with the requirements of The Building Code of Australia, AS2419, AS2941, Fire & Rescue NSW, Warringah Shire Council and this specification

B 2 CONNECTION TO EXISTING SUPPLY

Disconnect the existing booster assembly and install a new 65mm dia double check detector check backflow prevention valve assembly complete with wheel operated isolation valves. Extend from the outlet of the assembly to the fire tanks in the location shown on the drawings using the pipework specified below

B 3 PIPING AND FITTINGS

Piping in the water supply to the fire tanks shall be Type B copper piping conforming to AS 1432 with copper moulded pressure fittings except that where located in-ground, 1m or more from the point of entry, the piping may be type 100 class PN16 polyethylene conforming to AS 4130 with spigot & socket moulded PE electro-fusion welded fittings

Piping in the hydrant system from the fire tanks, where exposed above ground in the pump and valve rooms and at the booster assembly shall be medium weight galvanised mild steel piping conforming to AS 1074 with galvanised malleable cast iron fittings conforming to AS 1832 or with fabricated GMS fittings

Underground piping in the hydrant system shall be either 'Blue Rhino' PVC-M Class PN16 pipe conforming to AS/NZS 1477 with moulded ductile iron plastic coated pressure fittings, type 100 class PN16 polyethylene piping conforming to AS 4130 with moulded spigot & socket PE electro-fusion welded fittings or Type B copper piping conforming to AS 1432 with copper moulded pressure fittings

Piping shall be installed in accordance with the requirements of Section A of this specification

B 4 JOINTING

'Blue Rhino' PVC-M piping shall have spigot & socket rubber ring joints with flanged joints where connecting to valves & fittings

Polyethylene Type 100 piping shall have spigot & socket joints sealed by electro-fusion welding

Copper piping and fittings shall have spigot and socket Viega "Propress" joints sealed with a rubber seal or sealed with silver soldered joints all as specified for 'cold water service' with flanged joints where connecting to valves and cast iron fittings

Galvanised mild steel piping and fittings shall have roll grooved joints sealed with flexible neoprene sealing rings and galvanized malleable iron bolted couplings

Flanged joints shall be made with AS 2129 Table E flanges sealed with 3mm thick reinforced insertion rubber and bolted together with stainless steel hexagon Whitworth nuts and bolts

B 5 VALVES GENERALLY

Unless otherwise specified valves are to be manufactured in Australia. All valves shall conform to the relevant Australian or British Standard and shall bear a mark of compliance

Valves shall be placed in accessible positions for operating and repairs

Valves shall be bronze up to and including 80mm and cast iron for 100mm and above

Screwed pattern up to and including 50mm and flanged from 65mm dia and greater

Valves to be manufactured to a minimum working pressure of not less than 2,000 kPa

Flanged valves to be a minimum of Table 'E'

Valves within the system which will be subject to pressures in excess of 2,000 kPa shall be manufactured to withstand those pressures

Flanged valves subject to pressures in excess of 2,000 kPa shall be supplied with Table 'H' flanges

All valves of a particular type shall be of the one manufacture. Any bronze or gunmetal components shall be of a type not subject to dezincification

Gate Valves

Gate Valves and control valves shall be used for isolating services. Screwed bronze valves up to and including 50mm. Flanged up to and including 80mm. Cast Iron, flanged Gate Valves, 100mm and greater

Control Valves

Shall be of approved manufacture with tested brass body and loose valve to conform to AS1718

Check Valves

Shall be of the Swing Check type with bronze body up to and including 80mm

The screwed patterns shall be used for valves up to and including 50mm in accordance with AS1628. 65mm and 80mm valves shall be flanged

Cast Iron flanged Check Valves from 100mm and above in accordance with BS3464

Note (Check Valves on pump sets to have lever arm and counterweight fitted)

Float Operated Level Control Valves

The float and controls shall be copper or plastic with stainless steel or bronze linkage to the pilot valve

Valves \leq 65mm dia shall have bronze body, pilot valve, needles and pins

Valves \geq 80mm dia shall have cast iron body, bronze pilot valve, needles and pins

Float control valves shall be bronze "Dorot Series 100 FL" modulating float controlled valves with vertical differential metal float pilot valve Model 70-550

Note A stilling well is to be installed to surround the float to prevent rapid movement of the float due to wave motion on the water surface

B 6 BACKFLOW PREVENTION VALVE ASSEMBLY

Provide and install a 65mm dia backflow prevention valve assembly in the location shown on the existing hydrant system incoming supply. The backflow prevention valve shall be a double check detector check valve equal to 'Ames' by Tyco, complete with bypass meter and wheel operated isolation valves at the inlet and outlet as detailed on the drawings

B 7 HYDRANT & SPRINKLER BOOSTER VALVE ASSEMBLIES

Adjacent to the Ocean Street entry where indicated, install a 100mm dia dual inlet hydrant booster, a 150mm suction assembly comprising a 150mm suction point and four (4) x 65mm suction hydrants and a 100mm dual inlet sprinkler booster assembly, generally as shown on the detail drawings

The assemblies shall include a 100mm dia pressure gauge and drain valve on each inlet riser and each 65mm inlet connection shall incorporate a non-return valve

The 150mm suction point shall include a 150mm gate or butterfly valve & the four 65mm suction hydrants all as indicated on the detail drawing

All Fire Brigade hose connections shall be fitted with Storz couplings with matching caps and shall be located between 750mm and 1200mm to the centre line of the coupling above adjacent ground level. All isolation valves shall be low torque hand wheel operated valves

The booster assembly shall be housed in a zinc anneal metal cabinet with lockable hinged doors, 100mm high legs, all primed and finished in enamel paint in a colour to be selected. The cabinet shall be secured by a 10mm dia masonry fixing at each leg to a 150mm min thick concrete plinth extending a minimum of 150mm all round beyond the cabinet. The words 'HYDRANT BOOSTER' shall be painted/fix to the cabinet face in 75mm high uppercase lettering in a contrasting colour. The cabinet shall be fitted with a CP lock set keyed to a standard '003' key

Provide and install a Block Plan and a Test & Boost Pressure statement complying with AS 2419, within the hydrant booster cabinet. The block plan and pressure statement shall be constructed of an engraved/etched stainless steel sheet having a minimum size of A3 sheet size.

The whole of the booster valve assembly shall have a high gloss enamel paint finish with valve hand wheels painted black and valve bodies and pipework painted signal red.

B 8 FIRE HYDRANT PUMPS

Supply, install and put into satisfactory operation a diesel and an electric powered fire hydrant pumps complying with AS 2941 and AS 2419.1. The pumps shall each have a capacity of 10 litres per second against a discharge head of 85 m with a run out flow of 15 litres per second.

The diesel engine powered booster pump shall have a Lister Petter heat exchanger cooled 2,500 RPM diesel engine.

The pump units shall include main pump, driver/motor – 1 X diesel engine & 1 X electric motor, base, a common electric jacking pump for maintaining system pressure, control panels, engine instrumentation, starting and monitoring batteries, fuel tank, fuel gauge, muffler, condensate trap and exhaust pipe flexible connections. The main pumps shall be able to withstand internal pressures up to 2100 kPa and shall have a cast iron casing, bronze impeller, stainless steel shaft, mechanical shaft seal and be direct coupled to the motors of adequate power for the duty in compliance with the Standards.

Mount each pump unit on a 150mm high concrete plinth in the location shown in the new pump house ensuring a minimum clearance to adjacent walls of 1.0m. Secure the pump bases to the plinth with 4 minimum M114 vibration mounts and 8 minimum 10mm dia masonry anchors.

Provide for each pump, a floor mounted electrical control panel complying with the requirements of Fire & Rescue NSW, AS 2941 and AS 3000 Wiring Rules. Each control panel shall include an external key operated isolating switch which permits the removal of the key in the 'ON' position only, controls for automatically starting the diesel engine, battery trickle charger, door mounted manual 'start' push button switch, 'power on' indication lights, engine instrumentation and an alarm bell mute push button switch. The panel is to be of fully welded mild steel construction with full width hinged door with lockable CP handles all finished in gloss enamel paint. Mount in an agreed location on the side of the booster valve cabinet, a 100mm dia weatherproof alarm bell to ring when the pump is running and wire to the terminals within the panel.

Provide and install in the discharge piping of the pumps, pressure switches to control the main diesel & electric pumps and jacking pump. Piping connections to both the main and jacking pumps shall include stainless steel vibration eliminators.

The pump units shall be delivered to site all prewired and tested. The electrical sub-contractor shall extend the electrical supply to the control panel and terminate on the terminals provided within the panel.

Extend the diesel engine exhaust pipe through the pump house roof terminating with a rain excluding flap and seal the roof penetrations watertight with a heat resistant flashing. Insulate the exhaust pipe within the pump room with 25mm thick mineral wool sectional pipe insulation sheathed in aluminium foil.

B.9 PUMP ROOM EXHAUST FAN

Supply and install a 400mm dia 240 volt 2900 RPM thermostat controlled exhaust fan in the pump room. The fan shall be located immediately below the ventilation opening in the pump room roof by masonry anchors and rubber vibration mounts. The fan shall be wired in series with a manual override switch to enable running of the fan manually. The Electrical Subcontractor will provide essential services power to the fan control switch and will terminate on the terminals within the switch.

B.10 TANK CONNECTION FITTINGS

The plumbing contractor shall provide to the Builder, GMS suction and overflow fittings for casting into the walls of the tanks by the tank contractor. The fittings shall be prefabricated in accordance with the details on the detail drawing then hot dip galvanized prior to installation.

B.11 TESTING

The fire hydrant service shall be commissioned and hydrostatically tested to a test pressure of 1700 kPa, as specified in AS2419.1

C STORMWATER DRAINAGE**C.1 SCOPE**

Provide an underground stormwater drainage system to convey overflow water from the tanks and sub-soil drainage water from the sump pump rising main to the existing stormwater system, all as shown on the drawings. Where the existing stormwater drainage system is damaged by excavation for the tanks etc. replace the damaged section with piping of the same size as the existing pipework.

The system includes all piping, bends, junctions, couplings and other items required or shown.

C.2 PIPES AND FITTINGS

Stormwater drainage pipework generally shall be constructed of sewer grade (DWV) P V C pipes and fittings conforming to A S 1260.

P V C pipes and fittings shall have spigot and socket solvent welded joints or rubber ring joints. Where connecting from the GMS overflow pipe to the PVC drainage at each tank, make connection with a "Plumbquick" rubber coupling sealed with stainless steel hose clamps at each end.

C.3 LAYING OF PIPES

All stormwater drains shall be laid after the tank excavations have been backfilled and compacted on a 50mm bed of coarse sand or other approved fine granular material. The socket end of pipes and fittings shall generally face upstream.

Piping shall have a minimum cover of 350mm generally, 500mm under internal driveways and where under concrete floor slabs and beams, a minimum clearance of 50mm from the underside of the structure shall be maintained.

C.4 STORMWATER PITS

Make connection to the existing stormwater pit terminating the new pipe flush with the internal pit wall and grouting the joint with sand cement mortar finishing smooth with a steel trowel.

C.5 REFLUX VALVE

Supply & install a 150mm dia PVC reflux valve in the stormwater line adjacent to the connection to the stormwater pit. Extend the access shaft to ground level and finish with a bolted trapscrew with protective concrete surround.

C.5 TESTING OF STORMWATER DRAINS

Test all drains as required by and to the complete satisfaction of the local authorities, the architect and consultant before commencing any backfilling. Where requested, stormwater drains shall be hydrostatically tested to overflow level.

Any leaking joint, pipes or fittings shall be remade or replaced and retested. Supply all plugs, apparatus and ancillary equipment necessary for the testing.

D SUBSOIL DRAINAGE**D 1 SCOPE**

Provide sub-soil drainage pipelines and sump pumps in the locations and to the levels shown on the drawings to relieve hydrostatic pressure by collecting the sub-soil water and discharging to the stormwater drainage system

The installation includes all piping, bends, junctions, plugs, filter membrane, filter bed, sump pumps & controls, connection to stormwater system and other items required or shown

D.2 PIPING AND FITTINGS

Piping and fittings for sub-soil drainage shall be 100mm diameter slotted medium density polyethylene corrugated tubing equal to 'Corflo' with moulded PVC fittings. The corrugated tubing shall be fully sleeved in a woven geofabric sock and shall be purchased in the pre sleeved form

Joints between pipes and fittings shall be spigot and socket type using specially manufactured adaptors for connection to piping

D 3 LAYING OF PIPES

After excavation, all trenches shall be approved by the consultant or consultant's nominated representative. Before pipe laying commences lay woven geofabric in the base of the trench, up the trench walls and provide flaps to overlap after the trench is backfilled

Place on the geofabric in the trench before piping is laid a 50mm bed of 10mm crushed blue metal or approved fine granular material for the full 300mm minimum trench width, graded evenly with the pipe fall

Pipes shall be laid in straight lines with even grade in the locations and to the levels shown on the drawings

D 4 BACKFILLING OF PIPES

After pipework has been inspected and approved, all sub-soil drainage trenches shall be backfilled with 10mm washed blue metal or other approved porous fine granular material to a minimum depth of 300mm above the pipe. Over lay the geofabric flaps across the full trench width, with a minimum of 200mm overlap and then backfill the remainder of the trench as specified in Section A of this specification

D 5 SUMP PUMPS

Provide dual submersible sump pumps where indicated on the drawings in a concrete pit in the pump room floor. The installation shall be complete with discharge valves and piping, level control switches, electrical control panel and interconnecting wiring

The pumps shall be Grundfos "Unilift AP12-40-04" 0.4 kW pumps with single phase rotor motor

Extend from each pump discharge connection in 40mm class 12 PVC piping with BSP union, non-return valve and gate valve for each pump. Valves shall be located within the pump well within reach from the adjacent finished surface level. Extend from the valves with a combined 50mm PVC rising main discharging to the stormwater system as indicated on the drawings.

The pumps shall be controlled by level control switches in conjunction with a pump control panel, wall mounted where indicated on the drawings. The panel shall include voltage free terminals for a remote pump failure & high level alarm to be extended by the electrical contractor.

Provide underground electrical conduits between the control panel and the pump well and carry out all inter-connecting wiring between the panel, the pumps and the level switches.

Provision of a power supply to the control panel and terminations within the panel will be carried out by the electrical contractor.

D 6 CLEAROUTS

Extend the upstream end of subsoil drainage piping to ground level where indicated and terminate with a P V C bolted trapscrew set in a moulded concrete surround finishing flush with the adjacent surface material.