SCENTRE GROUP

DEVELOPMENT, DESIGN & CONSTRUCTION

PEOPLE PROTECTING PEOPLE

GENERAL SPECIFICATION
HYDRAULIC SERVICES

SCENTRE DESIGN AND CONSTRUCTION PTY LIMITED ABN 53 000 267 265
Level 30, 85 Castlereagh Street, Sydney NSW 2000 Australia · GPO Box 4004 Sydney NSW 2001 Australia · T +61 (02) 9358 7000 · scentregroup.com

DOCUMENT INFORMATION

Document No.	Version No.	Date of this issue
NSD-SDC-HYD-GSS-001	10.0	19/01/24

PREFACE

This General Specification is intended as supplementary information to be read in conjunction with the Project Specification issued in the Contract Documents.

The Scope of Works relevant to the Contract is contained within the Project Specification(s) and this specification provides additional information as to requirements pertaining to that scope.

Items may be referenced within that are not within the Scope of Works.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 GENERAL REQUIREMENTS

1.1 GENERAL

This General Specification covers the requirements of materials and workmanship, as well as technical requirements, for Hydraulic Services designs and installations. Unless specified otherwise in other project specific documents, these requirements will apply when they are relevant to the project and/or if they are referenced within Section 5 of the Project Specification.

If a service is not detailed in the project specification this general specification is to be used when adding services to the project as the minimum standard for that service and as a basis for costing by the contractor.

1.2 STANDARDS

1) General:
   a) Comply with NCC, relevant Australian Standards and all State, local government & council requirements and applicable utility Authorities.
   b) Refer to the latest issue of the Australian Standard unless a particular issue is referenced in the NCC.

1.3 TECHNICAL REQUIREMENTS

The scope of work detailed within the Project Specification is to be considered a concept design for costing purposes. Design review, development and associated documentation is the responsibility of the Design & Construction (D&C) Contractor who assumes the design responsibility for the project based on the concept design intent.

The Contractor's design shall incorporate the technical requirements detailed within this General Specification to enable the building services systems to function at the optimum level, maximise energy efficiency and to minimise the environmental impact, while being economically sustainable, maintainable and appropriate to the business nature of the building. The systems need to be designed such that they can be commissioned in line with the design parameters and measurements can be taken to verify such parameters have been met.

1.4 PLANT AND EQUIPMENT

1) Locate and arrange all services and equipment so that:
   a) Failure of plant and equipment does not create a hazard for the building occupants.
   b) Failure of plant and equipment causes minimum or no damage to the building, its finishes and contents.
   c) Inspection and maintenance operations can be carried out in a safe and efficient manner with minimum inconvenience and disruption to building occupants or damage to the building structure or finishes.
   d) If parts of the plant require regular inspection and maintenance, either locate plant so it is safely and readily accessible from floor level or provide permanent access platforms and ladders.
2) Allow to modify manufacturer's standard equipment when necessary to provide the plant access to Scentre Groups approval.
3) Hot water unit, pipework, valves or other potential leak sources are not located over rooms containing water sensitive equipment or finishes.
4) Safe tray and an overflow pipe are provided to each tank, hot water heater and storage vessel.
5) Conform to the relevant requirements of AS 1470, AS 1657, AS/NZS 1892.1 AS/NZS 2865 and AS/NZS 3666.1.
6) Conform with manufacturers' requirements in order to not void product warranties.

1.5 MATERIALS AND WORKMANSHIP

1) Materials: Provide new and high quality materials and components.
2) Workmanship: The standard of workmanship for all works shall conform to the industry best practice and shall be in accordance with the relevant standards, codes of practice.
3) Consistency: For the whole quantity of each material or product, use the same manufacturer or source and provide consistent type, size, quality and appearance.
4) Factory finish: To manufacturer's standard for factory fabricated equipment. All ferrous metallic work which is exposed to elements shall be hot dip galvanised. Any damage to the factory finish shall be repaired at completion.
5) Manufacturer: Select equipment from the manufacturers and suppliers as nominated in Appendix A.
6) Alternatives: If alternative manufactures are proposed, submit proposed alternatives and include samples and available technical information for approval prior to installation.
7) Samples: Submit samples for review as required.
8) Certification: All products shall be certified in accordance with AS 5200 where applicable.
9) Locking system: Provide 'Lockwood Twin System' (including 003 for Fire Brigade Access) for all locking applications.

1.6 CENTRAL CABLE MANAGEMENT SYSTEM (CCMS)

1.6.1 GENERAL

1) The Central Cable Management System (CCMS) shall be designed and installed by the Electrical Contractor. All other Services Contractors shall liaise with the Electrical Contractor to determine and advise cable containment and pathway requirements. The pathways shown on the design drawings show the 'design intent only', and the Electrical Contractor is to make all allowances necessary to augment the CCMS to include the services noted below, such that the development has a complete CCMS. It is incumbent on the other Services Contractors to review the CCMS design drawings and confirm the allowances are acceptable in their tenders. If no advice has been received at tender, it assumed that the Contractors accept the CCMS design and have made all other allowances within their tenders.
2) All individual cable management systems (required for other services) to and from the CCMS will be the responsibility of each individual Services Contractor and must conform to the requirements below. The Electrical Contractor shall coordinate with other Services Contractors during the developed design phase of the project to finalise the scope of CCMS. Any additional cable management required by other Services Contractors after this time will be at their cost.

   It is the responsibility of all Services Contractors to coordinate the CCMS design with each other, and to notify the Electrical Contractor of any design considerations.
3) CCMS may be required for the following systems below:
   a) Electrical & Communication Cabling
   b) Structured Cabling Systems
   c) Master Antenna Television System (MATV)
   d) Mechanical Services Cabling
   e) Distributed Antenna Systems (DAS)
   f) Carrier Structured Cabling
   g) Building Management System (BMS)
   h) Wireless Access Points (WAP)
   i) Lighting Control Systems

j) Emergency Lighting Systems
k) CCTV Security Systems
l) Access Control Systems
m) Fire Alarm and Warning Systems
n) Public Address System
o) Mall Music Systems
p) Audio Visual System
q) People Counting System
r) Parking Systems (Parking Guidance and Controlled Parking)
s) Demand Management System
t) Digital Signage Systems
u) Two-Way Radio System

4) All cable pathways are to be installed in accordance with the information and drawings provided in AS/NZS3084. Particular reference is to be made to separation of services and also to diagrams showing installation sectional detail and typical construction diagrams.

5) The cable management system shall be designed in accordance with all relevant standards including AS/NZS3000, AS/NZS3084 and AS/ACIF S009.

1.6.2 DESIGN REQUIREMENTS

1) Locate cable ladders and trays away from specialty shops and plasterboard ceiling areas wherever practical; otherwise fix cable ladders and trays at high level to achieve minimum 4 m ceiling height.

2) Avoid running cable ladders and trays across malls.

3) Cabling containment systems shall be installed so that sufficient space remains around containment system to facilitate moves, additions and changes.

4) Cable containment systems shall be appropriately sized so that they are not more than 40% filled at initial installation.

5) Cables shall not be stacked higher than the side of the cable tray or basket.

6) Adequate space should be left around the containment systems to allow the set-up and use of cable-pilling equipment.

7) Cable pathways for Fire systems shall not be shared with any other service. Fire containment systems shall be installed above Power and other structured cable containment and pathway systems.

8) De-rating of cables: Cables supported by cable ladders and cable trays shall be grouped and spaced in such a way that de-rating of the cable will be kept to the minimum.

9) Cable support systems supporting essential services or fire rated cables shall be rated to WS52W in accordance with AS/NZS 3013 (120-minute fire rating, moderate impact protection).

10) The Electrical cable trays shall be bonded to Earth.

11) The structured communications cable containment system shall be bonded to the Telecommunications Reference Earth.

12) Structured cabling for data / voice services including Cat.6 cables, fibre cables, multi-pair voice cables, coaxial and shielded cables (>80dB coupling attenuation) may lie together in a common tray.

13) Structured cabling that carry analogue or switching (for example security sensors and audio cabling) shall be separated by metal barrier from digital cables when sharing a cable tray.

14) Electrical cables and structured communications cables may not share penetrations and may not co-exist in the same conduits, slots or sleeves.

15) Electrical cable trays shall be solid or slotted.

16) Communications structured cabling tray may be slotted or cable basket.

17) Final cable management detail is to be determined to suit specific site conditions and area and recognising the services distribution requirements.

1.6.3 INDICATIVE DIAGRAMS

An indicative cross-section detail is provided for horizontally aligned cable containment (Figure 1) and vertically aligned cable containment (Figure 2) for information only to all trade contractors. Refer to Table 1 for Separation Distance (d) details.

All Cable Tray run locations to be clearly shown on “As Built” drawings.

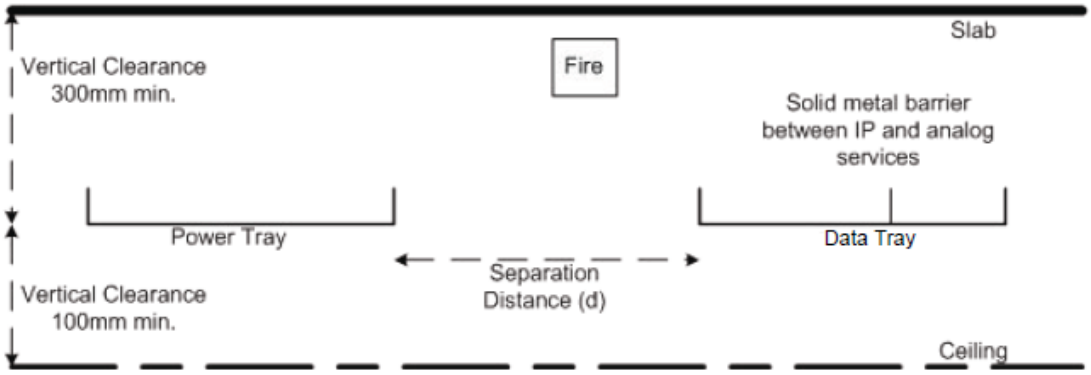


Figure 1: Horizontally aligned cable containment

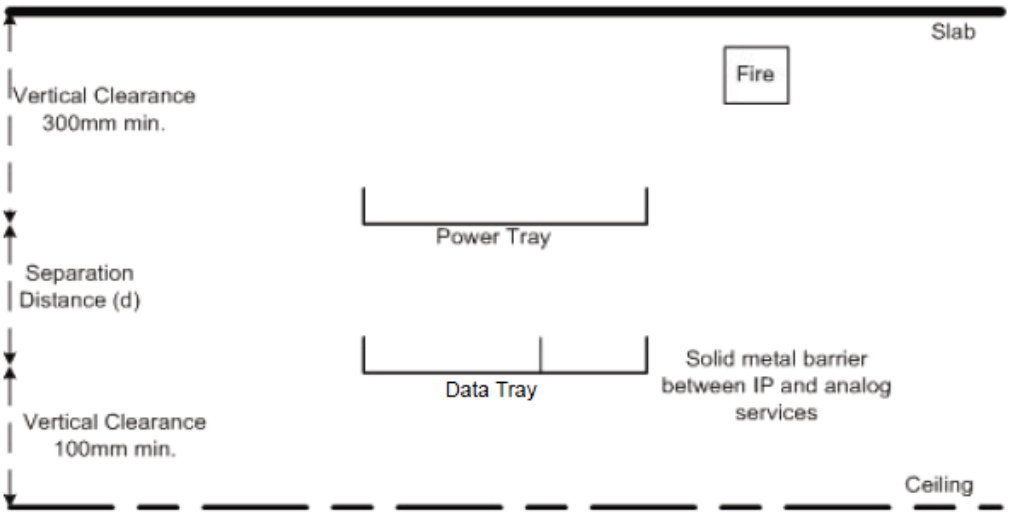


Figure 2: Vertically aligned cable containment

1.6.4 SEPARATION DISTANCES

1) Refer to the following guidelines for minimum separation distances. When space permits greater separation should be maintained.

2) The following table assumes the electrical cables are placed in a solid or slotted cable tray with a fill rate of <40%. Communications cables may be in slotted tray or wire basket containment systems.

Quantity of Power Circuits (230V, 20A)	Horizontal Separation (minimum) (Electrical-Tray, Comms-basket/tray)	Vertical Separation (minimum) (Electrical-Tray, Comms-basket/tray)
1-3	100 mm	150 mm
4-6	100 mm	150 mm
7-9	100 mm	150 mm
10-12	150 mm	150 mm
13-15	150 mm	150 mm
16-30	200 mm	200 mm
31-45	300 mm	300 mm
46-60	400 mm	400 mm
61-75	500 mm	500 mm
75+	600 mm	600 mm
3 Phase cables shall be treated as 3 one-off cables More than 20A shall be considered as multiples of 20A Less than 20A shall be considered as 20A Consider expansion requirements of power cables when sizing		

Table 1: Electrical tray separation distances

1.6.5 CONDUITS

1.6.5.1 GENERAL

1) Type: Generally, PVC conduits to be 25 mm minimum. Use metallic conduits wherever exposed to mechanical damage.
2) Set out: If exposed to view, install conduits in parallel runs with right angle changes of direction.
3) Draw-in boxes: Provide draw-in boxes at intervals not exceeding 30 m in straight runs, and at changes of level or direction.
4) Flexible conduit: Use for equipment and plant subjected to vibration. If necessary, use for adjustment or ease of maintenance. Provide the minimum possible length.
5) Minimum sizes: Metallic and non-metallic conduits: 25 mm.
6) Rigid conduits: Provide straight long runs, smooth and free from rags, burrs and sharp edges. Set conduits to minimise the number of fittings.
7) Set out: If exposed to view, install conduits in parallel runs with right angle changes of direction.
8) Inspection fittings: Provide facilities for inspection. Locate inspection fittings in accessible positions.
9) Draw-in boxes:
    a) General: Provide draw-in boxes at intervals not exceeding 30 m in straight runs, and at changes of level or direction.
    b) Underground draw-in boxes: Provide covers and seal against moisture.
10) Draw wires: Provide galvanise steel drawing wires for all spare conduits.

1.6.5.2 CONDUIT INSTALLATIONS

All conduit installations as a minimum must comply with AS/NZS 3000, and under no circumstances shall be cast-in slabs, unless the written approval has been obtained from Scentre Group.

For proposed installations:

1) Unless otherwise approved by Scentre Group, services are to be reticulated via surface mounted conduit or cable management systems fixed to the underside of slabs.
2) Conduits reticulated for rooftop services (e.g. car park pole lights) may be run in slab within beams (if water ingress is an issue), subject to approval by the Project Services Manager, or preferably shall be run in ceiling space of the level below, fixed to the underside of slab (where an existing installation is being modified). All conduits shall have an upturn and penetration directly beneath each service with appropriate measures taken to waterproof the slab.
3) Slab on ground concrete pours are to have conduits installed beneath the slab.
4) Conduits for ground level services in malls are to be installed within a “services zone” and run parallel to each other and building grids. Access pits to be located within mall areas at every change of direction.
1) Conduits reticulated within column cladding to be heavy duty PVC (HD PVC) and installed in a straight vertical arrangement, and have their location identified at the top of the column or ceiling. Submains cabling of all types shall not be reticulated within column cladding or wall partitions/cavities. Chasing of columns is not permitted.

For proposed installations where services cannot be reticulated using the above systems:

1) If written approval is given to cast in slabs, conduits are to be tied on bar chairs with a minimum 60mm clearance above the formwork level and be reticulated in beams where possible. In any event the conduit is to be run between the top and bottom layers of reinforcement.
2) Conduit pathways are to parallel to grids, between fittings and fixtures instead of shortest possible (or diagonal) routes.
3) Casting conduits in columns should be avoided. If there is no other option, conduits cast in columns to be located within steel reinforcement, and written approval from Scentre Group shall be obtained. Chasing of columns is not permitted.

1.6.6 CABLE DUCT / TRUNKING

1) Cable ducts:
   a) Material: Metal.
   b) Material finish: Metallic-coated to AS 1397 Grade G2, Coating Class Z275.
   c) Construction: Solid.
   d) Accessories: Purpose-made to match the duct system.
   e) Covers: Screw-fixed or clip-on type removable only with the use of tools.
   f) Cable support: Except for horizontal runs where the covers are on top, support wiring with retaining clips at intervals of not more than 1,000 mm.
2) Proprietary trunking systems:
   a) General: Provide proprietary, skirting duct, wall duct, floor duct and service column systems, incorporating segregation where used for multiple services. Provide rigid supports. Round off sharp edges and provide bushed or proprietary cable entries into metallic trunking.
   b) Accessories: Provide proprietary fixings and mountings facilities for accessories and outlets.

1.6.7 CABLE TRAY / LADDER SUPPORT SYSTEMS

1) General: Provide a complete cable ladder system, complete with brackets, fixings and accessories. Fabricate brackets, racks and hangers using structural steel sections or other materials in sections of equivalent strength. Run cables < 13 mm diameter on cable trays or in ducts.
2) Standard: NEMA VE-1.

3) Construction:
   a) General: Use 2 folded steel side rails with cable support rungs between the rails.
   b) Material: Galvanised, heavy-duty steel.
   c) Rung spacing: 300 mm maximum.
   d) Minimum width:
      i) For power cable: 450 mm
      ii) For communications cable: 150 mm.
   e) Bend radius: Provide bends with a minimum inside radius of 12 times the outside diameter of the largest diameter cable carried.
   f) Covers: Provide ventilated flat covers to cable trays/ladders installed in accessible locations.
   g) Fixing to building structure:
      i) General: Fix supports to the building structure or fabric using direct fixing, hangers or brackets.
      ii) Supports: Galvanised or zinc plated.
      iii) Spacing: Space supports at maximum intervals of 1.5 m.
      iv) Rods: 10 mm minimum diameter.
      v) Access: Provide a minimum of 150 mm free space above and 600 mm free space on one side of trays and ladders.
4) Spare capacity: ≥ 50%.
5) Cable fixing:
   a) Provide slats or rails suitable for fixing cable ties, strapping or saddles.
   b) Cable protection: Provide rounded support surfaces under cables where they leave trays or ladders.

1.7 INSTALLATION

1) General: Install equipment and services plumb, fix securely and organise reticulation neatly. Allow for expansion and contraction movements in both the structure and services.
2) Install equipment in accordance with manufacturer's recommendation, and in such a way that the performance of the equipment shall not be adversely affected.
3) Arrangement: Arrange services so that services running together are parallel with each other and with adjacent building elements. Under suspended floors, keep services at least 150 mm clear above ground surface, additional to insulation, and ensure access is not impeded.
4) System integration: Interconnect system elements so that the complete installation performs the designed functions.
5) Fixing:
   a) General: If equipment (e.g. ducts, pipe or the like) or services are not suitable for fixing to non-structural building elements, fix directly to structure and trim around holes or penetrations in non-structural building elements. Return the building fabric penetrated to the building fabric's original fire/acoustic rating.
   b) Fasteners: Use proprietary fasteners capable of transmitting the loads imposed, and sufficient to ensure the rigidity of the assembly.
   c) Securely fix all plant and equipment to the building structure to resist seismic loads determined in accordance with AS 1170.4.
6) Mounting: (caution heavy items will require structural engineers' approval prior to installation)
   a) Wall/ceiling mount: Provide galvanised steel support from building structure.

b) Roof mount:

i) Metal Roof: Unless equipment platform is provided by the Builder, provide galvanised steel support from roof structure.

ii) Concrete Roof: Fix equipment on concrete plinth or other approved supports.

7) Equipment plinth:

a) General: Provide concrete plinth for floor mounted equipment. Contractor to confirm size and location on a builders' work drawing for review and coordination.

b) Construction: Provide a galvanised steel frame to all four sides of the supported equipment. Builder will provide the concrete infill.

8) External application: Equipment and installation located outdoor shall be suitable for external application and shall be protected from the elements preventing any potential water ponding.

9) Cleaning: At completion, clean all plant, equipment and associated materials (internal and external). Remove all redundant material and rubbish from site.

10) Services connections:

a) Statutory Authorities requirements: If the authorities elect to perform or supply part of the works, make the necessary arrangements. Install equipment supplied, but not installed, by the authorities.

b) Connections: Connect to statutory authorities' services or service points. Excavate to locate and expose connection points. On completion reinstate the surfaces and facilities which have been disturbed.

1.8 BUILDING PENETRATIONS

1) Provide all necessary building penetrations details shop drawings including those formed in situ in concrete and block work structures to allow structural coordination. Seal all penetrations after installation of services in accordance with any applicable fire or acoustic rating.

2) Piping sleeves:

a) Provide metal sleeves formed from pipe sections for piping penetrations through building elements.

b) Sleeve diameter: Sufficient to provide an annular space around the pipe or pipe insulation of at least 12 mm.

c) Minimum sleeve thickness:

i) Metal: 1 mm.

ii) PVC: 3 mm.

d) Sleeve terminations:

i) If cover plates are fitted: Flush with the building surface.

ii) If floor draining to floor waste: 50 mm above finished floor.

iii) In fire-rated and acoustic-rated building elements: 50 mm beyond finished building surface.

iv) Elsewhere: 5 mm beyond finished building surface.

e) Finish: Prime paint ferrous surfaces.

3) Cable sleeves: Provide UPVC sleeves formed from pipe sections, for penetration through ground floor slab and beams and external walls by cables not enclosed in conduit.

4) Penetrations:

a) Fire Resistance Level: Seal penetrations using a system to comply with NCC Spec A1.3, AS 1530.4 and AS 4072.1 to retain the design FRL of the building element.

b) Non-fire rated building elements: Seal penetrations around conduits and sleeves. Seal around cables within sleeves. If the building element is acoustic rated, maintain the rating.

c) Roof penetration for open shafts: Any permanently open penetrations with the smallest side greater than 600mm shall be provided with bars. Provide leak-proof seal for roof penetration with under-flashing and over-flashing.

d) Limitations: Do not penetrate or fix to the following without approval:

i) Structural building elements including external walls, fire walls, floor slabs and beams.

ii) Membrane elements including damp-proof course, waterproofing membranes and roof coverings.

e) Membranes: If approval is given to penetrate membranes, provide waterproof seal between the membrane and the penetrating component.

1.9 VIBRATION SUPPRESSION

1) Minimise the transmission of vibration and noise from rotating or reciprocating equipment to other building elements.

2) Flexible connection: Provide flexible connections to rotating machinery and assemblies containing rotating machinery.

a) Isolate ducts by flexible connections.

b) Isolate pipes by incorporating sufficient flexibility into the pipework or by use of proprietary flexible pipe connections installed so that no stress is placed on pipes due to end reaction.

3) Equipment requiring vibration isolation mountings: Except for external equipment that is not connected to the structure of any building, support rotating or reciprocating equipment on mountings as follows:

a) For static deflections < 15 mm: Single or double deflection neoprene in-shear mountings incorporating steel top and base plates and a tapped hole for bolting to equipment.

b) For static deflections ≥ 15 mm: Spring mountings.

c) Selection of vibration isolation mountings: Select mountings to achieve 95% isolation efficiency at the normal operating speed of the equipment.

4) Spring mountings: Use freestanding laterally stable springs with at least 12 mm clearance between springs and other members such as bolts and housing. Provide the following:

a) Ratio of mean coil diameter to compressed length at the designated minimum static deflection: > 0.8:1.

b) Minimum travel to solid of at least 150% of the designated minimum static defection.

c) Levelling bolts and lock nuts.

d) Neoprene acoustic isolation pads between base plate and support.

e) Vertical resilient limit stops: To prevent spring extension when unloaded, to serve as blocking during erection, and which remain out of contact during normal operation.

f) Snubbing: Snub the springs to prevent bounce at start-up.

5) Installation: Set and adjust vibration isolation mounting supports to give adequate clearance for free movement of the supports.

6) Inertia bases:

a) General: Use inertia bases with mass at least that of the equipment supported.

b) Construction: Steel-framed reinforced concrete.

1.10 NOISE CONTROL

1) General: Control noise levels at site boundaries and in occupied spaces by proper system design, equipment selection, and acoustic treatment to plant rooms and noise sources.
2) Environmental noise:
    a) Comply with the noise limit requirements of the authorities.
    b) Background noise: If there is no specific authorities' noise limit requirements, classify the site as noise area category R3 in accordance with AS 1055.
    c) Noise level at boundary: If there is no specific authorities' noise limit requirements, ensure that when equipment operates under normal conditions it will not raise the ambient noise level at the nearest boundary of the site by more than 5 dB when measured on the unweighted 'A' scale, and will be free of any disturbing tone or harmonic sound, at any time of day and night, 7 days a week.
    d) Building interior noise: Ensure that the sound levels of different areas of the building interior will not exceed the recommended 'satisfactory' levels in accordance with AS 2107, when all equipment are operating under normal conditions.
3) Engage acoustic consultant to assess noise levels in accordance with local council requirements and include control measures through proper system design, equipment selection, and acoustic treatment to plant rooms and noise sources.

1.11 METAL WORK

1) Use metalwork capable of transmitting the loads imposed, and sufficient to ensure the rigidity of the assembly without causing deflection or distortion of finished surfaces. Construct to prevent rattle and resonance.
2) Edges and surfaces: Keep clean, neat and free from burrs and indentation. Remove sharp edges.

1.12 WELDING, BRAZING AND CRIMPING

1) Hot work permit: Apply hot work permit procedures for all welding, brazing, grinding or other operations including open flames or producing heat and or sparks.
2) Welding:
    a) Steel: To AS 1554.1.
    b) Aluminium: To AS 1665.
    c) Stainless steel: Follow the recommendations of WTIA Technical Note 16.
3) Brazing: Ensure brazed joints have sufficient lap to provide a mechanically sound joint.
4) Crimping: Provide manufacturers details if press fit crimped joint system proposed.
5) Filler metal:
    d) General: To AS 1167.1.
    e) Copper-to-copper, copper-to-brass, brass to brass: Minimum 2% silver content and maximum 0.05% cadmium.
    f) Application: Ensure the brazing alloy wets all surfaces and fills the clearance between the overlapping parts.

1.13 SITE PAINTING

1) Paint all new surfaces of equipment, duct and pipes except surfaces of chromium, anodised aluminium, UPVC and stainless steel finish; non-metallic flexible materials and normally lubricated machine surfaces.
2) Exposed to view: 1 prime coat and 2 full gloss enamel finish coats.
3) Uninsulated ferrous pipes in concealed space: 1 prime coat.

4) Factory painted items: Repair damaged paint.
5) Low VOC emitting paints: Provide the following low odour/low environmental impact paint types with the following VOC limits:
   a) Primers and undercoats: <5 g/litre.
   b) Low gloss white or light coloured latex paints: <5 g/litre.
   c) Coloured low gloss latex paints: <16 g/litre.
   d) Gloss latex paints: <90 g/litre.
6) Paint application: Apply first coat immediately after substrate preparation and before contamination of the substrate can occur. Ensure each coat of paint or clear finish is uniform in colour, gloss, thickness and texture, and free of runs, sags, blisters or other discontinuities.
7) Repair galvanising: If galvanised surfaces have been cut or welded after galvanising, prime the affected area using zinc rich organic binder.
8) Colour schedule: Follow the colour schedule below unless otherwise documented.

Service	Conforming AS 2700 Colour
Potable cold water	Jade green, G21
Hot water	Jade green, G21
Sanitary and tradewaste drainage	Black
Fire fighting	Signal red, R13.
Electrical	Orange, X15

Table 2: Paint colour schedule

1.14 ELECTRICAL HAZARD IDENTIFICATION (EHI)

1) The Electrical Hazard Identification (EHI) procedure was intended as a key control to mitigate and prevent unsafe interaction of works and electrical services.
2) The purpose of the EHI procedure is to ensure any person(s) undertaking works in a Scentre Group asset or workplace are fully aware of the potential Electrical Hazards that are present in the works area and that they have a clear understanding of the controls to be implemented when they undertake the works.
3) The Contractor is to ensure EHI activities are completed prior to commencing any excavation, trenching or where a surface is to be disturbed.
4) The EHI procedure must always be followed.

1.15 SERVICES TRENCHES

5) General: Provide trenches and reinstatement for all below ground installations.
6) Excavation:
   a) Compliance: Excavation of trenches shall be in accordance with the relevant Australian Standards.
   b) Existing surfaces: Before excavating trenches, saw-cut existing concrete and bituminous surfaces on each side of the trench to provide a straight even joint. Cross cutting of the trenches shall not extend beyond trenches' edge. Lift and store unit pavers for later reinstatement.
   c) Route: If practicable, make trenches straight between pits, personnel access ways, junctions and changes in cable/pipe route, with vertical sides and uniform grades.
   d) Spoil: If excavated material cannot be used for filling or backfilling, remove it from the site. It is contractor's responsibility to test for soil contamination.
   e) Trench widths: Keep trench widths to the minimum consistent with the laying and bedding of services, and the construction of personnel access ways and pits.

f) Trench depths: If excavation is necessary below the level of adjacent footings and in ground services, seek approval, and provide necessary support for the footings.

g) Excess excavation: If trench excavation exceeds the correct depth, reinstate to the correct depth and bearing value using compacted bedding material or grade N20 concrete.

h) Obstructions: Clear trench of sharp projections. Cut back roots to at least 600 mm clear of services, pending approval from arborist. Remove other obstructions including stumps and boulders, which interfere with services or bedding. If rock is encountered, give notice.

i) Dewatering: Keep trenches free of water. Place bedding material, services and backfilling on firm ground free of surface water. Contractor to allow for temporary dewatering.

j) Boring: If required by statutory authorities, provide under road boring carried out by a suitable qualified person in lieu of trenches. Ensure a tight fit to the service pipes. If voids are encountered, fill by pressure grouting.

k) Timbering of Excavation: Where necessary for safe and efficient completion of the work, erect shoring and timbering of sufficient strength and quality to prevent earth and other material slipping or falling into or being shaken from the side of the excavation. As the work proceeds, all shoring and timbering shall be withdrawn except in the cases where the Superintendent has directed in writing that such shoring and/or timbering shall be left in position. The supply, erection and withdrawal of all timberwork shall be considered to be included in the cost of excavation. The whole of this work shall be in accordance with the requirements of the relevant safety acts and regulations. Minimum trench widths specified shall be clear of all trench supports.

l) Precaution and Safeguards: Carry out the work in a careful, secure, safe and tidy manner and take all precautions against 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 fences, barriers and night-lights adjacent to any works such as trenches and excavations or stacks of material, which could be considered a danger to persons, or traffic of any kind. The Contractor shall obey all directions given to him by the Superintendent or Authority regarding the provisions of lighting and barriers but shall not be relieved of responsibility for any accident of damage. Obtain permission from Authorities when required for placement of barricades.

7) Backfilling:

a) Compliance: Bedding and backfill shall be in accordance with the relevant Australian Standards.

b) General: Backfill trenches as soon as possible after approval of laid and bedded service. Place the backfill in layers < 150 mm thick and compact to the density which applies to the location of the trenches, to minimise settlement and so that pipes/cables are buttressed by the trench walls.

c) Boring: If required by statutory authorities, provide under road boring, carried out by a suitably qualified person, in lieu of trenches. Ensure a tight fit to the service pipes or cables. If voids are encountered, fill by pressure grouting.

d) Under roads and paved areas: Coarse sand, controlled low strength material, or fine crushed rock.

e) In topsoil areas: Complete the backfilling with topsoil for at least the top 50 mm.

f) In reactive clay: In sites classified M, H, P or E to AS 2870 use an impervious material if trenches fall towards footings.

g) Elsewhere: Well graded, inorganic, non-perishable material, maximum size 75 mm, plasticity index ≤ 5%. Do not place stones greater than 25 mm within 150 mm of services.

8) Reinstatement:

a) Lawn areas: Provide 150 mm of loam and re-sow the lawn over the trench and other disturbed areas.

b) Paving and roads: Reinstate to match adjacent work, paved surfaces and assets disturbed or removed during excavation of trenching.

c) Concrete surfaces: Reinstate concrete surfaces to the original level. If necessary, provide steel reinforcement keyed to the adjacent concrete and laid to prevent the reinstalled concrete from subsiding and cracking.

d) Bituminous surfaces:

   i) General: Provide crushed rock base and sub base to match the existing pavement. Prime coat the existing surfacing with bitumen. Lay and compact hot-mix asphalt so that the edges are flush and the centre is cambered 10 mm above the existing pavement. If hot pre-mix is not available, cold pre-mix may be accepted.

   ii) Minimum asphalt thickness: 50 mm or the adjacent pavement thickness, whichever is thicker.

e) Unit paving: Provide sand bedding and, if necessary, compacted crushed rock base. Reinstate the paving units.

f) Any existing line marking that has been removed during excavation shall be reinstated at the contractor's cost.

1.16 MARKING AND LABELLING

1) General: Mark services and equipment to provide a ready means of identification.

2) Piping: Identify throughout its length, including in concealed space.

3) Gas: Labels must identify gas pressure within pipework (handwritten label is not accepptable).

4) Pressure vessels: Mount manufacturer's compliance certificate in glazed frames on wall next to the vessel

5) Electrical:

   a) Mark operable control devices, indicators, isolating switches to provide a ready means of identification.

   b) Label cables to indicate the origin and destination, cable number, cable cross sectional area and associated earth cable size.

   c) Externally controlled equipment: To prevent accidental contact with live parts, provide warning notices for equipment on assemblies not isolated by main switch or local main switch.

   d) Stand-by power: Provide warning notices stating that assemblies may be energised from the stand-by supply at any time.

   e) Custom-built assemblies: For insulation or shrouding requiring removal during normal assembly maintenance, provide danger notices with appropriate wording for replacement of insulation shrouding before re-energising assemblies.

   f) Location: Locate notices so that they can be readily seen, next to, if impracticable, on busbar chamber covers of functional units, and behind the front cover of functional units. Provide circuit identification labels in the cabling chamber of each functional unit, located next to external terminations.

   g) Schedule cards: Provide schedule cards with written text showing the following as-installed information.

   h) Submain designation, rating and short-circuit protective device.

   i) Equipment item numbers and current ratings, cable sizes and types and areas supplied.

   j) Mounting: Mount schedule cards in a holder fixed to the inside of the assembly or cupboard door, next to the distribution circuit switches. Protect with hard plastic transparent covers or laminated.

6) Live Electrical Services:
   a) Base building electrical services that cannot be obviously identified shall have a Live Services label fitted in a clear visible location at 4,000 mm increments. These include electrical services that are not clearly visible, or are not an obvious electrical system, such as:
      i) Electrical services installed within enclosed cable tray;
      ii) Busduct systems (also known as busways or busbar trunking systems);
      iii) Cable link boxes or junction boxes;
      iv) Mineral Insulated Metal Sheathed (MIMS) cable (also known as MICC or Pyro cable); and
      v) Electrical services concealed behind surfaces / within structures that are hidden from view.
   b) This label is intended to be a visual indicator for Contractors working on or near energised electrical services and to ensure any unintended contact from individuals, tools and construction materials is mitigated.
   c) Contractors will be provided the Live Service labels from Scentre Group
7) Consistency: Label and mark equipment using a consistent scheme across all services elements of the project.
8) Text: Provide marking and labelling text identical to the text and terminology used in Operating and Maintenance Manuals.
9) Labels and Notices: Select from the following:
   a) For indoor application: Engraved two-colour laminated plastic or proprietary pre-printed self-adhesive flexible plastic labels.
   b) For outdoor application: Engraved and black filled lettering on stainless steel or brass, minimum thickness 1 mm – to be screw fixed.
   c) Fire Services: If not painted signal red pipe marking shall be provided in accordance with AS1345.
10) Location: Locate labels so that they are easily seen and are either attached to, below or next to the item being marked.
11) Fixing:
   a) General: Use mechanical fixing.
   b) Valves and pumps: Attach by key ring to valve hand wheels.
12) Emergency functions: Code compliant Safety Signs required for operational environment
13) Colours: Generally, in conformance with Australian Standards as appropriate, otherwise black lettering on white background except as follows:
   a) Danger, warning labels: White lettering on red background.
   b) Main switch and caution labels: Red lettering on white background.
14) Minimum lettering heights: Unless specified in the Australian Standard:
   a) Equipment nameplates: 40 mm.
   b) Warning notices: 7 mm.
   c) Automatic controls and electrical equipment: 5 mm.
   d) Isolating switches: 5 mm.
   e) Inside electrical enclosures: 3.5 mm.
   f) Other: 3 mm.

1.17 TRAINING

Conduct initial training for Scentre's representatives at an agreed time, using draft O&M Manuals, not later than one month prior to Completion / Handover of any stage or tenancy. Conduct a second training one month after Completion / Handover to ensure that Scentre Management fully comprehend the operation and function of the installation.

For any equipment requiring seasonal operation, demonstrate during the appropriate season and within 9 months of the Completion / Handover.

Cover the design intent, function, operation and maintenance of the installations. Use the Operations and Maintenance Manual as basis for instruction.

Conduct training by demonstrators or qualified person who are knowledgeable about the installation.

The initial training session is to comprise a minimum of a PowerPoint presentation covering all basic functions of the systems installed, FAQ's, troubleshooting and maintenance requirements. Interactive training using the head end management controls of each system is also required.

The PowerPoint presentation should be produced in an easy to follow manner and copies of this distributed to the trainees on completion. The presentation is to be submitted 3 weeks prior to the arranged training date and will need to be submitted for a formal approval. All changes are to be incorporated and re-submitted ready for the formal training session.

The follow up training sessions should reiterate that covered during the initial training and also address any problems that have occurred during the DLP and what works have occurred to rectify the problem.

1.18 WORKS AS EXECUTED (AS-BUILT) DRAWINGS / MODEL

1) General: Produce accurate Work-as-executed (As-Built) drawings/model as a true reflection of the agreed coordination and subsequent installation, in line with the Scentre BIM Execution Plan (BEP), the Revit Manual, Autocad standards and Project Specification as applicable. A full suite of standards is available on request and will be provided to the Contractor on Contract Award. The Contractor will be required to comply with these documentation standards.

   Work-as-executed drawings/model shall contain the following information as a minimum:

   a) Work-as-executed drawings shall be based on the shop drawings, the most current architectural backgrounds, and include changes made during the construction and commissioning periods. The contractor is to maintain a set of drawings on site marked up with any alterations to their shop drawings during construction. These should be available for inspection at any time and as a record to assist them in their final work-as-executed drawing production.

   b) Provide all necessary information of contractor's designed systems noting that the as-built document is not a shop drawing.

   c) Record all unexpected obstructions that may be of use to the operational building.

   d) Add all related shop drawings to as-built drawings as an appendix to the drawings. Make sure there are references on the drawing page to the appendix.

   e) Update the index sheet to show the latest drawing changes or additions

   f) For inspection purposes drawings are to be stamped with 'RECORD DRAWING AS-BUILT FOR INSPECTION' including contractor's name, date, and other relevant information as may be required.

   g) Following inspection and subsequent workflow review process, if a sheet has not been changed at all or no mark has been added, label the sheet 'AS-BUILT' and transmit using the web based project tool.

   h) If a sheet has been changed or modifications have been added, label it 'REVISED AS-BUILT' ensuring clear, concise details of the change or modification are noted.

   i) The Level of Development for a Revit work-as-executed model shall be LOD300 as applicable.

   j) FINAL AS BUILT drawings / model to be issued upon completion of the process above.

k) Asset tagging or naming are produced in accordance with SCG Engineering Services Asset Reference Numbering and Naming. The Scentre asset register will need to be populated as part of the equipment schedules for approval by the Scentre engineers.

Should the Contractor not have in-house AutoCAD/Revit documentation capacity then the drafting is to be undertaken for the Contractor (at the Contractors cost) by a suitable drafting company with demonstrable AutoCAD/Revit capability. Such company is to be nominated for Scentre approval prior to Contract Award.

All costs caused by incomplete or inaccurate as-builts will be recovered from the Contractor.

The production of as-built information does not in any way infer that Practical Completion has been achieved unless otherwise advised by the Project Manager.

2) Inspections of Work-as-executed (As-Built) Installation and Corresponding Drawing/Model: The contractor is responsible for scheduling area specific inspections in advance with the Services Manager, Services Coordinator and, or Scentre Engineering representative to ensure availability of required persons in maintaining programme. Should the programme outline milestones for such inspections not be met then it remains the responsibility of the contractor for scheduling of the same inspections. In addition, the contractor must ensure that any services installed within adjacent tenancy service zones are inspected prior to the tenancy being handed over to the tenant.

3) Submissions:

a) Submit the draft work-as-executed drawings for review and comment.

b) Submit the final work-as-executed drawings prior to practical completion in the following formats:

i) Portable Document Format (PDF)

ii) Autocad CAD (DWG) files

iii) Revit Model (RVT) (as applicable to the Project)

iv) Navisworks (NWC or NWD) (as applicable to the Project)

c) The work-as-executed drawings/model are to be provided and uploaded to the web based system, e.g. Aconex or similar in use by Scentre specific to this project or distributed in any such manner as directed by the Project Manager.

4) Data Version: Work-as-executed drawings/model shall be produced in the current agreed AUTOCAD/REVIT/NAVISWORK version in use at the time of the Project. Data in other compatible formats may be considered, but will only be accepted with prior agreement by the Project Services Manager.

1.19 OPERATION AND MAINTENANCE MANUAL

1.19.1 GENERAL

The Contractor shall submit Operation and Maintenance (O&M) Manuals on the online Project Management System in use by Scentre for this project in accordance with the relevant guidelines and requirements referred to in the appendices of this specification.

1.19.2 STAGED COMPLETION / SECTIONAL HANDOVERS

Where a project has multiple stages the O&M Manual is to be prepared and submitted one (1) month prior to the first stage completion. It will be written in such a manner as to later incorporate, without major modification, any works amended during following stages not foreseen at time of the O&M submission.

The Contractor is to then update the manual one (1) month prior to the completion of each subsequent stage.

1.19.3 SUBMISSION

All O&M Manuals shall be submitted through either Aconex or a similar approved online Project Management System.

The draft O&M manuals shall be submitted one (1) month before the date for practical completion or commencement of training on services equipment, whichever is the earlier.

The final O&M manuals shall be submitted within four (4) weeks after practical completion.

1.19.4 DOCUMENTATION FOR MAJOR AND MINI-MAJOR TENANTS

Where Major and or Mini-Major Tenants are part of the scope of works the contractor shall in addition to providing the work-as-executed drawings and operation and maintenance manuals specified for the main Project, also provide three copies of work-as-executed drawings and operation and maintenance manual for each of the major and mini-major tenants undertaken as part of this contract. The drawings and the manuals shall contain all, and only the information relevant to the installation of the particular tenant and any interface it has with the base building plant and equipment.

1.19.5 FORMAT AND STRUCTURE

1.19.5.1 ELECTRONIC COPIES

Electronic copies of the O&M manuals shall be:

1) Sized and set to print on A4 paper.
2) Provided in two formats:
    a) PDF
    b) The original source file
3) Produced to suit electronic online documentation as defined within the Preliminaries (such as BIM PLAN or equivalent).
4) Produced in a form suitable for use with Adobe Acrobat software.
5) Suitable for use with pre-formatted documents produced by other software products for inclusion in the manuals, be provided in Adobe Portable Document Format, PDF.
6) Provided in electronic format with the following information:
    a) Project name
    b) Services
    c) Drawing numbers
    d) File type/s
    e) Date

As-constructed drawings shall have:

1) PDF Versions of DWG drawings be named the same with the file type extension providing differentiation of files (include short descriptor such as elec,-power, lighting, etc. in all file names);
2) DWG files be supplied with all XREFs bound into a single file. This is inclusive of all images, shapes and fonts. Providing XREFs with main drawing will NOT be accepted; and
3) Each drawing shall be provided as a separate file. A tabbed suite of drawings will NOT be accepted.

1.19.5.2 GENERAL STRUCTURE

The Operation and Maintenance Manuals shall be set up with the following structure which includes but not limited to the associated information

1) Contents
2) Introduction and Guide

3) Design Intent
4) System Description
5) Equipment Description
6) Assets Register
7) Operating Procedures
8) Maintenance Procedures (including Maintenance Schedule)
9) Warranties, Licences and Certificates
10) Testing and Inspection, Commissioning Results: Including all baseline data as required in AS1851 for the applicable fire services.
11) Spare Parts
12) Help and Contacts
13) As-Constructed and Shop Drawings
14) Health and Safety

1.19.5.3 INTRODUCTION AND GUIDE

This section shall include the following:

1) Introduction: provide information on what the project is about, where on the site or building the works has been completed, etc.
2) Directory: Names, addresses, and telephone and fax numbers of consultants, contractors, and names of responsible parties.
3) General description of installations.
4) How to use guide: Information on where certain information can be found to reduce the amount of time a person is required to read and find information.
5) Contractual and Legal Information.

1.19.5.4 DESIGN INTENT

This section shall include the following:

1) A description of the energy efficiency features and strategies in relation to the design of the building, including an overview of the potential savings, as stated for economic and environmental impact.
2) Design parameters, assumptions and relevant standards referenced within the design.
3) Print out of calculations (e.g. heat load, maximum demand).

1.19.5.5 SYSTEM DESCRIPTION

Technical description of the systems installed. Identifying function, normal operating characteristics, and limiting conditions.

1.19.5.6 EQUIPMENT DESCRIPTION

1) Names, addresses and telephone numbers of manufacturers and suppliers of items of equipment installed.
2) Schedule (system by system) of equipment, make, model numbers, stating locations, duties, performance figures, materials. Use unique item number cross-referenced to the work-as-executed drawings.
3) Manufacturer's technical literature for equipment installed.

1.19.5.7 ASSETS REGISTER

The Contractor shall complete the Asset Register with all asset details for work completed, and comply with SCG Engineering Services Asset Reference Numbering and Naming for assets naming convention.

1.19.5.8 TECHNICAL DATA

Manufacturer's technical literature assembled specifically for the project and excluding irrelevant matter. Each product data sheet marked to clearly identify the specific products and components used in the installation and data applicable. Additional instructions and illustrations as required to identify any changes to the manufacturer's data or to illustrate the function of each component in the installation.

1.19.5.9 OPERATING PROCEDURES

Include the following information in this section:

1) Manufacturer's technical literature as appropriate. For other than common accessories, where no manufacturer literature is available, a precise and concise description of the operation procedure in plain English shall be provided.
2) Safe starting, running, operating and shutting-down procedures for the equipment installed including logical step-by-step sequence of instructions for each procedure.
3) Control sequence and flow diagrams for the systems installed.
4) A legend for colour-coded services. A legend of the symbols used on the drawings, unless included on the drawings.
5) Schedule of the parameter setting of each protective device, including fixed and adjustable circuit breakers, protective relays, adjustable photoelectric switches, pressure switches, and any other control and monitoring device, as established during commissioning and maintenance.
6) Provide all procedures that may be utilised to identify and rectify common system/equipment faults.
7) First Aid.

1.19.5.10 MAINTENANCE PROCEDURES

Provide the following information in the section:

1) Maintenance instructions
    a) Emergency procedures, including telephone numbers for emergency services, and procedures for fault-finding.
    b) Manufacturers technical literature as appropriate.
    c) Detailed recommendations for the frequency of performance of routine maintenance tasks.
    d) List of procedures and tasks associated with preventive (routine) maintenance.
    e) Procedures for safe trouble shooting, disassembly, repair and reassembly, cleaning, alignment inspection and adjustment, including a logical step-by-step sequence of instructions for each procedure.
    f) Provide detailed cleaning regimes for each major system (and individual equipment) in accordance with the manufacturer's requirements and warranties.
2) Maintenance schedules
    a) A schedule of the frequency of the required or recommended maintenance, testing or inspection for each type of equipment. This schedule is to include weekly, monthly attendance times.
    b) Provide separate maintenance schedules for each type of equipment with the minimum details as shown below:
        i) Information/data name

ii) Location of the equipment
iii) Description of the equipment
iv) Unique ID
v) Inspection type/frequency
vi) Maintenance required
vii) Inspection results
viii) Comments on each inspection
ix) Inspection date
x) Inspector name, title and address

Update the maintenance section of the O&M manuals at the end of defects liability period to include all changes and upgrades to services.

1.19.5.11 WARRANTIES, LICENCES AND CERTIFICATES

Include the following information in this section:

1) Copies of manufacturers warranties.
2) Copies of any relevant licences (manufacturers, system, and/or authority).
3) Copies of all guarantees.
4) Certificates from authorities and certifiers.
5) Individual certificates (from the installing/specialist trades) of compliance for each and every system to be provided.
6) If installation is not by the manufacturer, and product warranty is conditional on the manufacturer's approval of the installer, submit the manufacturer's approval of the installing firm.

All Warranties shall name the equipment owner.

1.19.5.12 TESTING AND INSPECTION, COMMISSIONING RESULTS

Include the following information in this section as a minimum:

1) ITP
2) Records of test results
3) Records of commissioning plan and program
4) Records of certified testing equipment

1.19.5.13 SPARE PARTS LIST

Include the following information in this section:

1) Schedule of spares with an expected operating life less than 60,000 hours, including item label manufacturer name, address and telephone number, catalogue number, name and address of local distributor, and the expected replacement frequency.
2) Schedule of consumable items (oil, grease, belts, bearings, etc.) to be used during servicing.
3) The cost of such spares shall include, supply, individual packing and identification of each item, and delivery to site.
4) Spares and service expertise shall be available for at least 15 years after Completion.

5) Spares and Consumable Register including the following information for each product:
    a) Product
    b) Manufacturer Name
    c) Address and Telephone Number
    d) Catalogue Number
    e) Local Distributor Name, Address and Telephone
    f) Replacement Frequency
    g) Comments
6) Imported Equipment: Where the Contractor has imported equipment from outside of Australia then the following additional information in a separate table:
    a) List of all imported equipment
    b) Country of origin
    c) Importer details
    d) Australia servicing contact details

1.19.5.14 HELP AND CONTACTS

Provide all help and contact details for each service contract (including specialist installers). Minimum contact details are as follows:

1) Discipline/Service (i.e. Electrical, Security, Structured Cabling, Assistance Call, etc.)
2) Name of Contractor
3) Address
4) Daytime telephone contact
5) Afterhours telephone contact

1.19.5.15 AS-CONSTRUCTED AND SHOP DRAWINGS

Include the following information in this section:

1) Index list of all drawings in numerical order including full title and revision date
2) Copy of all As-Constructed Drawings
3) Copy of all approved Shop Drawings

All hard copies shall be provided on the same size print sheet for uniformity of all drawings.

1.19.5.16 HEALTH AND SAFETY

Include the following information in this section:

1) Guidance to relevant legislation
2) Control of workplace hazardous substances
3) Risk Assessments
4) Disposal Information

1.20 CONTRACTOR DESIGN DELIVERABLES

1.20.1 TECHNICAL DATA

1) General: Carry out system design. Submit system design details and technical data for all items of plant and equipment selected before ordering equipment.

2) Data to be submitted: Include at least the following:
   a) System design:
      i) Assumptions and design parameters.
      ii) Engineering Calculations - The calculations should be in accordance with the current Standards, Council requirements, etc. and accompanied by drawings. These documents are to be submitted to Scentre Group for review prior to construction.
   b) Schedules of equipment selected with the following information:
      i) Model name, designation and number.
      ii) Capacity of all system elements.
      iii) Country of origin and manufacture.
      iv) Materials used in the construction.
      v) Size, including required clearances for installation.
   c) Manufacturers' technical literature, type test report.

1.20.2 DRAWINGS

1) General: Prepare and submit drawings of fabrication and installation of services and equipment. Drawings shall be dimensioned, with reference to building structure and other services. Drawings shall contain all necessary information for coordination and construction on site, including symbols and legends, details, sections, and equipment schedules.
2) Drawings: Prepare and submit the following drawings:
   a) Drawings of work to be provided by the Builder including:
      i) Equipment rooms and platforms.
      ii) Shafts and risers.
      iii) Access doors and panels.
      iv) Loads to be imposed on the structure during installation and operation.
      v) In situ penetrations and openings.
      vi) Structural support for equipment.
      vii) Fire resistance of building structures.
      viii) Other Builder's works documented.
   b) Hydraulic Services drawings including:
      i) Layouts of pipework and equipment (valve locations, sanitary hardware and others).
      ii) Riser layouts and sections.
      iii) Pump room, valve room layouts.
      iv) Seismic restraint details.
      v) FH & FHR coverage drawings (if requested by building certifier, fire engineer or fire brigade).
      vi) Relevant performance data for each item of equipment including make, model, speed, capacity, etc., as appropriate.
      vii) Pipework schematic drawings.

2 PIPEWORK

2.1 GENERAL

1) Cleaning: Before installations, remove loose scale, burrs, fins and obstructions.
2) Protection: During construction, prevent the entry of foreign matter into the piping system by temporarily sealing the open ends of pipes and valves using purpose-made covers of pressed steel or rigid plastic.
3) Certification: All Pipework materials to be FM Global certified.

2.2 INSTALLATION

1) General: Install piping in straight lines at uniform grades with no sags. Arrange to prevent air locks. Provide sufficient unions, flanges and isolating valves to allow removal of piping and fittings for maintenance or replacement of plant.
2) Arrangement: Arrange and support piping so that it remains free from vibrations whilst permitting necessary movements. Minimise the number of joints.
3) Spacing: Provide at least 25 mm clear between pipes and between pipes and building elements, additional to insulation.
4) Changes of direction: Provide long radius elbows or bends where practicable, and swept branch connections. Provide elbows or short radius bends where pipes are led up or along walls and then through to fixtures. Do not provide mitred fittings.
5) Dissimilar metals: Join dissimilar metals using fittings of electrolytically compatible material.
6) Accessibility: Provide access and clearance at fittings, which require maintenance or servicing, including control valves and joints intended to permit pipe removal. Arrange piping so that it does not interfere with the removal or servicing of associated equipment or valves or block access or ventilation openings. If possible, locate valves in groups and in easily accessible locations.
7) Embedded piping: Do not embed pipes that operate under pressure in concrete or surfacing material.
8) Expansion and contraction: Sheath or sleeve metal piping chased into masonry or encased in concrete so that expansion or contraction can take place without damage to the pipe or to the material or surface finish of the surrounding element. Provide expansion loops as necessary to allow for expansion and contraction of the pipework systems.
9) Cover plates: If piping emerges from exposed building surfaces, provide cover plates of non-ferrous metal, finished to match the pipe, or of stainless steel, close fitting and firmly fixed in place.

Cover plates sizes table:

Nominal Pipe Size (mm)	Cover Plate Diameter
< 20	65 mm
$\underline{\geq}$ 20, < 50	100 mm
$\underline{\geq}$ 50	50 mm larger than pipe

Table 3: Cover plate sizes

10) Support system:
    a) General: Provide proprietary support systems of galvanised or zinc-coated construction.
    b) Vertical pipes: Provide anchors and guides to maintain long pipes in position, and supports to balance the mass of the pipe and its contents.
    c) Balance the mass of the pipe and its contents.
    d) Saddles: Do not provide saddle type supports for pipes ≥ DN 25.
    e) Uninsulated pipes: Clamp piping supports directly to pipes.

f) Insulated pipes:

i) Spacers: Provide spacers at least as thick as the insulation between piping supports and pipes. Extend either side of the support by at least 20 mm.

ii) Spacer material: Rigid insulation material of sufficient strength to support the piping and suitable for the temperature application.

g) Support spacing

i) Cold and heated water pipes: To AS/NZS 3500.1.

ii) Sanitary plumbing: To AS/NZS 3500.2.

iii) Gas: To AS 5601.

iv) Other pipes: To AS/NZS 3500.1.

2.3 BELOW GROUND INSTALLATION

1) Depth of cover: Comply with the relevant Australian Standard.

2) Corrosion protection: Provide corrosion protection for:

a) Underground ferrous piping.

b) Underground non-ferrous metal piping in corrosive areas.

3) Protection methods: Select from the following:

a) Impermeable flexible plastic coating.

b) Sealed polyethylene sleeve.

c) Danger tape with trace wire to be installed for non metalic pipe services.

d) Continuous wrapping using proprietary petroleum taping material.

4) Pit: Provide precast or in situ concrete pits to accommodate fittings of below ground installation:

a) Concrete: Grade N20, 100 mm thick, reinforced with F82 fabric.

b) Internal dimension: Provide 300 mm clear space all around the fittings in the pit.

c) Grade: Grade floor to a point on one side and provide drain for water.

d) Finish to exposed surfaces: Provide a smooth seamless finish, cove or splay internal corners.

5) Pit cover:

a) Standard: Class D to AS 3996.

b) Installation: Cast in the pit cover frame, flush with the finished surface, or 20 mm above the ground level in landscaped area.

2.4 CONDENSATION INSULATION

1) General: Insulate pipework

a) carrying wastes below ambient temperature from plant rooms and refrigeration equipment until married into sanitary plumbing or drainage lines.

b) carrying water or wastes below ambient in supply or return air plenums where located above plasterboard ceilings.

2) Insulation materials:

a) Type: Elastomeric foam or polyethylene foam with aluminium foil facing.

b) Thickness: In compliance with Section J of BCA.

3) Joints: Seal aluminium foil laminate overlap at joints using aluminium foil tape to complete the vapour barrier.

4) Valves and fittings: Cut insulation and form to fit around valves and fittings. Use loose mineral wool or glass wool to fill air gaps and voids. Provide a continuous vapour barrier.

5) Provide support formed to fit around the insulation.

6) For pipes ≥ DN 25:

   a) Protect the insulation at the support point with metal sheathing; or

   b) Replace the insulation at the support point with a shaped wooden spacer block. But the insulation up to the wooden block and seal with silicon compound.

2.5 COPPPER TUBE AND PRESS FITTINGS

Copper tube:

1) Copper tubes shall comply with AS 1432, made from high residual phosphorous deoxidised copper classified as C12200 Alloy, Watermark approved.

2) The copper brazed fittings shall comply with AS 3688 and shall have Watermark approval.

Copper Press Fitting:

1) The copper press fittings shall be of press fit M-Profile type, complying with AS 3688. All fittings, excluding GAS fittings with HNBR type O-rings, shall have Watermark approval.

2) The copper tube system used shall be from the one manufacturer only.

3) 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.

4) The supplier shall operate a Quality Management System which is certified to comply with the requirements of IS0 9001.

5) 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 the manufacturer to meet warranty requirements.

6) 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 document shall consider the medium, pressures, temperatures and operating environment for the application.

2.6 ROLL GROOVE PIPEWORK COUPLING AND FITTINGS

All new / retro fitted roll groove piping systems to mechanical, hydraulic and fire services are to:

1) Be a proprietary system installed strictly in accordance with the manufacturer's tested systems/manuals.

2) Have dimensional checks in accordance with manufacturer's manuals (ie Victaulic I-100 or equivalent)

3) Be carried out on the coupling manufacturer's supplied equipment;

4) Be a single manufacturer's fittings, couplings and rolling equipment (no mixing) per installation;

5) Be inspected and verified by the manufacturer in the presence of SDC, at hold points as required.

2.6.1 GENERAL

1) Follow ALL detailed instructions contained within manufacturer's manuals (ie Victaulic I-100 or equivalent)

2) The contractor is to engage with the manufacturer to ensure they have the appropriate and latest proprietary equipment and installation manual, and ensure that a copy is issued to the site installation staff and to SDC services representative prior to any work commencing;

3) The contractor is to ensure all staff are trained by the Manufacturer's certified trainer. (Sales representatives are not deemed suitable for this on-site training); SDC require documentary evidence from the contractor identifying staff and training completed.

4) All grooved components (couplings, fittings, valves, gaskets, bolts and nuts) must be of one manufacturer (no mixing of fittings and couplings) per installation, (rolling equipment may be of different manufacture, but must be approved by the coupling manufacturer and SDC.

5) The contractor to submit ITP with nominated hold points for inspection of system. These will include for the contractor to arrange for the supplier/manufacturer to attend site with SDC services representative to witness metal thickness measurements of roll grooved joints

   a) Hold points will be: Prior to work commencing and quarterly inspections during the project (inspection hold points may be increased in frequency should roll grooving standards are found to be non-compliant with the manufacturers specifications).

2.6.2 DETAILED INSTRUCTIONS AND INSPECTIONS:

2.6.2.1 ROLL GROOVING INSPECTION

1) The Design & Construct contractor is to specify the proprietary grooved components including nomination of the relevant standards, and manufacturer's requirements and details, for approval by SDC.

2) Roll grooves and associated couplings, and fittings must be selected from a single manufacturer. The manufacturer's installation manual is to be on site at all times. A copy of this is to be submitted to SDC prior to any works commencing on site.

3) Roll grooves and associated couplings, fittings and approved rolling equipment are to be specified and installed in compliance with the proprietary system manufacturer's installation manua, (i.e. Victaulic l-100 or equivalent).

4) Where required by SDC the coupling manufacturer's certified trainer is to provide onsite training for all staff nominated by the contractors.

5) Hand (lever type) roll groove equipment (equal to or similar to Ridgid 960) is not to be used.

6) Ends must be clean and free from indentations, projections (welds) and roll marks in the area from pipe end.

7) All castings used for coupling housings, fittings, valve bodies, etc. shall be batch stamped for quality assurance and traceability.

8) Inspections are to be undertaken to confirm dimensional tolerance and uniformity of the zinc coating on the couplings.

9) All regular checking is to be undertaken by a suitably qualified person nominated by the contractor and/or the manufacturer's authorised representative.

2.6.2.2 COUPLING INSPECTION

1) Galvanising is to conform with AS/NZS 4680

   a) In particular Clause 7: Appearance and Free from Defects: The galvanized coating shall be continuous and as smooth and evenly distributed as possible and shall be free of defects that may affect the stated use of the article. The coating shall be free of blister, i.e. raised areas separated from the solid metal, roughness, sharp points, and flux residues. Lumps and zinc ash are not permitted where they affect the intended end use of the galvanized product.

   b) Example: Internal surfaces at the 'key' section are to be free of build-up of coatings and are to have a uniform surface to provide 100% surface contact with the roll groove. Excessive galvanising (zinc) that reduces the 'key' contact and face contact of the bolt pad faces is to be rejected.

2) Coatings to couplings (Galvanizing and other finishes such as paint) are not to be greater than 0.25mm in thickness.

3) Couplings are to have the manufacturers name as part of the casting to ensure traceability in future.

4) Batch coding is be stamped on the inside face of both halves of the coupling to ensure traceability in future. Note that style or model number only is insufficient information and is to be rejected.

2.6.2.3 RUBBER GASKET INSPECTION

1) Follow ALL detailed instructions contained within manufacturer's manuals (ie Victaulic I-100 or equivalent.
2) Gaskets are to be delivered as part of the coupling assembly and not as a separate stock item.
3) Visually inspect the gasket for any imperfections or damage prior to installation.
4) Gaskets are to be pre-lubricated by the manufacturer.
5) Supplementary lubrication may be required however excessive lubrication may result in joint failure (refer manufacturers' installation guide lines).

2.6.2.4 TIGHTENING OF COUPLINGS

1) Follow ALL detailed instructions contained within manufacturer's manuals (ie Victaulic I-100 or equivalent.
2) Tighten the nuts evenly by alternating sides until metal-to-metal contact occurs at the angled bolt pads. Make sure the housings' keys engage the grooves completely and the offsets are equal at the bolt pads. To ensure a rigid joint, equal and positive offsets are preferred.

3 TRADE WASTE & SANITARY PLUMBING AND DRAINAGE SYSTEMS

3.1 GENERAL

Purpose: Collect and discharge efficiently and reliably trade waste, sanitary waste and effluent from fixtures, stacks and appliances.

All provisions to tenancies are to be in accordance with the Lessor Tenancy Services and Provisions Schedule.

General standards: Comply with AS 3500.2 Sanitary plumbing and drainage and Local Authorities requirements.

3.2 PROVISION OF SANITARY PLUMBING AND DRAINAGE

1) Non-leased areas: Provide plumbing, drainage, fixtures and tapware for the following:
   a) Public toilets/rest rooms, parents' rooms, customer care rooms, changing rooms, etc.;
   b) Cleaner's rooms;
   c) Drinking fountains;
   d) Water features;
   e) Centre management facilities such as office, lunchroom, centre management workshop, etc.;
   f) All Mechanical services plant rooms and the like for chillers, cooling towers, boilers and air handling units;
   g) Roof-mounted air conditioning equipment; and
   h) Switch rooms, Data rooms and Edge Termination Point rooms with A/C condensates.
2) Specialty shops (except food shops and mini majors): Provide a 50 mm Ø (except where located on grade provide a 100mm Ø), capped sanitary plumbing connection point for each shop. Locate the connection point at rear of shop below the cold water supply point.
3) Mini Majors: Provide a 100 mm Ø capped sanitary plumbing connection point. Locate the connection point at rear of shop below the cold water supply point or as nominated in the tenant's specification and/or lessor-lessee scope of works.
4) Restaurants with amenities: Provide a 100 mm Ø capped sanitary plumbing connection point for each shop. Locate the connection point at rear of shop below the cold water supply point.
5) Provide a tundish with a waterless trap for shops that are provided with additional Fan Coil Units to collect A/C condensates.

3.3 PROVISION OF TRADE WASTE PLUMBING AND DRAINAGE

1) Non-leased areas: Provide trade waste floor drain with basket trap for the following:
   a) Loading docks;
   b) Wet compactors; and
   c) Other polluted areas.
2) Food shops: Unless otherwise specified, provide the following:
   a) Food shops in Food Court and Fresh Food Market: Provide a 75 mm Ø (except where located on grade provide a 110mm Ø), capped trade waste connection point for each tenant. Locate the connection point inside the premises at floor level at the rear of the shop below the cold water supply point.
   b) Food kiosks: Provide a 75 mm Ø (except where located on grade provide a 110mm Ø), capped trade waste connection point for each tenant. Locate the connection point inside the premises at floor level within the allocated kiosk zone.

c) Restaurants: Provide a 110 mm Ø capped trade waste connection point for each tenant. Locate the connection point inside the premises at floor level at the rear of the shop below the cold-water supply point.

3.4 PROVISION FOR MAJOR STORES (INCLUDING CINEMAS)

1) If hydraulic services fitout of the major store is excluded from this Contract, provide;
   a) A capped sanitary drainage connection point sized to suit fixture rating for connection by the tenant;
   b) For major store having cooking and catering facilities, a capped trade waste drainage connection point sized to suit fixture rating for connection by the tenant; and
   c) Terminate the drainage connections at floor level at the location shown on the Drawings, or specified by the tenant.
2) If the hydraulic service fitout of the major store forms part of this Contract, provide trade waste, sanitary plumbing and drainage fitout in compliance with the tenant's specification.

3.5 SYSTEM DESIGN - GENERAL

1) Point of connection: Connect drain into the authority's sewer / existing sewer at the location(s) shown on the Drawings.
2) Gravity feed drainage systems: Sanitary plumbing above the invert level of the authority sewer shall be connected to gravity feed drainage systems.
3) Pumped system: Only allowed where gravity feed drainage is not possible, provide pumped system comprising wet well and pump station, in accordance with local authority requirements.
4) Fixture unit ratings: Where fixture layout is shown on the Drawings: Design the system in accordance with the following:
   a) General: In accordance with AS 3500.2.
   b) Special equipment: To manufacturer's specification.
   c) Where fixture layout is not shown on the Drawings: Design the system in accordance with the following unit ratings:

Area	Unit Rating	
	Sanitary Plumbing	Trade Waste plumbing
Specialty shop - general	3	-
Specialty shop - Food market	-	10
Specialty shop - Food Court	-	12
Kiosks – all	-	10
Restaurant.	30	25
Mini major store	20	-
Department Discount Store (DDS)	60	-
DDS with cafeteria	60	10
Supermarket	58	52
Department store	160	30
Cinemas, 8-auditoriums	160	25

Table 4: Fixture unit ratings

5) Pipe sizing:
   a) General: Size pipes in accordance with AS 2200 and AS 3500.2.
   b) Pipe laid in ground: Minimum size 100 mm Ø.

3.6 ON SITE PRE-TREATMENT

1) Location: provide onsite pre-treatment system within suitable distance of trade waste generating area. (Note: In addition to estimated load the size of the system will allow for an additional 25% spare capacity (for all components) for future connection.)
2) Design and install the following as required for the installation of the onsite pre-treatment system:
   a) Provision and connection of 150mm diameter trade waste drainage line to DAF units.
   b) All penetrations, block-outs and access points required in walls and floors and described on the specialist contractor's drawings.
   c) Construction of floor sump(s) to plant room.
   d) Connection and installation of sludge suction discharge line to the proposed tanker station. (Specialist contractor to install tanker "Kamlok" coupling and remote panel.)
   e) Connection and installation of waste transfer discharge pipe(s) from transfer pump valves manifold to sanitary drainage discharge point within building as indicated on the drawings. Liaise with SCM waste contractor to determine final pipe sizes, coupling sizes and requirements for transfer pump arrangements.
   f) Electrical supply the Main Control Panel and Sludge tanker control station panel from nearest available House DB with emergency generator back-up.
   g) Electrical conduit between the above panels (control wiring provided by the specialist contractor).
   h) All communications cabling from the Hydraulics control panel to the BMS controller by the BMS contractor.
   i) System:
      i) Supply a fully assembled Dissolved Air Flotation (DAF) unit/s of suitable volume to treat the estimate volume of trade waste discharge. The system is to be a prefabricated skid mounted unit complete with a dissolved air recycle unit, air compressors, screening and control panel. Refer to technical equipment schedule for DAF unit.
      ii) Supply a free standing sludge tank with mechanical mixer, mounting supports, level sensor and sludge transfer pump(only required if local pump out not available). Refer to technical schedule for specification of sludge transfer pump.
      iii) Where DAF effluent outlet is unable to connect to the gravity drainage system supply and install a treated water transfer tank/pump well complete with three (3) off discharge pumps (duty, follow-on and standby/follow-on) including level all level controls for pump operation and alarms, all isolation and check valves. Refer to technical schedule for specification of treated water transfer pump.
      iv) Main control panel and all associated instrumentation.
      v) Sludge tanker station control panel. Only required if pump out remote from sludge tank location).
      vi) All necessary automatic and manual valving.
      vii) Inlet flow switch and outlet flow meter (to authorities' requirements).
      viii) Interconnecting pipework and electrical wiring as required.
      ix) Provision of maintenance wash down: hot water hose reel with RPZD, including control cabling from hot water units to main control panel.
      x) Access platforms to equipment, grated covers.

xi) All metering, alarm and system interface provision at Main Control Panel.

3.7 TRADE WASTE ARRESTORS

1) Location: Where practical, avoid locating trade waste arrestor inside the building. If it could not be avoided locate grease arrestors in the dedicated mechanically ventilated plant room.
2) Size: Size trade waste arrestor according to the authority's trade waste sizing guide. In addition to the calculated volume allow for 25% spare capacity in the arrestor, for shared arrestors only, for future connection.
3) Multiple units: Where the capacity of the arrestor is restricted, multiple units in parallel are acceptable.
4) Suction line: For trade waste arrestor that is inaccessible for servicing, provide an 80 mm (minimum) suction line complete with lockable cap and chain. Maximum suction lift 6 m, maximum length 50 m.
5) Registration of trade waste system: Prepare documentation for centre management's authorisation for submission to the authority for both or either above systems as required.
6) Internal finish: Ensure all concrete trade waste pits (insitu and precast) are supplied with or have an applied epoxy finish or sealant appropriate for intended use. Finish must comply with local authority requirements. Where existing trade waste arrestors are to be re-used the internal condition is to be provided as part of the dilapidation report and refurbishment of pit to be included.
7) Sizing of grease arrestors: Sizing of grease arrestors shall be in accordance with local authority requirements. Individual tenant loadings, in litres, shall be as per tenant specifications and in accordance with local authority requirements where fixtures can be allocated. Prior to the above information being available the following general allowances in grease arrestor allocation for each tenant shall be used as the basis for design:

Tenant	Total in litres
Food Market/Food Court	1,000
Food Specialty	1,500
Food Preparation rooms	1,000
Kiosks (*Note for NSW/ACT increase to 1,000 litres)	500*
Restaurant (excluding large Yum Cha type)	2,000
Supermarket (dedicated to tenant)	5,000
Department Store with Cafe	2,000
Cinemas, 8-Auditoriums	3,000
Others (Loading dock: garbage wash down, wet waste compactor, etc.)	1,000

Table 5: Grease arrestor allocation

8) Construction:
   a) General: Comply with Authority's requirements and approved products and fittings.
   b) Cover:
      i) Arrestor located in a mechanically ventilated room: Provide easy lift sectional fully serrated, galvanised mild steel grate covers.
      ii) Arrestor located outdoor: Provide gas tight lid, Class D to AS 3996.
      iii) Platform and stair: For arrestor greater than 1000 mm above finished floor level, provide fully serrated, hot dip galvanised mild steel grated access platform complete with safety rails, and stair with non-slip nosing. Access platform is to be 900 mm below top of arrestor.
   c) Installation: To manufacturer's recommendation or specification and local authority regulations.

3.8 WET WELL AND PUMP STATION

1) Location: Provide wet wells and pump stations to all areas where a gravity drainage in not feasible. Provide an agitation circuit if required by the Authority.
2) Configuration: surface-mounted transfer pumps shall be used where possible. Submersible can be used as an alternative due to spatial restrictions. Locate wet wells and pumps in the mechanically ventilated plat rooms, where practical consolidate locations with the grease arrestors and/or DAF rooms.
3) Sewage pump flow: 2 L/s pump flow or to authority's requirement for both duty and standby pump. Where flows are required to be in excess of 2 L/s obtain the necessary authority approval for the calculated discharge.
4) Wet wells:
   a) Housed in a room provided with mechanical ventilation.
   b) Construction: Reinforced fibreglass / Pre-cast reinforced concrete / In situ reinforced concrete well.
   c) Provided with access cover and lifting mechanism for removal of basket and access to the well;
   d) Provide level control as per clause 8.5.1(7). Protect level control devices from the objects in the well.
   e) Capacity: Capacity of wet well shall be sized to provide the following:
      i) Initial storage: The volume of total inflow less pump rate (2 L/s) for one day.
   f) Spare capacity: 80% of the total inflow.
   g) Suitable for dual pump installation (if submersible pumps selected) complete with lifting guide rail, access ladder and control and alarm float/level indicators.
   h) Provide separate valve pit for check valves, isolation valves and emergency suction connection.
   i) Pump's control panel to be provided with IP rating and be compatible with Centre's BMS system.
5) Total inflow: Calculate total inflow base on the following:

Area	Inflow
Supermarkets	3,700 L/day each
Department Stores/DDS	6,300 L/day each
Mini Majors	350 L/day each
Cinemas	6,300 L/day
All food tenants (incl. Kiosks)	1,300 L/day
Restaurant	2,200 L/day each
Amenities Blocks	1,040 L/day per block
Misc Allowance (car wash, cleaners, EOT, dock washdown, etc.)	Contractor to calculate
Future Connection Allowance	25% of total inflow from above calculation

Table 6: Inflow calculation

6) Rising main:
   a) Standard: To AS 3500.2.
   b) Material: Pressure class UPVC or HDPE.
   c) Check valves: Provide non-clog ball-check valve to all submersible pump rising mains. Ball-check valve to operate in horizontal, vertical or inverted position.
   d) Check valves and isolation valves to be located in separate pit adjacent the wet well and include suction diversion connection where required by the local authority.

3.8.1 GRINDER

1) Provide a heavy-duty grinder of 150 mm ∅ inlet minimum, complete with isolation valves and automatic by-pass.
2) The grinder shall be electronically controlled to prevent large solids from jamming the machine. The unit shall sense an overload condition and momentarily reverses the cutlets to clear the condition and return to normal operation. After 3 tries of reverse rotation, if the grinder is still jammed, generate system failure alarm for remote monitoring by the BMS.

3.8.2 TRANSFER PUMPS

1) General: Provide the following electric driven pumps, complete with non-return valve and isolation valves:
   a) One duty pump; and
   b) One standby pump.
2) Control: Provide a microprocessor based control system for the following control functions:
   a) Submersible pumps:
      i) The grinder shall be timer controlled for out of hour shutdown.
      ii) When the grinder is in system failure alarm, the by-pass valve shall open automatically.
      iii) When the duty transfer pump fails, stop the duty pump and start the standby transfer pump, and generate system failure alarm.
      iv) When the high level is reached, start the standby pump and generate alarm.
      v) When the flooding level is reached, generate flooding alarm.
      vi) When level control calls for pump to stop, stop the pump.
   b) Surface-mounted pump configuration:
      i) When level control calls for duty pump to start, start the associated grinder first, then start the duty transfer pump after 5s time-delay.
      ii) If the grinder is jammed, automatically reverse the rotation of the grinder.
      iii) When the duty transfer pump fails, stop the duty pump and start the standby transfer pump, and generate system failure alarm.
      iv) When the high level is reached, start the standby pump and generate high level alarm.
      v) When the flooding level is reached, generate flooding alarm.
      vi) When level control calls for pump to stop, stop the pump and the associated grinder.
      vii) Alternate the duty pump and the standby pump after each pumping cycle.
3) Provide a control panel complete with select switch/button, audible and visual indication.
4) Interface with BMS: Provide high level interface with BMS at the control panel for remote status and alarm indication. Ensure all items are nominated and detailed in the BMS Point Schedules.
5) Power supply: Provide a control panel for all electrical equipment and all local wiring from the control panel. Power supply to the control panel will be provided by the electrical services contractor.

3.9 SANITARY FIXTURES, TAPWARE & CAST INSITU ELEMENTS

1) Provide:
   a) Sanitary fittings and fixtures within designated areas for the benefit of a hygienic environment; and
   b) Tapware for sanitary fittings, fixture and appliance to control cold and hot use.
2) Manufacture and model: Provide sanitary fixtures and tapware in accordance with the architectural schedule.
3) Water efficiency: All fittings and fixtures shall be water efficient as specified and documented in the architects schedules with appropriate maximum WELS ratings.
4) Finish: White unless otherwise specified.
5) All sanitary fixtures and tapware are to be in accordance with the Scentre Group standard amenities schedules. The Contractor must ensure that all specified fittings are “fit for purpose” and provide a completed schedule for Scentre Group approval that demonstrates compliance with the Scentre Group specified fittings as part of the developed design process.
6) The Contractor is to submit all sanitary drainage items that are to be cast in concrete structures to SDC prior to construction in a timely manner such that detailed co-ordination with concrete profile drawings and formwork requirements can be established in incorporated. The Contractor is responsible for the correct installation of all cast in drainage items such as floor wastes and stainless steel floor channels and grates.
7) Installation:
   a) Standard: To AS 3500.2.
   b) Silicone sealant: Provide approved non-shrink white silicone sealant to all fixtures where they abut walls and bench tops.

3.10 MECHANICAL SERVICES CONNECTIONS

The drainage connection to all mechanical services plant in any locations (including within tenancies) is to be provided by the Hydraulics Contractor. This will include the supply and installation of all tundishes to the point as required by the Mechanical Contractor.

3.11 PIPEWORK

1) Sanitary pipes and fittings: Select from the following:
   a) Above ground installation:
      i) Unplasticised polyvinyl chloride (UPVC) pipe and fittings to AS/NZS 1260 with solvent weld joints (waste temperature less than 50°C).
      ii) High density polyethylene (HDPE) pipe with electrofusion welded joints and fittings to AS/NZS 4401.
      iii) Copper pipe AS 1432 or AS 3501 with silver brazing alloy joints.
      iv) Copper alloy pipes to AS 3795 with silver brazing alloy joints.
      v) Copper and copper alloy fittings to AS 3688, AS 1589 and AS 3517.
      vi) Polypropylene (PP) pipe to AS/NZS 5065 with rubber ring joints.
   b) Below ground installation:
      i) Unplasticised polyvinyl chloride (UPVC) pipe and fittings to AS/NZS 1260 with solvent weld joints (waste temperature less than 50°C).
      ii) High density polyethylene (HDPE) pipe with electrofusion welded joints and fitting to AS/NZS 4401.
      iii) Polypropylene (PP) pipe to AS/NZS 5065 with rubber ring joints.

2) Trade waste pipes and fittings:
   a) Select from the following:
      i) High density polyethylene (HDPE) pipe with electrofusion welded joints and fittings to AS/NZS 4401.
      ii) Stainless steel pipe and fitting Grade 304 to ASTM A270, with rubber ring joints.
      iii) Polypropylene (PP) pipe to AS/NZS 5065 with rubber ring joints.
3) Finishes: Finish exposed piping, including fittings and supports, as follows:
      i) In internal locations such as toilet and kitchen areas: Chrome plated copper piping to AS 1192 service condition 2, bright.
      ii) Externally: Paint.
      iii) In concealed but accessible spaces (including cupboards and non-habitable enclosed spaces): Leave copper and plastic unpainted except for identification marking.
4) Bucket trap: Provide approved bucket trap with a stainless steel strainer, or sediment bucket fitted with stainless steel cable fixed to body of trap, grate and secondary strainer.
5) Plant rooms:
      i) General: Provide a floor waste gully in plant room for collection of sanitary drainage from mechanical equipment.
      ii) AHU room: Provide a minimum of 80 mm water seal in the floor waste gully.
      iii) Cooling tower compound: Provide a sump with upstand bund to collect cooling tower discharge.

4 STORMWATER PLUMBING AND DRAINAGE SYSTEM

4.1 GENERAL

a) Purpose: To collect and discharge efficiently and reliably surface and subsoil stormwater for the whole building and to recycle stormwater for other usage as documented.

b) General standards: Comply with AS/NZS 3500.3: Stormwater Drainage.

4.2 SYSTEM DESIGN

Design the system in accordance with the following:

1) Annual Exceedance Probability (AEP): To the requirement of the authority; otherwise, 1 in 500 years recurrence interval.
2) Rainfall intensity: The local rain fall intensity to be established from Australian Standards
3) Discharge:
   a) General: Connect stormwater drainage system to the external network or the detention storage on site and then to the external network or the existing stormwater drainage system as required
   b) Hydraulic grade line: Carry out hydraulic grade line analysis. Design hydraulic grade level of each pit to be 150 mm below the top of grate or cover.
4) On-Site Stormwater Detention (OSD)
   a) Provide OSD to authority's requirements / in accordance with the Civil Engineer's technical report.

4.3 ROOF DRAINAGE

Provide roof drainage for:

1) Metal roof;
2) Concrete roof including under gutters;
3) Canopies and overhangs; and
4) Roof of plant room, fire stair, light well and lift machine room.

4.4 UNDER GUTTERS

Provide drainage and under gutters at concrete deck roof levels to:

1) All structural expansion joints, under slabs, column capitals and around columns.
2) Any structural joints exposed to weather.
3) Joints between existing and new structures.
4) Materials: Under Gutters are to be stainless steel.
5) Design and installation:
   a) Minimum size 300mm Wide x 50mm Deep.
   b) Minimum fall 1:200.
   c) Minimum outlet size to be 50mm.
   d) Outlet to drain independently to stormwater drainage or downpipe system.
   e) A low flow reflux valve shall be installed to avoid surcharge issues.
   f) Under gutter shall have fixings that help promote non destructive access for maintenance.

4.5 BOX GUTTERS

1) General: The Contractor shall calculate and provide design information to the Architect on the required size of the box gutters (constructed by others).
2) Minimum size: 600 mm x 200 mm.
3) Water depth: Based on overflow conditions, water depth shall not exceed 100 mm.
4) Box gutter under construction joints: Provide box gutter and downpipe connection under construction joints (e.g. expansion joint) in concrete roof directly above retail area.
5) All expansion joints to be running expansion joints.
6) Information: The Contractor must provide the Project Manager all information required for the design and construction of box gutter, valley gutter and eaves gutter, including but not limited to the following:
    a) Location of box gutters.
    b) Size of box gutters.
    c) Gradient of box butters.
    d) Location and size of sumps. Size in accordance with AS 3500.3.
    e) Location and size of downpipe connections.
    f) Location and size of overflows.
    g) Location of gutter's high points.
    h) Location and design of hail guards.

4.6 DOWNPIPES

1) General:
    a) Size pipes in accordance with AS 2200 and AS 3500.3.
    b) Velocity: Minimum of 0.6 m/s, maximum of 6 m/s.
    c) Minimum in-ground pipe size: 100 mm Ø.
    d) Connection: Vertically connected to a sump in box gutter via 2 x 45 bends.
2) Downpipes from Entries, Plant Rooms or other such roof areas that are above a car park or public area are to be plumbed into the main stormwater system in ground (or under slab) and are not to openly discharge, unless detailed otherwise by SDC.

4.7 OVERFLOW

1) General:
    a) Provide overflow in accordance with AS 3500.3.
    b) All Overflows must discharge to atmosphere, discharge locations to be coordinated with Architectural and Facilities teams and surveyor.
2) Box gutter overflow:
    a) Overflow pipework/duct/channel through external wall.
    b) Vertical pipe overflow, where box gutters located above retail areas.
3) Concrete roof overflow:
    a) Overflow outlets located at the high points of the catchment area.
4) Provide suitable cover to overflow as required by the Architect for aesthetic purposes.

4.8 SUMPS AND DRAINAGE CHANNELS

The Contractor is to provide all sumps, sump protectors and drainage channels (excluding formed concrete channels) for all stormwater systems for all areas including but not limited to:

1) Box Gutter Sumps.
2) Rainwater outlets (car park) including siphonic outlets.
3) Rainwater sumps for small roof areas
4) Drainage channels to car park (including basement) ramps and external entries. All channels in pedestrian areas to be provided with a class D heel guard grate (maximum 5 mm drainage slot opening). Drainage channels to be provided where required to prevent flow down ramps, this may require channels at the top and bottom of ramps.

The Contractor is to submit all drainage items that are to be cast in concrete structures to SDC prior to construction in a timely manner such that detailed co-ordination with concrete profile drawings and formwork requirements can be established in incorporated. The Contractor is responsible for the correct installation of all cast in drainage items.

4.9 SIPHONIC SYSTEM

1) Pipe and fittings: High density polyethylene (HDPE) pipe and fitting to AS/NZS 4401.
2) Pipe support: Support system shall be capable of handling the thrusting force and preventing pipe movement. Typical support system comprises steel rail and bracket supported by steel rods.
3) Normal outlet and overflow outlet:
    a) Box gutter:
        i) Construction: Constructed with stainless steel body and baffle. Provide stainless steel removable debris guard/upstand shroud.
        ii) Fixing: Pop riveted to box gutter with a continuous silicon bead between surfaces.
        iii) Connection to drain pipe: With HDPE threaded connector.
    b) On concrete slab:
        i) Construction: Constructed with stainless steel body and baffle. Provide stainless steel removable grate.
        ii) Fixing: Fix to concrete slab with stainless steel lugs tied off to concrete reo.
        iii) Membrane: maintain the integrity of membrane.
4) Design program: Siphonic drainage system shall be designed by the Contractor or their Consultant using an accredited CAD or Revit programs. Contractor is to nominate supplier and program intended within the return brief for approval by SDC.
5) Overflow: Provide overflow system of matching capacity to the drainage system with a combination of:
    a) Side overflow;
    b) Internal gravity overflow system; and/or
    c) A secondary siphonic drainage system.

4.10 SURFACE DRAINAGE

On-grade surface drainage will be provided:

1) To Loading dock areas not under cover subject wind driven rain.
2) Building set back and area subject to wind driven rain.
3) Other Areas as may be indicated on the drawings.

4.11 SUBSOIL DRAINAGE

1) Material: Unplasticised polyvinyl chloride (UPVC) pipe and fittings to AS/NZS 1260 with solvent weld joints (waste temperature less than 50°C).
2) Trench width: Minimum 450 mm.
3) Geotextile filter: To AS 3500.3.
4) Pipe: Minimum 100mm perforated plastic pipes to AS 2439.1.
5) Fill: Material excavated.
6) Embedment: Gravel.
7) Pipe depth: Provide the following minimum clear depths, measured to the crown of the pipe:
   a) 100 mm below formation level of the pavement, kerb or channel.
   b) 100 mm below the average gradient of the bottom of footings.
   c) 450 mm below the finished surface of unpaved ground.
8) Provide subsoil drainage for the following areas:
   a) Behind retaining walls.
   b) Around the base of vertical transportation pits.
   c) Under pavement.
   d) Type: Type Minimum to AS 3500.3.

4.12 DRAINAGE FOR FIRE PROTECTION SERVICES EQUIPMENT

Provide drainage for the following fire protection equipment:

1) Sprinkler pump test drain.
2) Sprinkler storage tank overflow.
3) Sprinkler valve test drain. (Note: co-ordinate with fire sprinkler contractor for remote test drain requirements)
4) Sprinkler flow switch drain.
5) Hydrant storage tank overflow.
6) Hydrant pump test drain.

4.13 DRAINAGE OF PLANTER BOX

1) General: Collect all runoff from internal and roof planter boxes.
2) Connection to downpipe. Provide reflux valve and then connect at 45° with the flow. Minimum pipe size 50 mm Ø.
3) Arrestor (oil or silt or both) to treat stormwater prior to discharging into the stormwater drainage network.

4.14 STORMWATER INGROUND PIT

1) Material: Precast concrete, unless detailed /specified otherwise by SDC.
2) Construction: To AS 3500.3. Provide bolt down cover or grate to pits.

4.15 STORMWATER ARRESTOR

1) General: Provide stormwater arrestor to remove contamination, generally silt, oil, or both from stormwater prior to discharge to the stormwater drainage network.
2) Material: Precast concrete.
3) Construction: To AS 3500.3

4.16 PUMPED SYSTEM

1) General: Provide a pumped stormwater drainage system consisting of a wet well to which stormwater or subsoil drainage discharge is gravitated, and from which it is removed by automatically operated pumps. Provide necessary piping, valves, rising main, electric wiring, alarms and control panel.
2) Wet well:
    a) Standard: To AS 3500.3
    b) Location: Locate wet wells and pump stations as required and in coordination with the Project Manager.
    c) With submersible or surface-mounted transfer pumps as required.
    d) Construction: precast reinforced concrete or in situ reinforced concrete
    e) Wet well size: the capacity of the wet well shall be sized:
        i) In accordance with AS 3500.3 and local Authorities requirements.
        ii) Adequate to house and operate pumps and associated equipment.
        iii) Adequate for 1 day storage for subsoil drainage.
3) Pumps: Provide submersible or surface-mounted transfer pump in duplicate.
4) Control:
    a) Control panel: Provide a control panel complete with selector switch, indicating lights of pump status, audible and visual alarm indication (high-level and low-level) in accordance with AS 3500.3.
    b) Interface with BMS: Provide high level interface with BMS at the control panel for remote status and alarm indication. Ensure all items are nominated and detailed in the BMS Point Schedules.

4.17 STORMWATER HARVESTING

1) General: Provide a rainwater harvesting system to collect rainwater from roof areas (excluding car park areas) for re-use. The system shall comprise of storage tank, filtration, bacterial treatment, delivery pump, automatic control and mains water top up / change over supply. Provide all piping, valves, controls, electrical connections, etc. for a complete and working system.
2) Feed water analysis: Conduct water quality analysis and use information from the analysis to design the filtration and treatment system for the desired outcome.
3) Recycled water quality: The recycled water shall meet the water quality standards appropriate for the specified application and in compliance with the Statutory Requirements. Reference: Australian Guidelines for Water Recycling: Stormwater Harvesting and Reuse by National Environmental Protection Council (NEPC).
4) Storage tanks: Provide separate storage tanks for harvested stormwater and cooling tower bleed-off.
    a) General: Comply with ATS 5200.026 (Technical specification for Plumbing and Drainage Product – Cold Water Storage Tanks).

b) Above ground tank:

i) Polyethylene tank to AS/NZS 4766.

ii) Galvanised steel tank to ATS 5200.026 (Technical specification for Plumbing and Drainage Product – Cold Water Storage Tanks).

c) Underground tank: Polyethylene, Precast or in-situ concrete tank with gas tight covers. Underground tanks shall be bedded and backfilled to manufacturer's specification.

d) Accessories: Provide all inlets, outlets, drains, overflows, valves, access covers, access ladders, etc.

e) Overflow and drain: Connect storage tank's overflow and drain to stormwater drainage.

5) Design validation: Validate the design by an independent expert, based on verifiable, traceable information and standards (e.g. US EPA 2006).

6) Filtration and treatment: Provide the following:

a) First flush device: Provide a first flush device appropriately sized to match rainwater catchment area to capture initial run off containing debris and silt. Use storage tank manufacturers recommended device where applicable.

b) A biofilter to reduce phosphorous and iron concentration if necessary.

c) A filter before the UV disinfection unit to reduce turbidity.

d) An ultraviolet (UV) disinfection unit: Comply with the requirements of NSF/ANSI 55-2004. The selected unit shall have automatic lamp cleaning mechanism, and UV lamps shall be removable without contact with liquid of the system.

7) Pumping system for applications:

a) General: Provide an automatic pressurised pumping system(s) to supply recycled water to the specified applications.

b) Mains change over: Provide an automatic changeover from recycled water supply to mains water supply when recycled water drops to low level, or when the pumping system fails. Supply and install float switch assembly in the recycled water storage tank to control the pumping system. Provide backflow prevention to authority's requirements. The change over valve to be monitored by Centre's BMS.

c) Provide a water meter to record the amount of recycled water supplied by the system.

8) Automatic control: Provide a microprocessor based automatic control system, which shall perform the following functions:

a) Water level switches for:

i) High and low water level indicators.

ii) Automatic control of the delivery pump(s).

iii) Automatic mains change over.

b) Control and monitoring of delivery pumps:

i) When water level in the storage tank reaches the low level limit, stop the delivery pump.

ii) Generate alarm upon pump failure. Use magnetic flow sensor to provide positive indication of pump running.

c) Mains change over: Change over from the recycled water to town main supply with control valves when:

i) Water level in the storage tank reaches the low limit.

ii) When the delivery pump fails.

d) UV disinfection unit monitoring: Monitor the photo intensity of the unit, and generate alarm when the UV intensity drops below the designed level.

e) Control panel: Provide a control panel complete with selector switch, indicating lights of equipment status, audible and visual alarm indication in accordance with AS 3500.3.

f) Interface with BMS: Provide high level interface with BMS at the control panel for remote status and alarm indication. Ensure all items are nominated and detailed in the BMS Point Schedules. Control panel to be IP rated.

9) Authority's approval: In compliance with the Statutory Requirements:

a) Obtain authority's approval on the design, installation and operation of the stormwater harvesting system; and

b) Log application and register the stormwater harvesting.

10) Commissioning: To prove the system is operating as designed, carry out commissioning, validation and verification in accordance with the Australian Guidelines for Water Recycling: Stormwater Harvesting and Reuse by National Environmental Protection Council (NEPC).

4.18 PIPEWORK AND FITTINGS

1) Stormwater pipes and fittings - Non-pressure: Select from the following:

a) Unplasticised polyvinyl chloride (UPVC) pipe and fittings to AS/NZS 1260 with solvent weld joints (waste temperature less than 50°C).

b) Fibre reinforced cement (FRC) pipes and fitting to AS 4139 bitumen coated with rubber ring joints.

c) High density polyethylene (HDPE) pipe and fitting to AS/NZS 4401.

d) Precast concrete pipe (steel reinforced) pipes and fittings to AS 4058/NZS 3107 with rubber ring joints, of class to suit imposed load.

2) Stormwater pipes and fittings - Pressure: Select from the following:

a) High density polyethylene (HDPE) pipe and fitting to AS/NZS 4401.

3) Downpipe: Select from the following:

a) Encased in column: High density polyethylene (HDPE) pipe and fitting to AS/NZS 4401; Maximum size 160 mm ∅. Tie to structural steel every 1m. Fill with water before concrete pour. Drain water when formwork is stripped.

b) Exposed:

i) Unplasticised polyvinyl chloride (UPVC) pipe and fittings to AS/NZS 1260 with solvent weld joints (waste temperature less than 50°C).

ii) High density polyethylene (HDPE) pipe and fitting to AS/NZS 4401.

iii) Fibre reinforced cement (FRC) pipe and fitting to AS 4139 bitumen coated with rubber ring joints, supported in accordance with Unistrut pipe support and bracing methods for FRC.

c) Connection to box gutter: Vertically to the base of sump.

4) Planter drain pipe: Select from the following:

a) Unplasticised polyvinyl chloride (UPVC) pipe and fittings to AS/NZS 1260 with solvent weld joints (waste temperature less than 50°C).

5) Normal outlets and overflow outlet:

a) On concrete slab: Cast iron roof outlets with rubber ring, mechanical or push fit joints to suit and fitted with heavy duty flat grate.

b) Fire stairs: Parapet outlets with rubber ring or push fit joints to suit with overflow duct/channel through parapet wall.

c) Colonnades: Cast iron body with rubber ring mechanical or push fit joints to suit and fitted with square heavy duty flat nickel-bronze adjustable grate.

d) Main entries: Stainless steel trough with heel-guard wedge wire grate and frame of duty suitable for expected traffic loadings.

4.19 WORKMANSHIP

1) Gutters, sumps and rainheads are to be kept free of debris during installation. On completion of the installation, all debris to be removed to prevent it entering the downpipes and stormwater drains.

2) CCTV footage of the downpipe and civil system is to be provided upon completion and issued to SDC for review and approval.

5 WATER SYSTEMS

5.1 GENERAL

Provide water supply for fire protection services, cold water system and hot water system for the building. The water system shall comprise water supply connection, meters, cold water reticulation, hot water reticulation, fittings, fixtures, plants and appliances.

All provisions to tenancies are to be in accordance with the Lessor Tenancy Services and Provisions Schedule.

In any instance where the Contractor is connecting into the existing centre's water system the Contractor is to allow for all works required, including upgrade or replacement of existing, if necessary, to achieve the required capacity / flow / pressure for the new works.

1) General standards: Comply with the following:
   a) AS/NZS 3500.1: Water Services.
   b) AS/NZS 3500.4: Heated water services.
   c) AS/NZS 2845.1: Water supply – Backflow prevention devices.
2) Certification and registration: Provide certification and registration of all air gaps and backflow prevention devices to Authorities as required.

5.2 COLD WATER SERVICES

5.2.1 WATER SUPPLY CONNECTION

1) General: Connect to the existing cold water system or to the Authority's main through a stop valve and authority's meter, including backflow prevention device where required by the authority.
2) Valve box:
   a) Provide cast iron valve box with removable covers for access to underground control valve. Cover to be marked C.W.
   b) Set beneath each box a shaft formed of 100 mm Ø UPVC pipe to give clear access to the valve wheel or spindle. Set top flush with finished surface, or 25 mm above landscaped surface, and encast in formed concrete box of 150 mm thick, with top surface trowelled smooth.
3) Water main characteristics:
   a) Obtain a written Water Pressure and Flow Statement outlining the current available water main characteristics (minimum and maximum pressure, flow rates, etc.) applicable to the requirements of the project from the local water supply authority. Update Statement throughout the timeline of the project to ensure the statement is always valid.
   b) If connecting to the existing cold water system within the building pressure and flow testing of the relevant cold water system to be carried out and results to be submitted to SDC for review and record.
   c) Use the supplied data to advise/confirm the need for pump assistance to the system or additional water volume through tank storage.
   d) Where pumps are required submit selected pump technical data including performance curves to illustrate the town main, design duty and overall system performance.
   e) Prior to completion obtain a new Water Pressure and Flow Statement should the original statement validity period have expired (i.e. normally 12 months) to confirm system compliance. In the event of differing conditions, advise the Project Manager, resubmit pump performance data and make the necessary adjustments to the system installation.

4) Water supply for fire protection services:
   a) The water supply for the automatic fire sprinkler system and fire hydrant system will be either combined or separate as identified in the scope of works.
   b) Comply with the water agency's connection requirements as appropriate.

5.2.2 WATER SUPPLY FOR AUTOMATIC FIRE SPRINKLER SYSTEM

1) Provide water supply for automatic fire sprinkler system by connecting to water supply utility's main and terminate at the control valve of storage tank or the suction manifold of sprinkler pump set in the sprinkler pump room as required. Provide booster suction and inlets in line, if required.
2) Water supply to be the appropriate grade, as required in accordance with the requirements of AS 2118.1.

5.2.3 COLD WATER SYSTEM

1) General: Provide cold water supply to all points of usage in non-leased areas and for tenants. The system shall include connection to water supply, storage tank, water pump, fittings and pipework.
2) Connection to water supply: Connect to the water supply utility's main or the existing service as required.
3) Provide master meter, in compliance with authority requirements inclusive of Automatic Meter Reading (AMR) system, where required.
4) Pumped system: Where the minimum pressure requirements for the installation cannot be met by the water supply utility's main (i.e. 150 kPa at most disadvantaged water supply point or minimum required pressure specified by tenant), provide:
   a) A booster system to pump water to an elevated storage tank, and supply cold water to outlets by gravitational means; or
   b) An automatic pressurised pumping system that supplies water to the outlets from the water main or a cold water storage tank.
   c) System pressure requirements must incorporate all requirements of the centre and also take into account any requirements as stipulated with Tenancy Specifications.
   d) Booster pump:
      i) With design flow up to 6 L/s, provide 3 identical variable speed drive pumps each selected for full design flow.
      ii) Where design flow exceeds 6 L/s, provide 3 identical variable speed drive pumps each selected for half design flow. The stand-by duty pumps to cut in when the flow reaches 70% of the duty pump design flow.
   e) Pump control:
      i) Booster systems: Storage tank level control.
      ii) Pressurised pumping systems: Pressure switches.
      iii) Pump hunting and water surges: Control pump hunting and water surges with pressure tank.
5) Cold water storage tank:
   a) General: Provide a cold water storage tank to serve the building. Tank to have divisional wall for to provide 50% storage at all times for maintenance purposes.
   b) Storage: Size storage of the tank based on the design flow rate. Where tank inflow is less than the design flow rate, increase the storage accordingly. Where building restrictions occur, storage may be reduced by half (maximum) with increase in tank inflow accordingly.
   c) Design flow rate: Allow for requirements of irrigation and other services.

6) Points of usage in non-leased areas: Including but not limited to:
   a) Toilets, parents room, customer care room and similar amenities: Fixtures, hot water heaters, appliances, etc.
   b) Loading dock: Hose cock for cleaning.
   c) Cleaner room: Sink and hot water unit.
   d) DAF/Grease arrestor / treatment rooms or location and wet well pump station: Hose cock for cleaning. For DAF rooms with chemical dosing requirements allow for a Safety Shower Eye Wash unit from the potable water supply.
   e) Centre management facilities such as offices, workshops, lunch rooms, etc.: Fixtures and appliances.
   f) Irrigation systems, including Green Walls: Terminate water supply with control valve at required connection point.
   g) Water Feature plant. Terminate water supply with control valve at required connection point.
   h) Skylights: A hose tap suitably and safely located externally for maintenance washdown.
   i) Mechanical service equipment:
      i) Chiller plant room: Provide a connection point terminated with a control valve. MS contractor will connect to the chilled water circuit and heating water circuits, and a hose cock for general purpose.
      ii) Cooling tower compound: Provide a connection point terminated with a control valve. The MS contractor will connect to the cooling towers and the condenser water circuit.
      iii) Air handling unit room: A hose cock adjacent to the floor waste gully.
7) Hot water units, boiling water and chilled water units.
8) Cold water supply for tenants: Unless otherwise specified, provide the following:
   a) Specialty shops: Provide a 20 mm Ø cold water supply terminated with a control valve. Locate the control valve at high level on the inside of the rear wall.
   b) Kiosk: Provide a 20 mm Ø cold water supply terminated with a control valve adjacent the drainage point.
   c) Restaurants: Provide 32 mm Ø cold water supply terminated with a control valve. Locate the control valve at high level on the side of the rear wall.
   d) Mini majors: Provide 25 mm Ø cold water supply terminated with a control valve. Locate the control valve at high level on the inside of the rear wall.
   e) Majors including cinemas:
      i) If hydraulic service fitout of the major is excluded from this Contract, provide cold water supply terminated with a control valve at high level on the inside of the rear wall of the reserve area.
      ii) If hydraulic service fitout of the major forms part of this Contract, comply with Tenant's Specification. Provide a control valve where water pipe enters the premise, and fix the control valve at high level in a readily accessible position.
      iii) Refer to the Tenants Specifications (if applicable) and the Lessor Tenancy Services and Provisions Schedule in Appendix B of project specification, for sizing requirements.

5.2.4 NON-POTABLE WATER SUPPLY

Where applicable, connect to the following non-potable water supply:

1) Harvested rainwater: Provide recycled for the following applications:
   a) Toilet flushing.
   b) Grease arrestor rooms, AHU rooms.

c) Irrigation system. Including Green Walls.

5.2.5 HOT WATER SYSTEM

1) General: Provide heated water service to all points of usage. The system shall include water heater, fitting and pipework.
2) Points of usage in non-leased areas: Including but not limited to:
   a) Public amenities basins in ACT, SA, VIC and WA (NSW & QLD cold water only).
   b) Hand wash basins in parents' room and customer care room.
   c) A hot water tap at each loading dock (bin wash area).
   d) A sink in each cleaner room.
   e) Wash hand basins and sinks at centre management facilities.
   f) Scullery, bussing stations and wet waste rooms.
3) Water heaters: Provide mains pressure storage type electric water heaters of the following capacity:
   a) Parents room: 50 litre 3.6 kW 3-phase, in suitable location
   b) Loading dock: 50 litre 3.6 kW 3-phase, wall-mounted at high level.
   c) Cleaner room: 50 litre 3.6 kW 3-phase, wall-mounted at high level.
   d) Centre Management Office, Scullery, etc.: 50 litre 3.6 kW 3-phase, under bench or other suitable location.
   e) Amenities: 50 litre 3.6 kW 3-phase, in suitable location.
   f) Shower facilities: 315 litre 21.6KW 3 phase, or suitably sized for expected usage.
   g) Hot water circulation: Provide a flow and return circulation system with dual circulation pump as required.
   h) Power supply: Connect hot water unit to socket-outlet or direct connection.
4) Thermostatic mixing valves:
   a) General: Provide thermostatic mixing valves for heated water serve to all sanitary fixtures used for personal hygiene purpose.
   b) Outlet temperature: Outlet temperature not to exceed 36°C +/- 2°C.
   c) Completion: Provide a Thermostatic Mixing Valve – Commissioning and Maintenance Report to the requirements of the authority having jurisdiction over the installation and/or in accordance with the national code.

5.2.6 BOILING WATER AND CHILLED WATER UNIT

1) General: The unit shall consist an under sink assembly of water filtration, a water boiling tank and a chilled water tank; a water tap with operating levers. The unit shall be capable of instant supply of boiling and chilled water.
2) Provide a boiling water and chilled water unit to provide at tap instant boiling water and chilled water at:
   a) Kitchen in Centre Management office; and
   b) Parents Rooms – Chilled water unit only (assume every Amenities block).
3) Installation: To manufacturer's recommendation.

5.2.7 LOADING UNIT RATINGS

1) Where fixture layout is shown:
   a) General: To AS3500.1.
   b) Special equipment: To manufacturer's specification.

2) Where fixture layout is not shown, design the system in accordance with the following unit ratings:

Area	Loading unit rating
Specialty Shop - General	3
Specialty Shop - Food Market/Food Court	7
Kiosks – All	7
Café' And Restaurant	25
Mini Major Store	6
DDS	160
DDS With Cafeteria	175
Supermarket	100
Department Store	160
Cinemas, 8-Auditoriums	160
Special Equipment	To Manufacturer's Specification
Others	To AS3500.1

Table 7: Fixture unit ratings

3) Flow rate: For conversion of fixture unit loadings to flow rate refer to:
   a) Up to 60 fixture units: AS3500.1
   b) Above 60 fixture units: BS 6700.

4) Hot water flows for stores: Allow 30% (low loading) to 40% (high loading) of the cold water flow loadings.

5.2.8 PIPEWORK

1) Cold water pipe and fittings: Select from the following:
   a) Copper pipes and fittings Type B to AS 1432 with silver brazing alloy joints or press fittings. Provide manufacturers details if press fit crimped joint system proposed.
   b) Copper alloy pipes and fittings to AS 3795 and fitting to AS 3688.
   c) Ductile iron fittings to AS/NZS 2280 with rubber ring joints.
   d) Polypropylene (PE) pipes and fittings to AS/NZS 4130 and AS/NZS 4129 with fusion weld joints.
   e) Rehau PEX pipework with brass lead free press fittings (only for installation within amenities downstream from water meters).

   Note: All internal above ground cold water pipework to be Copper Type B unless specified otherwise.

2) Size pipes in accordance with AS 3500.1 and AS 2200.

3) Resistance coefficients for valves and fittings: To AS 2200 or as recommended by the relevant manufacturer.

4) Hot water flow and return temperature loss: Not to exceed 5°C.

5) Pipe velocities: Not to exceed 1.5 m/s for cold water supply; 1.2 m/s for hot water flow and 1 m/s for hot water return.

6) Control valve: Provide a control valve for every fixture, or tap or appliance.

7) Ring main and distribution pipework: Provide isolation valves at regular intervals so that not less than 75% of design flow can be maintained during shut down. All valves to be located at an appropriate height for accessibility and location such that they are easily maintained after installation. The Contractor is to ensure that all locations are identified Architecturally to allow for the documentation of access hatches where required. Do not locate valves within tenant demised premises.

8) Installation connected to recycled water supply:

   a) General: Provide separate pipework for installation which is connected to the recycled water supply and segregated from installation which is supplied by the town main.

   b) Toilets and urinals: Where no connection to recycled water is specified, provide separate pipework for toilets and urinals from the other fixtures in amenities with isolation valves for future connection to recycled water.

5.2.9 WATER SUBMETER

1) Cold water service:

   a) General: Provide water submeter to measure water consumption of:

      i) All tenants as nominated by the Lessor Tenancy Services and Provisions Schedule;

      ii) Each cooling tower of central refrigeration plant; and

      iii) Each amenity block.

      iv) Each loading dock wash down area.

      v) Rainwater harvesting/recycled water supply potable water inlet and at pump outlet, including submeter to each amenity block and point of irrigation

      vi) Water Feature/Pond

   b) Identification: Identify tenant water submeter with shop number. All sub meters to have identification number. All water meters are to be cross referenced and indicated on as built documents.

   c) Standard: To AS 3565.1.

   d) Interface with BMS: Water meter to have high level level interface capability with BMS (native BACnet).

   e) All meters to be smart ultrasonic meters.

   f) All water meters to be pattern approved (NMI).

2) All meters are to be located in an accessible location not higher than 1.5m from FFL to enable manual reading for validation purposes. Final meter's location to be coordinated with tenants.

3) For projects in Queensland all tenants (specialty shops, food shops and kiosks, restaurants, major stores, mini-major stores etc) and all other back of house water usage areas nominated above in section 1 a) above are required to be provided with an authority water meter. Allowance must include for all meter cupboards in common areas for meter installation throughout the centre. Cupboard arrangement and locations are to be agreed with the local water authority prior to installation.

5.2.10 BACKFLOW PREVENTION DEVICE

1) General Provide backflow prevention devices for containment in compliance with the requirements of the authority.
2) Non-leased areas: Provide backflow prevention devices for zone and individual protection (i.e. Reduced Pressure Zone Device with Hose Connection Vacuum Breakers in unison.) of the following common areas:
    a) Plant rooms and AHU rooms.
    b) Loading docks.
    c) Grease arrestor rooms.
    d) Wet well pump stations.
    e) Irrigation systems, Water Features, and all external hose cocks for irrigation system.
    f) Rainwater harvesting system
3) Tenants: To be provided by the tenant.
4) Completion: Provide a complete schedule of all devices installed outlining location, size, inspection and maintenance requirements of the approval of local authority or national code requirements. Where the backflow prevention device is required to be registered with the local authority attach a copy of each registration certificate to the schedule.

5.2.11 FITTINGS AND ACCESSORIES

1) Approvals: All fittigs and fixtures to be WaterMark approved.
2) General: Provide fittings necessary for the proper functioning of the water supply system, including taps, valves, backflow prevention devices, pressure and temperature control devices, strainers, gauges, tenancy water meters and automatic controls and alarms.
    a) Pressure control valves:
        i) General: Provide reduction valves, pressure limiting valves, or ratio valves, which produce the necessary reduction in pressure.
        ii) Standard: To ATS 5200.052.
    b) Line strainers:
        i) Type: Low resistance, Y-form bronze body type, with screen of dezincification resistant brass or corrosion-resistant stainless steel.
        ii) Screen perforations: 0.8 mm maximum.
    c) Pressure gauges:
        i) Provide gauges: Oil filled with full-scale reading in kPa, a minimum diameter of 65 mm and capable of reading pressures at least 25% higher than the maximum static pressure of the system.
        ii) Locate at inlet and outlet sides of cold water pumps. Isolate from pump vibration and complete with gauge cock on inlet.
    d) Provision for irrigation system: Provide hose cocks and or control valves as required including back flow prevention devices for connection by irrigation contractor.
    e) Urinal flushing system
        i) General: Provide electronic urinal flushing systems for staff and public toilets with “smart flush” on-demand and delay automatic sensors, complete with control valve and filter.

5.2.12 PRESSURE BOOSTER SYSTEM:

1) General: Provide a system consisting of pumps and motor sets, and pressure vessels, operated by an interconnected automatic control mechanism. Assemble the units in factory on steel frames mounted on steel base plates.
   a) Flexible pipe connection: Connect suction and discharge pipes with flexible pipe of pressure rating ≥ 2x the system design pressure.
   b) Pressure vessels: Diaphragm pressure tanks of fabricated steel construction; epoxy coated on metal surfaces in contact with water; pre-charged with air.
   c) Pumps: Provide in-line or end-suction centrifugal.
   d) Control panel: Provide a control panel complete with selector switch, indicating lights of equipment status, audible and visual alarm indication
   e) Interface with BMS: Provide high level interface with BMS at the control panel for remote status and alarm indication. Ensure all items are nominated and detailed in the BMS Point Schedules.

5.2.13 FINISH

1) Piping: Finish exposed piping, valves, fittings and supports as follows:
   a) Exposed piping in amenities such as toilet, parent's room and kitchen areas: Bright chrome plate copper piping to AS 1192 service condition 2.
   b) In concealed but accessible spaces (including cupboards and non-habitable enclosed spaces): Leave copper and plastic unpainted except for identification marking.
2) Valves: Finish valves to match connected piping.

5.3 HEATED WATER SERVICES

5.3.1 PIPES AND FITTINGS

1) Pipes: Copper pipes and fittings copper pipes and fittings Type B to AS 1432 with silver brazing alloy joints or press fittings Provide manufacturers details if press fit crimped joint system proposed.
2) Fittings and accessories: Provide fittings necessary for the proper functioning of the water supply system, including taps, valves, backflow prevention devices, pressure and temperature control devices, strainers, gauges, tenancy water meters and automatic controls and alarms.
3) Finish: Finish exposed piping, including fittings and supports as follows:
   a) Exposed piping in amenities such as toilet, parent's room and kitchen areas: Bright chrome plate copper piping to AS 1192 service condition 2.
   b) In concealed but accessible spaces (including cupboards and non-habitable enclosed spaces): Leave copper and plastic unpainted except for identification marking.
   c) Valves: Finish valves to match connected piping.

5.3.2 HOT WATER CIRCULATION

1) General: Where specified, provide a hot water circuiting system comprising hot water pump, thermostatic mixing valves, and thermal insulation.
2) Hot water pump: In-line centrifugal.
3) Hot water circuit: Flow and return.

5.3.3 THERMOSTATIC MIXING VALVES

1) Standard: To AS 4032.
2) Type: Water temperature regulated by a single hand control, and capable of delivering water at the temperature of either of the supply systems and at any temperature in between, and suitable for controlling single or multiple outlets, as appropriate.
3) Controls: Incorporate the following:
   a) A temperature sensitive automatic control, which maintains temperature at the pre-selected setting and rapidly shuts down the flow if either supply system fails, or if the normal discharge water temperature is exceeded.
   b) Lockable temperature control.

5.3.4 THERMAL INSULATION SYSTEMS:

1) Insulation: Thermal Insulation for hot water pipework to be FM Global certified.

   When exposed to external weather conditions the insulations should be protected by a metal sheathing.

Material	Facing	Fixing
Foamed nitrile rubber		Glue adhesive
Closed cell polyethylene foam	Aluminum foil laminate	Self adhesive strip

2) Fire resistance: Insulation must have BCA compliant Spread of Flame and Smoke Development indices and UL certification.

5.3.5 PIPE SUPPORT:

   a) Provide support formed to fit around the insulation.
   b) For pipes ≥ DN 25: Replace the insulation at the support point with a shaped wooden spacer block. Butt the insulation up to the wooden block and seal with silicon compound or Adhesive strip.

5.4 TAPWARE

Provide tapware as per Scentre Group specification and schedules.

6 FIRE HYDRANT AND HOSE REEL SYSTEMS

6.1 GENERAL

1) General: The system shall include water supply, hydrants and hose reels, fittings, pipework and signage. Where specified harvest water from pump testing. Provide efficient, reliable, low maintenance systems for the suppression of fire, comprising:
   a) A fire hydrant system for use by the fire authority; and
   b) A fire hose reel system for use by personnel occupying the building.
2) In any instance where the Contractor is connecting into the existing centre's water system the Contractor is to allow for all works required, including upgrade or replacement of existing if necessary, to achieve the required capacity / flow / pressure for the new works.
3) General standards: Comply with the following:
   a) AS 3500.1: Water Services.
   b) AS 2419: Fire hydrant installations.
   c) AS 2441: Installation of fire hose reels.
   d) AS 2941: Fixed fire protection installations – Pumpset systems.
   e) AS 4118.1.4: Fire sprinkler systems – Components – Valve monitors.
   f) A/NZS 2845.1: Water supply – Backflow prevention devices.
   g) NCC Volume 1
4) Certification and registration: Provide certification and registration of all air gaps and backflow prevention devices to Authorities as required.
5) Testing: All systems new and existing to be hydrostatically pressure tested in accordance with the requirements of AS 2419.1.

6.2 DESIGN AND INSTALLATION

1) General: The design and installation must implement and comply with the requirements of the Fire Engineering Report.
2) System performance: For the purpose of calculating the required number of fire hydrant outlets discharging simultaneously, the following are to be taken into consideration:
   a) Effective height of building.
   b) Fire compartments.
3) The building is protected by automatic fire sprinkler system with any exceptions being only those noted in the Fire Engineering Report.
4) Pipe Sizing: Size pipes in accordance with AS 2200.
5) Monitored valves:
   a) Continuously monitored: Unless specified otherwise, continuously monitor control valves to AS 4118.1.4 and authority's requirements. The fire protection services contractor will provide connection from the monitoring device to the fire alarm and control system.
   b) Strapped and locked: If specified, provide isolation valves of indicating type. Strap and lock the valve in normal operating position to AS 2419.1 and authority requirements.
   c) Identification: All valves shall be clearly identified with a numbered tag
6) Water agency's report: Obtain a current report for design purpose.
7) Signage: All identification signage is to be provided in accordance with AS 1319.

8) Block Plans: Block plans complying in all aspects with AS2419.1 must be provided for the entire system including all existing portions of the system outside of the construction zone. Plans shall be provided at the booster cupboard/s, fire control rooms and all Fire indicator panels with designated “YOU ARE HERE” location identification markings. In addition, where required by the Fire Engineering Report provide tactical fire plans within fire isolated stairs and corridors.

9) Major stores including cinemas:

   a) Provide hydrants and hose reels to the store’s control plan. If store control plan is not available, provide hydrants and hose reels to an open plan based upon a 30m radius.

6.3 FIRE HYDRANT SYSTEM

1) General: Water supply for the fire hydrant system shall be sourced from the town main.

2) Connection: Connect to the water agency’s main as identified in the scope of works. Arrangement of connection and metering shall be in accordance with the requirements of the local water agency/authority.

3) Pressure/flow characteristic: Obtain a current local water agency’s report on pressure/flow characteristic of the town main to determine design requirements and available system performance.

4) Capacity of town main: Ascertain and demonstrate the ability of the town mains to provide sufficient capacity for the required flow rate for the system.

5) All hydrant valves, landing valves and suction outlets, to be provided with forged (pressure cast) Storz hermaphrodite hose couplings.

6) All fire hydrant landing valve to be installed with the outlet centreline at 1000mm above proposed floor levels.

7) Coverage: All design locations shall include a nominal distance allowance for potential tenant back of house infill walls so as to avoid additional fire hydrants and hose reels being required to be installed.

6.4 WATER STORAGE TANK

1) General: If the town main does not have sufficient capacity for the required flow rate, a water storage tank will be required. The Contractor is to ascertain and advise on the requirements for a tank, if required, and liaise with the Project Manager for a suitable location.

2) Tank capacity: To AS 2419.1 with make-up supply from the town main.

3) Construction: Metal tank / In situ concrete tank to AS2304.

   a) General: Modular bolted steel construction, fabricated heavy gauge steel plate panels, reinforced with stays and struts for maximum strength complete with vermin proof cover.

   b) Material: All panels, stays, struts and cover shall be hot dip galvanised.

   c) Bolts and nuts: Stainless steel bolts nuts and washers.

   d) Minimum base metal thickness:

      i. Wall and top panels: 2.4 mm.

      ii. Floor plate: 3 mm.

   e) Internal lining: Not required.

   f) Seam: External.

   g) 50% Isolation for maintenance.

4) Fixing: Elevated by concrete plinth and fully supported by galvanised steel beams to provide adequate access to the base of the tank in accordance with confined space requirements of AS/NZS 2865. Support beams shall be anchored both to the base of the tank and the plinth.

5) Hydraulic components: Provide the following (to each tank and or tank compartment):
   a) Manual quick-fill.
   b) Make up water. (Note: make up water float valves to be externally mounted vertical floats where tanks have a quick fill system.)
   c) Automatic inflow if required.
   d) Pump suction lines.
   e) Fire Brigade connection if required.
   f) Overflow.
   g) Tank drain and sludge valve.
   h) Pump testing inlet.
6) Maintenance facilities:
   a) Provide access manholes and ladders.
   b) Water level alarm control:
   c) Provide stainless steel liquid level sensing probe with PVC casing.
   d) Provide a control panel with audible and visual alarm indications (high water level and low water level).
   e) Interface with BMS: Provide low level interface with BMS at the control panel for remote alarm indication.

6.5 BREAK TANK

1) General: In the event that a direct connection fire hydrant pump to the town main is not acceptable to the water agency, provide a break tank between the town main connection and the pump.
2) Tank capacity and arrangement: In accordance with the requirements of AS 2304.
3) Construction: Metal tank / In situ concrete tank.

6.6 ACCESSORIES FOR TANKS

The Contractor must supply the following accessories for each tank:

1) Manual quick-fill connection.
2) Make-up connection.
3) Automatic inflow connection.
4) Suction connection(s).
5) Overflow connection.
6) Sludge drain connection.
7) Pump testing inlet connection.
8) Level indication in strict accordance with AS 2419.1

Note: Float valves installed under items 2) and 3) above shall be external vertical floats with visual indication. Float valve lever arms shall have mechanical fixings and not split pin connectors.

6.7 FIRE HOSE REEL SYSTEM

Connect the fire hose reel system to the cold water supply or Fire Hydrant System complete with double check valve backflow prevention device. Arrangement of connection and metering shall be in accordance with the requirements of the local water agency/authority.

6.8 FIXING OF FIRE HOSE REEL

1) Securely fix hose reel to building structure, provide galvanised fixing frame if necessary.
2) External cabinet: Fix hose reel to the fixing frame of the external cabinet

6.9 FIRE PUMPS

All fire pumps installed under the scope of this specification will sized to suit the demand requirements of the project and will be Owners Insurer approved.

6.9.1 FIRE HYDRANT PUMPSET

1) General: Provide the following pumps:
   a) A pumpset comprising:
      i) An electric driven pump; and
      ii) A diesel driven pump.
      iii) Type of pump: centrifugal end-suction pump.
2) Jockey pump: An automatic jockey pump to maintain the system pressure without starting the pumpset as a result of minor pressure drop in the fire main.
3) Standard: To AS 2941.

6.9.2 FIRE HOSE REEL PUMP

1) Provide a fire hose reel pump set if necessary for the performance of the system.
2) Fire hose reel pump: To AS 2941
3) Type: Electric driven centrifugal pump.

6.9.3 PUMP TESTING

1) Where water storage tank is provided, re-circulate the testing water back to the water storage tank.
2) Where water storage tank is not required and the pump is directly connected to the town main, provide a water recycling tank to store water resulted from routine pump testing in the following sequence:
   a) Test town main through the bypass to partially fill the tank;
   b) Test fire pump fed by the town main to fill the tank; and
   c) Test the fire pump from the tank.

6.10 FIRE BRIGADE BOOSTER ASSEMBLY

1) General: Provide booster assembly to Fire Brigade's requirement, otherwise to AS 2419.1.
2) Suction outlet: Connect to town main or storage tank as required.
3) Configuration: In parallel with the pump set unless the booster is distant from the pump room in which case it will be configured in series. Liaise with the Project Manager during design development to confirm.

6.11 INTERFACE WITH BMS AND FIRE ALARM AND CONTROL SYSTEM

Interface with the BMS for remote monitoring of:

1) All Fire pumps (pump run and fault alarms).
2) Water storage tanks (high and low level alarms).
3) Monitored Valves (status indication).

6.12 WATER RECYCLING

1) Recycle water used for pump testing.
2) Recycling Tank:
   a) Construction: Metal tank.
   b) Capacity: In accordance with the requirements of AS 2304
   c) Accessories: Provide the following:
      i) Pump testing inlet and suction outlet connections (in accordance with AS 2419.1);
      ii) Overflow connection;
      iii) Sludge drain connection; and
      iv) One 50 mm Ø suction connection for irrigation pump, terminated at a control valve.

6.13 SIGNAGE

1) The Contractor is to provide all signage, in accordance with AS 1319, for the Fire Hose Reel and Fire Hydrant systems.
2) Liaise with the architect for aesthetic co-ordination.

6.14 MATERIALS

6.14.1 FIRE HYDRANT PIPES

1) General: To AS 2419.1.
2) For above-ground installation select from the following:
   a) Medium grade galvanised steel pipes and fittings with roll groove rubber ring joints. Pipe thickness shall be a minimum of 4.5mm for 100NB and 5.0mm for 150NB pipework. Light wall steel pipe and ScH 10 pipework shall not be used.
3) For below-ground installation select from the following:
   a) HDPE or Pressure class UPVC pipes and fittings, not less than PN16.

6.14.2 FIRE HOSE REEL PIPES

Fire hose reels installation: copper pipes and fittings Type B to AS 1432 with silver brazing alloy joints.

6.14.3 FIRE HYDRANT VALVES

1) General: To AS 2419.2.
2) Material:
   a) Exposed to weather: Copper alloy.
   b) Elsewhere: Grey cast iron.
3) Coupling: Provide suitable forged Storz couplings fitted to fire hydrant valve for connection to local Fire Brigade's fire hose.
4) Blank caps: Metal of compatible material.

6.14.4 FIRE HYDRANT ISOLATION VALVES

1) General: To be either continuously monitored or strapped and locked in the normal operating position to authority requirements.

2) Type:
   a) Below-ground installation: Cast iron key operated sluice valve to AS 2638 with valve box over.
   b) Above-ground: Cast iron gate valve to AS 3579 or approved multi-turn butterfly valve.
   c) Monitored isolation valve: All new isolation valves to be fitted with internal supervisory switches each having SPDT contacts. The electrical ratings for the switch contacts are 10 A at 240 V a.c. and 1.5 A at 0-30 V d.c. Wiring tails are to be neatly tied and capped for connection by others (do not cut off).

6.14.5 FIRE HOSE REEL ISOLATION VALVES

1) General: To be strapped and locked in the normal operating position and labelled with an engraved non-ferrous metal tag with 8 mm upper case wording:
   a) FIRE SERVICES VALVE - CLOSE ONLY TO SERVICE FIRE HOSE REELS
2) Type: Copper alloy gate valves to AS 1628 or approved ball valves.

6.15 BLOCK PLANS & OPERATING INSTRUCTION

1) General: Provide block plans as per AS 2419.1
2) Fire Hose Reels: indicate locations of FHRs on the block plans

Material: Legibly print or engrave block plans and emergency instructions on durable material resistant to defacement, at least 3 mm thick or mounted on board at least 3 mm thick.

7 GAS SYSTEMS

7.1 GENERAL

1) General: Provide efficient and reliable distribution system to all points of usage. The Gas system shall include connection to gas supply, meters, fittings and pipework.

   All provisions to tenancies are to be in accordance with the Lessor Tenancy Services and Provisions Schedule

2) Standards: Comply with AS 5601: Gas installations.

7.2 SYSTEM DESIGN

1) Gas supply: Connect to the gas regulator provided by the network operator.
2) System pressure: 7 kPa maximum within building envelope, subject to network operator's requirements and main pressure.
3) Gas regulator: Arrange with the network operator to provide dual boundary regulator set to reduce the supply pressure to the system pressure.
4) Safety shutoff devices shall be nominated where required in accordance with the AS5601.
5) Provision for tenants: Unless otherwise shown on the Lessor Tenancy Services Provisions Schedule, provide the following:
   a) Food shops, restaurants and kiosks: Provide meter installations and pipe reticulation as per local authority requirements. Manifold sizing and branch sizing subject to design calculation by the Contractor. Manifolds and enclosures to include suitable space provision for the installation of all tenant meters.
   b) Major stores including cinemas:
      i) Provide suitably sized gas supply to each major store plant room in accordance with the Tenant's Specification.
      ii) Provide a gas installation to the store's control plan if hydraulic services fitout of the store form part of the Contract.
6) Provision for other services: If required, provide the following:
   a) Metered gas supply to the HVAC boiler.
   b) Metered gas supply to gas fuelled generators.
7) Control valves: Provide control valves at:
   a) Manifold and manifold branches;
   b) Main branch lines;
   c) Individual branch lines; and
   d) Where required by the authority.
8) Automatic control valve: For gas equipment/appliances enclosure (gas meter room, regulator room, booster room and gas boiler room and gas generator room) which is mechanically supplied/ventilated, provide an automatic valve which will be controlled by the BMS. Upon failure of the mechanical ventilation system, the BMS will initiate shut off of gas supply to the enclosure and lockout.
9) Pipe sizing: To AS 5601 with an allowance of 20% spare capacity for main distribution piping reticulation and manifold sizing. Consumer piping (i.e. from meter to tenant) to be sized as per Table 8: Minimum gas loading rates.

10) Gas loading: Design the system based on the following loadings unless an appliance layout is available or specified:

Area	Gas load (Mj/hr)
Fresh Food Market	300
Kiosk (cooking)/Food Preparation room	300
Food Court	500
Restaurant	1000
Supermarket	(1500-2000)* - Refer to tenant specification
DDS	(1200) * - Refer to tenant specification
DDS With Cafeteria	(1500) * - Refer to tenant specification
Department Store	(3200) * - Refer to tenant specification
Cinemas 8-15 Auditorium	(2500)* - Refer to tenant specification
HVAC Boiler	Confirm with Mechanical Contractor
Gas Generator	Confirm with Electrical Contractor

Table 8: Minimum gas loading rates

7.3 METERS

1) General: Provide gas meters/submeters for real-time local and remote reading of gas supply.
2) Standard: To AS 5601.
3) Accuracy: Minimum Class 3. Meters to have National Measurement Institute (NMI) pattern approval.
4) Interface with BMS: Provide low level intrinsically safe interface with BMS for remote reading.
5) Consumer billing meter:
   a) Coordinate with the network provider for installation of meters; or
   b) Where Scentre Group is acting as the retailer provide compliant meters for consumer billing purposes and coordinate with Scentre Group for preferred meter location(s)
6) Authority Meter Location: All meters are to be installed in a position as required / approved by the local Authority. The Contractor is to obtain design approval from the Authority prior to the installation of any meters.
   a) Where the meter is being installed internal to the boundary allow for all works to enable authority to complete the installation of the distribution mains.\
   b) Gas meters must not under any circumstances be installed in the ceiling space.
7) Sub-meters (if required):
   a) Provide gas sub-meter for:
      i) Each tenant;
      ii) House mechanical services; and
      iii) Gas generator
   b) Locate gas sub-meter with easy access and protected from mechanical damage.
      i) Major tenants: At termination point of gas supply as nominated by tenant.
      ii) Food Shops: On the rear wall of the premises, or in a service corridor, or externally where required and approved by the local Gas Authority and in a location approved by Scentre Group. Gas meters must not under any circumstances be installed in the ceiling space.

iii) Food kiosk: As above for food shops, with supply terminated within the remote food preparation room dedicated to that food kiosk.

c) All gas meters are to be smart meters or at a minimum be pulse output capable.

7.4 CONSUMER PIPING

1) Above ground installation: Select from the following:

a) Copper tube type B to AS 1432 with plastic coating, and copper alloy fitting to AS 3688 with silver brazing alloy joints or press fittings. Plastic polyethylene pipe, PE-X/AL/PE, **shall not be used**.

2) Below ground: Select from the following:

a) Copper tube type B to AS 1432 with plastic coating, and copper alloy fitting to AS 3688 with silver brazing alloy joints or press fittings.

b) Polyethylene (PE) pipe and fittings AS 4130 with butt-fusion or electro-fusion joints.

c) Polyamide (Nylon 11 and 12) pipe and fittings Class 300 and 400 to AS 2944.1 with adhesive joints.

3) Finishes: Finish exposed piping, including fittings and supports, as follows:

a) In internal locations such as kitchen areas: Bright chrome plated copper piping to AS 1192 service condition 2.

4) Installation:

a) Concealment: If practicable, install piping so that it is concealed within service ducts or non-habitable enclosed spaces and does not appear on external walls.

b) Below ground installation: During backfilling lay plastic warning tape 150 mm above buried piping, for the full length of the piping. Warning tape shall be of minimum 100 mm width, with ‘GAS PIPE UNDER’ marked continuously. Install pipework with copper trace wire.

7.5 CONSUMER PIPING GAS PRESSURE REGULATOR

1) General: Provide gas regulators with over pressure protection, to maintain downstream operating pressures.

2) Installations:

a) General: Complete gas regulator with upstream filter/strainer to pipeline size.

b) Nipples: Provide 6mm capped nipples to each side of gas regulator and filter/strainer for pressure test.

c) Vent: where required, provide vent off regulator vent to terminate outside building. Protect vent terminal against any forms of blockage.

3) Pressure switch: Provide a gas pressure switch for each regulator, located down stream of the regulator, with adjustable switching pressure and voltage free contacts for connection to the building management system.

8 PUMPS AND ASSOCIATED EQUIPMENT

8.1 GENERAL

General standards: Comply with the following:

1) AS 2417: Rotodynamic pumps.
2) AS 2941: Fixed fire protection installation – Pumpset systems.

8.2 END-SUCTION CENTRIFUGAL PUMP

1) Standard:
   a) General: To ISO 2858 or DIN EN 733.
   b) Fire pump: To AS 2941.
2) Type: Close-coupled, single-stage, radially split, end suction, back pull out pumps.
3) Pump characteristics: Provide pumps with constant falling head v. quantity curves for stable operation with duty nearest to the best efficiency point for the impeller diameter. Select a pump with design flow rate not to exceed 80% of the maximum rating of impeller size.
4) Parallel operation:
   a) General: No instability when operating either singly or in parallel at the same shaft speed.
   b) Maximum difference between the individual shut-off heads: 10% of that of the pump with the lowest shut-off head.
5) Materials:
   a) Casings: Cast iron to AS 1830, Grade T220.
   b) Shafts: Stainless steel Grade 416.
   c) Impellers: Grade 836B bronze.
6) Impellers:
   a) Maximum diameter: 90% of maximum impeller size for the casing.
   b) Statically and dynamically balance.
7) Coupling: General: Direct couple pumps and motors using flexible spacer couplings which are enclosed in coupling guards.
8) Shaft seals: Provide mechanical seals compatible with carbon elements rotating against a ceramic stationary face.
9) Installation:
   a) Bases: Mount pumps and motors on a mild steel base sufficiently rigid to prevent distortion.
   b) Inertia bases: Fix the pump assembly on an inertia base.
   c) Mounting: Mount the inertia base on a concrete plinth with anti-vibration spring mounts.
   d) Positive head: Provide positive head at pump suction.
10) For diesel pump only:
   a) Duplicate batteries: One set for automatic starting and one set for manual starting.
   b) Engine cooling: Manual by-pass provided.
   c) Circulation relief valve: Provide 19 mm circulation relief valve unless the diesel drive takes cooling water from the pump discharge.
   d) Battery charger: Individual charger for each battery set. Provide alternator/generator for battery charging.
   e) Speed governor: Capable of keeping engine within ± 10% of rated speed and tamper resistant.

f) Fuel supply: 5.1 litres/kW + 10%. Tank capacity: Minimum 6hrs pump running time. Fuel gauge to be provided.

g) Instrument panel: Complete with oil gauge, temperature gauge, tachometer, hour meter, and ammeter.

h) Over speed shutdown: Provide.

i) Jacket water heater, oil heater and power fail relay: Provide.

j) Local visible and audible alarm: High temperature, over speed shutdown, low oil pressure, fail to start, battery charger failure.

k) Attempt to start cycle: The attempt to start cycle shall be fixed and consist of six crank periods of approximately 12-second duration separated by five rest periods of approximately 15-second duration. In the event that the engine does not start after the completion of the “attempt to start” cycle, the controller should stop all further cranking and generate local and remote alarm.

11) Piping:

a) Disconnectable connections: Provide flanges or screwed connections with unions, for removal of pump casings without disturbing piping.

b) Suction connections: Provide demountable pipe sections between pumps and system isolating valves, for removal of impellers.

c) Drip tray: Drain to the nearest waste using DN 25 copper pipe.

8.3 IN-LINE CIRCULATING PUMPS

General: Canned rotor type, comply with the requirements Clause 7.2 - END-SUCTION CENTRIFUGAL PUMP except in the following:

1) Mounting: Suitable for mounting with the shaft vertical or horizontal.

2) Coupling: Close-coupled.

3) Radial bearings: Ceramic sleeve or ball bearing.

4) Axial bearings: Carbon/ceramic sleeve or ball bearing.

5) Casing arrangement: Back pullout.

6) Sealing: Seal motors and electrical connections to protect against ingress of condensation.

8.4 SUBMERSIBLE PUMPS

1) Type: Vertical, fully flooded submersible, close coupled, single stage, centrifugal.

2) Construction:

a) Casing: Cast iron to AS 1830/T-220, minimum.

b) Impellers: Cast iron or stainless steel Grade 416.

c) Shafts: Stainless steel to ASTM A240/240M.

d) Nuts and bolts: Stainless steel.

e) Suction screens: Stainless steel.

f) Float switches: Integral.

3) Motors:

a) Type: 3-phase, with windings protected by thermistors and moisture sensor. For liquid cooled motors, the maximum ambient temperature must be the highest available on the market.

b) Degree of protection: Water tight enclosure, IP68.

c) Install motors with inbuilt thermal shutdown protection feature.

4) Mounting: Provide duckfoot pedestal bases with guide rails or guide wire system.

5) Connections:

   a) Piping: Provide flanged discharge connections.

   b) Electrical: Provide resin filled cable glands.

6) Flush valves: Provide flush valve to the volute of one submersible sanitary drainage pump for flushing wet well to reduce sludge build-up.

8.5 SEWER PUMPS (INCLUDING TRADE WASTE PUMPS)

Provide a sewage pumping system, all to form a complete and approved installation as required, generally comprising:

1) Two identical submersible pumps

2) Controls and wiring

3) Rising main

4) Chamber vent

5) Holding well and covers.

6) A sewage Grinder: In-line type installed on inlet pipe where above ground or Channel type installed in wet well on inlet pipe.

8.5.1 HOLDING WELL

1) Provide insitu or precast concrete holding well. Allow to finish the top covers and frame to match pavement and finished pavement levels.

2) Provide Step Irons as required.

3) Provide pumps to comply with the following requirements:

   a) Submersible type with shredding impeller.

   b) Have casing made of GG-25 and stainless steel shaft.

   c) Have lubricated for life, maintenance free motor shaft bearings and high quality silicon carbide mechanical seal independent of direction of rotation; lip seal oil lubricated.

   d) Have waterproof cabling.

   e) Have three phase, 415 volts, 2,900 rpm electric motor.

   f) Have TCS-Thermo-Control-System and DI-System for Seal Monitoring.

4) Provide IP rated control panel, level controllers and wiring to give automatic operation of sewage pumps.

   a) Control panel to be fixed to wall and shall be suitable for external installation exposed to weather conditions.

5) Control panel to incorporate:

   a) ON/OFF automatic control for each pump.

   b) DOL starters for each pump.

   c) Automatic rotating switch.

   d) Liquid level control: Radar sensor type including signal instrument controllers.

e) Relays to operate visual alarm indicators showing:

Item	Criteria
Pump Failure	2 lights
High Water Level	1 light
Pump On	2 lights
Low Water Level	1 light

Table 9: Sewer pumps holding well visual alarm indicators

f) A relay to operate audio-visual alarm with mute button external of cabinet.

g) Circuit breakers.

h) All wiring and contactors – Class 1 Zone 2 electrical connections.

i) 24 V AC volt free relays and terminal strip for connection by others.

j) Intrinsically safe packs.

k) The control equipment shall generally be able to:

i) Automatically rotate the DUTY operation to either pump after each operation.

ii) Automatically activate the standby pump in the event of the DUTY pump failure.

iii) Prevent simultaneous starting of the pumps, either manual or automatic.

iv) Automatically activate alarm circuitry.

v) Centre's BMS compatible.

6) Provide all necessary wiring between control panel, level controllers, pumps and within control panel. All wiring to comply with SAA Wiring Rules and Local Authority requirements.

7) Provide level controller within holding well to start and stop pump(s) and alarm. Level controllers to be Radar Sensor type. Note: Mercury float switches are not suitable for this environment. Level controllers to have the following functions:

a) Stop pump

b) Start duty pump No. 1

c) Start standby pump No. 2

d) High level alarm

e) Low level alarm

8) Provide a rising main to comply to the following:

a) Rising main to be Pressure PVC (class 12 minimum).

b) Provide unions, non-return and gate valve on rising main in a separate pit external to the pump chamber. Include junction with ball valve and camlock connector on rising main, prior to valves, for emergency suction purposes.

c) Connect to the existing site sewer system.

d) Provide supports, excavation, bedding, backfill, fixings, brackets, etc. for rising mains and sewage pumping line – as before specified.

e) Connect to main gravity drainage junction to local authorities' requirements.

8.6 STORMWATER PUMPS

1) General: Provide a stormwater pumping system, all to form a complete and approved installation as required, generally comprising:

a) Two identical submersible pumps (duty / assist)

b) Controls and wiring

c) Rising main

d) Holding well and covers.

2) Holding Well

a) Provide insitu or precast concrete holding well. Allow to finish the top covers and frame to match pavement and finished pavement levels.

b) Provide Step Irons as required.

c) Provide pumps to comply with the following requirements:

i) Submersible type with shredding impeller.

ii) Have casing made of GG-25 and stainless steel shaft.

iii) Have lubricated for life, maintenance free motor shaft bearings and high quality silicon carbide mechanical seal independent of direction of rotation; lip seal oil lubricated.

iv) Have waterproof cabling.

v) Have three phase, 415 volts, 2,900 rpm electric motor.

vi) Have TCS-Thermo-Control-System and DI-System for Seal Monitoring.

d) Provide IP rated control panel, level controllers and wiring to give automatic operation of stormwater pumps.

e) Control panel to be located where shown on plans and fixed to wall and shall be suitable for external installation exposed to weather conditions.

f) Control panel to incorporate:

i) ON/OFF automatic control for each pump

ii) DOL starters for each pump

iii) Automatic rotating switch

iv) Liquid level control switches as provided by Pump supplier

v) Relays to operate visual alarm indicators showing:

Item	Criteria
Pump Failure	2 lights
High Water Level	1 light
Pump On	2 lights
Low Water Level	1 light

Table 10: Stormwater pumps holding well visual alarm indicators

vi) A relay to operate audio-visual alarm with mute button external of cabinet

vii) Circuit breakers

viii) All wiring and contactors – Class 1 Zone 2 electrical connections.

ix) 24 V AC volt free relays and terminal strip for connection by others.

x) Intrinsically safe packs.

xi) The control equipment shall generally be able to:

(1) Automatically rotate the DUTY operation to either pump after each operation

(2) Automatically activate the standby pump in the event of the DUTY pump failure.

(3) Prevent simultaneous starting of the pumps, either manual or automatic.

(4) Automatically activate alarm circuitry.

g) Provide all necessary wiring between control panel, level controllers, pumps and within control panel. All wiring to comply with SAA Wiring Rules and Local Authority requirements.

h) Provide level controller within holding well to start and stop pump(s) and alarm. Level controllers to have the following functions:

i) Stop pump

ii) Start duty pump No. 1

iii) Start standby pump No. 2

iv) High level alarm

v) Low level alarm

i) Provide a rising main to comply to the following:

i) Rising main to be Pressure PVC (class 12 minimum).

ii) Provide unions, non-return and gate valve on rising main within pump chamber

iii) Connect to the existing site sewer system.

iv) Provide supports, excavation, bedding, backfill, fixings, brackets, etc. for rising mains and sewage pumping line – as before specified.

v) Connect to main gravity drainage junction to local authorities' requirements.

8.7 DOMESTIC COLD WATER/FIRE HOSE REEL BOOSTER PUMP

1) General: Servicing domestic cold water/fire hose reel system. Provide cold water/fire pumps to give approved water pressures and be automatically controlled by variable frequency control motors and a variable speed controller.

2) Booster pumps to include

a) Pumps (number as required to meet performance curve of nominated system)

b) Check valves

c) Manifold piping

d) Flexible connections to rigid incoming and outgoing water supply

e) Controls

f) Base plate

g) Pressure tanks

3) Pumps to:

a) Be vertically mounted in line multi stage centrifugal type

b) Have cast iron casings, stainless steel shaft and stainless steel impellers

c) Have mechanical seals

d) Have screwed connections

4) Controls panel to incorporate the following:

a) Main isolation switch

b) Duty selector switch

c) Manual / off / auto selector switch for each pump

d) Motor and control circuit breakers

e) DOL contractors with hand reset thermal overloads

f) Automatic alternation

g) Lights for:
   i) Power On: 1 off
   ii) Pump Run: 1 off per pump
   iii) Pump Fail: 1 off per pump
   iv) Loss of prime alarm
h) Volt free contacts
i) Run on timers
j) Audible alarm with mute button
k) All mounted on a sheet metal weatherproof cabinet
l) Wiring from level switches in tanks to activate booster pumps

5) Provide all necessary wiring between control panel, pumps and within control panel. All wiring to comply with SAA Wiring Rules and Governing Authority requirements.
6) Manifold piping to:
   a) Be copper, as before specified for cold water.
   b) Include valves.
   c) Be generally as indicated on the drawings.
   d) Include anti-vibration (flexible) couplings at pump sections and discharges.
   e) Enable:
      i) Removable of each pump while remaining components operable
      ii) By-pass
      iii) Test drain
      iv) Testing pump operation and pressures
7) The whole assembly to be fixed on a concrete plinth with approved rubber-in-shear anti-vibration mounts and expansion fasteners.
8) Note that pumps, piping to be suitable for working pressure equal to maximum mains pressure plus maximum pump pressure (i.e. with “closed” head).
9) Provide pressure gauge and pet cocks to inlet and outlet of pump sets.

8.8 HYDRANT BOOSTER PUMPS

1) The booster pump shall be supplied and installed so as to maintain a minimum running pressure in accordance with the BCA & AS 2419.1.
2) The work shall include the following main items:
   a) Control panel
   b) Diesel driven hydrant booster pump
   c) Jacking pump and pressure vessel rated at a minimum of 0.2 l/s.
   d) Gate valves and check valves
   e) Inlet and outlet manifolds
   f) All test valves, gauges, brackets and plinth
   g) Galvanised steel fabricated frame and base
   h) Volt-free contacts
   i) Annubar flow test valve, surplus valve and test drains

j) Adjustable pressure limiting valve on the incoming and outgoing supply to the pump

3) Electrical connections shall be such as will ensure that power is available to the motor when switches for the distribution of other power throughout the premises are open. Any switches in the power circuit to the motor shall be locked 'ON' and clearly labelled 'FIRE HYDRANT BOOSTER PUMP – NOT TO BE SWITCHED OFF'.

4) All wiring to the electrical motor, including wiring related to the remote control starting system, shall be in accordance with AS 3000, Part 1 – 1991, and within the building shall be:

   a) Enclosed in a duct with a fire resistance rating of 2 hours; or

   b) PVC or elastomer insulated and armoured; or

   c) PVC or elastomer insulated and enclosed in screwed steel conduit; or

   d) Mineral-insulated, copper sheathed.

5) The Diesel Engine shall be air-cooled (in an open enclosure, outdoors) or heat exchanged cooled engine (inside a building in a sealed enclosure), twin cylinder, electrically started type complete with two batteries, starter motor, generator, voltage regulator, exhaust and fuel systems, oil bath, air cleaners, gauges, spare parts and tools.

6) The diesel compression ignition engine-driven pump set shall incorporate the following:-

   a) Dual starting batteries complying with AS 4029.2, AS 4029.3 or AS 3731.1 and AS 3731.2.

   b) Low battery voltage monitoring incorporating local aural and visual alarms at the pump controller and CIE, where installed.

   c) Low fuel level monitoring incorporating local aural and visual alarms at the pump controller and the CIE, where installed.

7) Two battery chargers of the constant potential type compatible with the battery being charged, each with separate transformers, ammeters and voltmeters, shall be incorporated into the fire pump controller. The chargers shall have automatic in-built current-limiting facilities. Chargers shall be capable of fully recharging each battery from 50% capacity within a period of 24 h. One charger shall service the engine automatic battery; the other shall service the engine manual starting battery.

8) Automatic means shall be provided to isolate the generator/alternator when the mains-powered battery charger is in operation, that is, when the engine is stopped.

9) Complete instructions covering the operation of the fire pump controller shall be provided and conspicuously mounted on the fire pump controller.

10) All switches that are required to keep the fire pump controller in the 'automatic' position shall be locked in the 'on' position.

11) The diesel motor to AS2419 / AS2941 shall incorporate a starter equal to a Star Delta starter.

12) The diesel motor shall be mechanically governed, have direct fuel injection and be continuously rated for twenty-four (24) hours operation to deliver not less than the horsepower required from the duty, at the loaded governed speed.

13) The fuel storage tank shall be mounted over the engine and shall be of sufficient capacity to run the engine for a minimum of six (6) hours. Sufficient fuel shall be kept on hand to run the engine for at least twenty-four (24) hours. The fuel system shall include a 200 mesh filter, contents gauge and all necessary pipework. The pipework shall be arranged to deliver fuel to the engine fuel pump by gravity without any possibility of air locking.

14) Exhaust gases shall be piped from the motor manifold to discharge to atmosphere in an approved location. Exhaust piping shall be heavy gauge galvanised steel tubing of a diameter recommended by the motor manufacturer. Silencers shall be fitted to all exhausts. Heat wrapping material shall be installed on exhaust system.

15) The pumps shall be proven to meet the design duty and to comply with the correct starting procedure, i.e.

   a) The jacking pump shall automatically maintain the hydrant system pressure.

b) The diesel-driven hydrant pump shall operate upon a pressure drop below 200 kPa.

c) The electric pump shall operate upon a pressure drop below 50 kPa.

16) During the guarantee period, the Proprietor reserves the right to carry out, at weekly intervals, test runs of the pumping equipment in accordance with standard approved procedures.

a) Starting equipment for the diesel hydrant pump;

b) DOL starting equipment for the jacking pump;

c) Manual test buttons;

d) An alarm gong to indicate booster pump operation with mute switch for the gong; and

e) Pump run lights for all pumps.

17) The Alarm Bell shall be mounted on an external wall with label “hydrant pump run” mounted under bell.

18) Supply and install a pressure jacking pump assembly to maintain the static pressure in the installation. The system shall consist of a pump, electric motor, DIR approved air chamber, pressure relief, pressure switch, pressure gauge and necessary non-return valves.

19) Supply and install approved automatic actuation devices responsive to pressure change in the installation shall be provided to perform the following functions:

a) Start the pressure jacking pump on a drop in pressure and stop it when the system has attained the required pressure.

b) Start the diesel engine.

20) The whole of the diesel engine and pump assembly shall be mounted on a steel base plate frame, bolted to a concrete plinth with anti-vibration pads.

21) Provide flanged flexible metal pump connectors to inlet and outlet of pumps. Connectors shall be the same size as the inlet and outlet of the pumps. Provide line size reducers after flexible metal pump connectors.

8.9 HOT WATER CIRCULATING PUMPS

1) Supply and install at each hot water return pump set vertical support frames comprising galvanised steel unistrut P1000 channel. Fix the hot water return pumps associated pipework and electrical control panels to the vertical support frames.

2) Dual Pumps shall be equal to Grundfos UPS mounted in the vertical position with interconnecting pipework and valves.

3) Provide and install gate valves, check valve, pressure gauges and gauge control valves on the inlet and outlet of each pump.

4) Provide stainless steel flanged vibration eliminators on the suction and delivery connection to each pump. Provide stainless steel vibration eliminators on the pipework connection to and from the pump set group.

5) Provide air eliminators on each side of the pump.

6) Provide and install anti-vibration mounts as required.

7) Provide electrical power, control and alarm wiring with conduits from the pumps electrical control panels to pump motors. Pumps to have thermal overload protection auto/off/manual selector for each pump, auto/change-over selection switch, motor, circuit breakers, AC on light, pump run lights, pump fail lights, alarm button and mute button.

8) Electrical wire each pump for 24 hours running with an automatic change over to the second pump after each 24 hour duty.

8.10 ACCESSORIES

8.10.1 CONTROL PANEL

1) General: Provide control panel of the same make as the manufacturer or supplier of the pumps.
   a) Provide a complete specification and drawings of pumps and control equipment prior to installation.
   b) Supply and install all equipment necessary to operate the pumps specified under hydraulic services.
   c) Allow for all control cabinets, mounting brackets, contactors, isolating and control switches, auxiliary switches, alarms, wiring between pump and panel, panel and level controls, and other associated equipment necessary for the safe and effective operation of the pumps as required for the installation and in accordance with statutory requirements to AS 3000.
2) Construction: Galvanised sheet metal construction with lockable door, weatherproof if external. Finish off with approved metallic paint. Contain starters, control equipment, visual indicators, audible alarm and other accessories.
3) Control of duty/standby pumps: Provide equipment as required to automatically:
   a) Alternate pumps after each cycle of operation;
   b) Activate standby pump in event of breakdown;
   c) Prevent simultaneous starting of pumps; and
   d) Activate pump failure alarm.
4) Visual indicators: Provide LED indicators for the following:
   a) Power on – green.
   b) Pump running – green.
   c) Pump failure (for each pump) – red.
5) Audible alarm: Provide audible alarm with mute button.
6) Remote monitoring: Provide suitable Communications connection for high-level interface with the Building Management System for remote monitoring of the following:
   a) Status of power supply.
   b) Pump running.
   c) Common fault.
   d) Level Alarms (where nominated).
7) Diagrams: Provide wiring diagrams in control panel in plastic sleeve. Clearly set out special operating procedures recommended by manufacturer on a panel and located in suitable position.

8.10.2 FLOAT SWITCHES

1) General: Provide one level switch with capability to read each liquid level required to be detected as described in the Project Specification.
2) Type: Radar sensor or Microwave.
3) Cable: Low moisture absorption type.

8.10.3 PRESSURE GAUGES

General: Provide a pressure gauge to indicate the pressure at the inlet and outlet of the system.

8.10.4 MARKING

1) Direction of rotation: Provide permanent indication on the principal component of the casing, indicating the direction of rotation.
2) Name plates: Attach to the casing permanent labels indicating the following:
   a) Make.
   b) Mode.
   c) Serial number.
   d) Casing material.
   e) Impeller material.
   f) Shaft material.
   g) Impeller diameter (if reduced).

APPENDIX A – HYDRAULIC EQUIPMENT SUPPLIER LIST

The tender is to allow for the preferred manufacturers. Should alternative equipment be offered the submission is to be presented with clear comparison documentation that provides evidence that quality and performance are equal or better. Subject to Scentre Group approval.

Equipment	Manufacturer
Sanitary fixtures and tapware in amenities	As specified
Urinal flushing device	As specified
Tapware	As specified
Thermostatic mixing valves	Enware, Rada, Hansa
Submersible pumps	Flygt, Grundfos, Mono
Surface pumps	Mono, Grundfos, Southern Cross
Grinder	Mono Muncher TR range, JWC Environmental Muffin Monster
Water meter	Bermad iPERL, Enware Hydrus
Gas meter	Email, Roots, Landis & Gyr (NMI pattern approved)
Electric hot water units	Rheem, Dux,
Pipe insulation	Armaflex FRV, Thermobreak.
Boiling and chilled water unit	Zip Hydro Tap, Clearwater Billi
Filtered and chilled water unit	Zip Chilltap, Aqua Cooler
Access covers and roof outlets	Gatic, S.P.S, Galvin
Stormwater pollution arrestor	Rocla, Kwikflo, Humeceptor, Littergard
Grease arrestors	As specified and approved by the local authority
Grease arrestor access platform	Weldlok Industries
Dissolved Air Filtration DAF Units	Hydrflux, Ovivo, Aerofloat
Fire water storage tank	Australian Panel Tanks, Tasman Tanks, Southern Cross
Water level alarm control	Vega,
Copper press fit joint system	Viega, KemPress

Table 11: Hydraulic Equipment Supplier List

DRAWING SCHEDULE

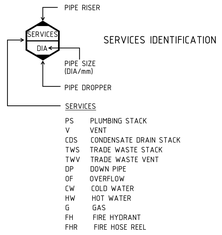
Drawing No.	Rev.	Drawing Title	Scale
HYD-00.0000	B	HYDRAULIC SERVICES COVER SHEET AND DRAWING SCHEDULE	N.T.S
HYD-00.0001	A	HYDRAULIC SERVICES PROJECT SPECIFICATION	N.T.S
HYG-10.0000	B	HYDRAULIC SERVICES SANITARY DRAINAGE & STORMWATER SERVICES DEMOLITION AND PROPOSED LAYOUTS	AS SHOWN
HYP-10.0000	B	HYDRAULIC SERVICES COLD WATER SERVICES PROPOSED LAYOUT	AS SHOWN

PIPEWORK LINE STYLE AND COLOUR SCHEME

SD	SANITARY DRAINAGE
SP	SANITARY PLUMBING
SRM	RISING SEWER MAIN
	VENT
DP	DOWN PIPE
SWD	STORMWATER DRAINAGE
CW	COLD WATER
XR	EXISTING SERVICES TO REMAIN
XD	EXISTING SERVICES TO BE DEMOLISHED

LEGEND

- ELBOW RISE
- ELBOW DROP
- TEE RISE
- BLANK FLANGE
- FLANGE CONNECTION
- CAP END
- PIPE CONTINUATION
- PIPE REDUCER
- FLOW DIRECTION
- PIPE RECONNECTION
- FWG — FLOOR WASTE GULLY
- BTFW — BUCKET FLOOR WASTE GULLY
- BT — BOUNDARY TRAP
- TD — TUNDISH
- AAV — AIR ADMITTANCE VALVE
- RV — REFLUX VALVE
- STP / TWTP — WASTE POINT
STP - SANITARY TENANCY POINT
TWTP - TRADE WASTE TENANCY POINT
- GREASE ARRESTOR
- CO — CLEAROUT
- IO — INSPECTION OPENING
- SMH / SWMH — MANHOLE
SMH - SANITARY MANHOLE
SWMH - STORMWATER MANHOLE
- PIT WITH SEALED LID
- PIT WITH GRATED LID
- GD — GRATED DRAIN
- RO — ROOF OUTLET
- SUMP
- EJ — EXPANSION JOINT
- DOWNPIPE SPREADER
- O/F — OVERFLOW
- PUMP
- WM — WATER METER
- HT — HOSE TAP
- CV — CONTROL VALVE
- RPZD — BACKFLOW PREVENTION DEVICE
- TMV — THERMOSTATIC MIXING VALVE
- GAS METER
- GAS REGULATOR
- HWU — HOT WATER UNIT
- HWU
- FHR — FIRE HOSE REEL
- FHV — FIRE HYDRANT VALVE
- IV — ISOLATING VALVE



SERVICES IDENTIFICATION

SERVICES

PS	PLUMBING STACK
V	VENT
CDS	CONDENSATE DRAIN STACK
TWS	TRADE WASTE STACK
TWV	TRADE WASTE VENT
DP	DOWN PIPE
OF	OVERFLOW
CW	COLD WATER
HW	HOT WATER
G	GAS
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL

ABBREVIATIONS

ACC.	ACCESSIBLE.
AFFL	ABOVE FINISH FLOOR LEVEL
B	BASIN
BTH	BATH
CI	CAST IRON
C.L.	CENTRE LINE
CLNR	CLEANER ROOM
CS	CLEANERS SINK
CU	COPPER
C/W	COMPLETE WITH
DBS	DOUBLE BOWL SINK
DW	DISH WASHER
EX	EXISTING
F/A	FROM ABOVE
F/B	FROM BELOW
FHRM	FIRE HYDRANT RING MAIN
FRL	FIRE RESISTANCE LEVEL
H/L	HIGH LEVEL
IC	INSPECTION CHAMBER
IL	INVERT LEVEL
IPMF	INDUCT PIPE MICA FLAP
KI	KERB INLET
KIP	KERB INLET PIT
L/L	LOW LEVEL
ORG	OVERFLOW RELIEF GULLY
PVC	POLY VINYL CHLORIDE
SB	SINGLE BOWL SINK
SHR	SHOWER
SS	STAINLESS STEEL
T/A	TO ABOVE
T/B	TO BELOW
TBA	TO BE ADVISED
TBC	TO BE CONFIRMED
TTD	TRAPPED TUNDISH
UR	URINAL
VB	VANITY BASIN
WC	WATER CLOSET

GENERAL NOTES

1. TO COMPLY WITH:
- SCENTRE GROUP GENERAL SPECIFICATION NSD-SDC-HYD-GSS-001 [10.0].
- HYDRAULIC PROJECT SPECIFICATION WML-C130139-SDC-HYD-00.0001.

2. THE PROJECT INVOLVES DESIGN OF THE NEW IN GROUND SEWER PUMP STATION TO REPLACE EXISTING AVAC VACUUM PUMP STATION. AVAC PUMP STATION AND ASSOCIATED REDUNDANT SERVICES TO BE DECOMMISSINED UPON COMPLETION OF THE THE NEW PUMP STATION.

3. AUTHORITIES AND STANDARDS
THE WHOLE OF THE PLUMBING SYSTEM, GENERALLY AS OUTLINED ON THE DRAWINGS, INCLUDING SANITARY DRAINAGE, COLD WATER SUPPLY, STORM WATER, FIRE HYDRANT AND FIRE HOSE REEL, SHALL BE UNDERTAKEN BY A FULLY LICENSED PLUMBER IN ACCORDANCE WITH ALL APPLICABLE PLUMBING CODES & REGULATIONS, AUSTRALIAN STANDARDS AND LOCAL AUTHORITY REQUIREMENTS. THE INSTALLATION SHALL BE IN A TRADESMAN LIKE MANNER AND TO THE SATISFACTION OF SCENTRE GROUP.

4. DRAWINGS
PRELIMINARY DRAWINGS AND RETURN BRIEF INDICATING THE CONTRACTORS DESIGN, IN ACCORDANCE WITH THE CONCEPT DESIGN AND SPECIFICATION PROVIDED AT TENDER, WILL BE PROVIDED AS REQUIRED BY THE AGREED DESIGN PROGRAMME. AFTER APPROVAL THE CONTRACTOR SHALL SUBMIT WORKSHOP DRAWINGS. ALLOW ADEQUATE TIME FOR THE RETURN OF THE REVIEW BY SCENTRE, ANY AMENDMENTS AND RESUBMISSION IF REQUESTED.

5. SITE VISIT AND FAMILIARISATION
TENDERS ARE ADVISED TO VISIT AND INSPECT THE SITE AND THE EXISTING AND/OR ADJACENT STRUCTURES PRIOR TO TENDERING TO ACQUAINT THEMSELVES WITH ITS NATURE, MEANS OF ACCESS, WORKING SPACE, NOTE LEVELS AND LOCAL CONDITIONS AND INCLUDE AND ALLOW FOR IN HIS TENDER ALL NECESSARY ITEMS WHICH ARE IMPLIED BUT WHICH MAY NOT BE STATED. THE TENDERER ACKNOWLEDGES THAT BEFORE TENDERING HE INSPECTED THE SITE AND HAS BECOME CONVERSANT WITH ALL VISIBLE EXISTING CONDITIONS OF ACCESS TO THE SITE FOR BUILDING PURPOSES AND HAS ALLOWED FOR ALL SUCH FACTORS IN THEIR TENDER. NO CLAIMS ARISING FROM THE NEGLECT OF THE FOREGOING ON THE GROUNDS OF IGNORANCE OF THE AMOUNT AND KIND OF WORK INVOLVED AND THE CONDITIONS UNDER WHICH THE WORKS WILL BE EXECUTED, WILL BE APPROVED.

6. EXISTING SERVICES
EXISTING SERVICES SHOWN ON THESE DRAWINGS HAVE BEEN INDICATED FROM AVAILABLE DATA AND RECORDS BUT MAY NOT REPRESENT THE ACTUAL ON SITE AS-BUILT SITUATION. THE CONTRACTOR IS RESPONSIBLE TO LOCATE AND VERIFY ALL SERVICES PRIOR TO COMMENCING WORK AND MUST NOTIFY SCENTRE GROUP AT A.S.A.P. SHOULD ANY MAJOR DISCREPANCIES EXIST THAT AFFECT OTHER TRADES AND THE PROJECT PROGRAM.

7. CO-ORDINATION & SETOUT
CO-ORDINATE NEW SERVICES WITH ALL OTHER TRADES AND EXISTING SERVICES. THE CONTRACTOR WILL BE RESPONSIBLE FOR SETTING OUT ALL PIPE RUNS, CORE HOLE PENETRATIONS AND SLEEVES AS NECESSARY TO COMPLETE THE WORKS. ALL PREFABRICATED PIPE SECTIONS MUST BE FIXED IN POSITION IN AMPLE TIME TO AVOID DELAY TO ANY OTHER TRADES.

8. PENETRATIONS AND SLAB SAW CUTTING
FLOOR PENETRATIONS AND SAW CUTTING SHALL BE UNDERTAKEN IN A METHOD APPROVED BY THE STRUCTURAL ENGINEER. SEAL ALL PENETRATION WITH APPROVED FIRE RATED MATERIAL TO MATCH MINIMUM FIRE RATING WHERE REQUIRED AND SEAL WITH AN APPROVED EPOXY SEALANT. CONTRACTOR PROVIDE SET OUT MARK-UP OF ALL PENETRATIONS AND SLAB SAW CUTS TO SCENTRE GROUP & STRUCTURAL ENGINEER FOR REVIEW & APPROVAL PRIOR TO WORKS BEING CARRIED OUT.

9. MATERIALS
MATERIALS USED SHALL BE NEW AND MANUFACTURED AND APPROVED IN ACCORDANCE WITH THE RELEVANT AUSTRALIAN STANDARD AND SCENTRE GROUP GENERAL SPECIFICATION GS-HS[8]. WHERE REQUIRED ALL MATERIALS SHALL HAVE THE APPROPRIATE WATERMARK.
MATERIAL SHALL MATCH EXISTING MATERIALS WHEREVER POSSIBLE.

10. DURING CONSTRUCTION
ALL ROUGH-IN WORKS ARE TO BE INSPECTED BY SCENTRE GROUP PRIOR TO CONCEALMENT. CONTRACTOR SHALL COORDINATE & REQUEST INSPECTION SO AS NOT TO DELAY SITE WORKS.

11. TESTING
TEST ALL SERVICES DURING INSTALLATION AND PRIOR TO CONCEALING IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND TO LOCAL AUTHORITY REQUIREMENTS. ANY LEAKS SHALL PER RECTIFIED AND RETESTED AS PER THE TEST REQUIREMENTS.

12. CERTIFICATION
THE CONTRACTOR SHALL CERTIFY THE DESIGN. UPON COMPLETION SHALL CERTIFY THE INSTALLATION AND PROVIDE A COPY OF THE REQUIRED CERTIFICATES TO SCENTRE GROUP.

13. AS BUILT DOCUMENTATION
THE CONTRACTOR SHALL KEEP ACCURATE MARKED UP RECORDS OF THE PLUMBING INSTALLATION DURING CONSTRUCTION AND SHALL SUBMIT UPON COMPLETION A SET OF AS BUILT DRAWINGS FOR APPROVAL TO SCENTRE GROUP. APPROVED AS BUILT DRAWINGS SHALL BE PROVIDED TO SCENTRE GROUP IN BOTH PDF AND AUTOCAD FORMAT.

SCENTRE GROUP
Scentre Design & Construction

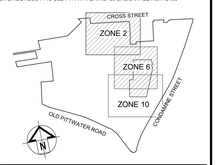
WARRINGAH MALL
C130139
AVAC SEWER PUMP STATION REPLACEMENT

WML-C130139-SDC-HYD-00.0001 [B]

TO BE PRINTED IN COLOUR ONLY

Rev	Date	By	Description
A	03.10.2024	NS	REVISED COSTING ISSUE
A	03.09.2024	NS	NE COSTING ISSUE

SITE ADDRESS : 145 OLD PITTWATER ROAD, BROOKVALE NSW 2100



AMP CAPITAL

SCENTRE GROUP
Scentre Design & Construction
"people protecting people"

General Note:
DRAWINGS TO BE CHECKED ON SITE. WRITTEN DIMENSIONS ONLY TO BE USED. REFER TO ALL DETAIL DRAWINGS, STRUCTURAL, MECHANICAL & SERVICES DRAWINGS BEFORE COMMENCING WORK. REFER ANY DISCREPANCIES TO THE ARCHITECT. DO NOT SCALE FROM DRAWINGS.
COPYRIGHT OF THE DESIGNS AND DRAWINGS PRODUCED BY SCENTRE DESIGN AND CONSTRUCTION. WRITTEN AUTHORITY IS REQUIRED FOR ANY REPRODUCTION.

SCENTRE GROUP
Creating Extra-ordinary Places, Connecting & Enriching Communities
WARRINGAH

Scentre Design and Construction Pty Limited
85 Castlereagh Street Sydney NSW 2000
Phone (02) 9358 7000 Fax (02) 9028 8500
GPO Box 4004 Sydney NSW 2001
ACN 000 267 265

Title
AVAC SEWER PUMP REPLACEMENT HYDRAULIC SERVICES COVER SHEET AND DRAWING SCHEDULE

Drawing Scale: NTS	Scale Bar 1:1: 0 10 20 30 40 50
Project No.: C130139	Plot Date: 04/04/2024 3:00:55 PM
Drawing No.: SDC-HYD-00.0000	Revision: B

COSTING ISSUE

CAD Filename - C:\Users\jguan\Documents\SDC_WR_C130139_SHEET3_RVT20_JGuanVVL48.rvt

PROJECT SPECIFICATION

SCENTRE SERVICES CONTRACTS ARE LET ON THE BASIS OF FULL DESIGN AND CONSTRUCT. THE FOLLOWING SPECIFICATION, AND ALL ASSOCIATED CONTRACT DOCUMENTS, ARE INTENDED TO PROVIDE GUIDANCE TO TENDERERS ESTABLISHING THE SCOPE OF THE WORK, SYSTEM CONCEPTS, DESIGN PARAMETERS, NATURE OF THE INSTALLATION, CONTROL AND OPERATION PRINCIPLES AND STANDARDS OF WORKMANSHIP, MATERIALS AND EQUIPMENT WHICH ARE UNIQUE TO THIS PROJECT.

PRELIMINARY DESIGN, IN THE FORM OF DRAWINGS, EQUIPMENT SCHEDULES OR THE LIKE, IS PROVIDED FOR TENDER GUIDELINE PURPOSES ONLY AND TO PROVIDE INFORMATION TO THE CONTRACTOR AS TO THE PREFERRED INTENT.

THE CONTRACTOR WILL HOLD FULL RESPONSIBILITY FOR THE IMPLEMENTATION OF ALL REQUIREMENTS INTO THEIR DEVELOPED DESIGN ON AWARD OF CONTRACT AND ASSUME RESPONSIBILITY FOR THE COMPLETE AND SUCCESSFUL OPERATION OF THE ENTIRE PROJECT, INCLUDING ANY ADJUSTMENTS TO SYSTEMS EQUIPMENT AND CAPACITIES AND OTHER WORKS WHETHER SPECIFICALLY MENTIONED OR NOT TO PROVIDE A FULLY FUNCTIONAL INSTALLATION.

ON CONTRACT AWARD THE CONTRACTOR WILL TAKE RESPONSIBILITY FOR, AND PAY FOR, ALL ALTERATIONS OF THE WORKS DUE TO ANY DISCREPANCIES, ERRORS OR OMISSIONS IN THE WORKING DRAWINGS, TECHNICAL DATA OR OTHER INFORMATION SUPPLIED UNDER THE CONTRACT, WHETHER SUCH PRINTS OF DRAWINGS, TECHNICAL DATA OR INFORMATION HAVE BEEN REVIEWED OR NOT.

THE CONTRACTOR SHALL COMPLY WITH THE GENERAL SPECIFICATION FOR PERFORMANCE, MATERIALS AND WORKMANSHIP WHEREVER APPLICABLE UNLESS OTHERWISE SPECIFIED IN THIS DOCUMENT; MUST COMPLY WITH ALL SCENTRE CONTRACT DOCUMENTS.

1. GENERAL

1.1. RESPONSIBILITIES

1.1.1. THIS CONTRACT IS A DEVELOP DESIGN AND CONSTRUCT CONTRACT. A PRELIMINARY DESIGN IS PROVIDED AS PART OF THIS PROJECT SPECIFICATION. THE CONTRACTOR MUST:

1.1.1.1. DESIGN AND SPECIFY THE WORKS, INCLUDING PREPARATION OF THE DESIGN DOCUMENTS;

1.1.1.2. PROVIDE, INSTALL, TEST AND COMMISSION THE BUILDING SERVICES, INCLUDING ALL LABOUR AND MATERIALS THAT ARE NECESSARY FOR A COMPLETE AND WORKING INSTALLATION; AND

1.1.1.3. THE CONTRACTOR MUST WARRANT THAT THE WORKS WHEN COMPLETED ARE FIT FOR THE STATED PURPOSE, THIS BEING THAT DESCRIBED BY THE SCOPE OF WORKS AND TECHNICAL REQUIREMENTS AS OUTLINED WITHIN THIS SPECIFICATION, AND COMPLY WITH ALL THE REQUIREMENTS OF THE CONTRACT AND SPECIFICATIONS.

1.2. NATIONAL CONSTRUCTION CODE AND AUSTRALIAN STANDARDS

1.2.1. COMPLY WITH THE NATIONAL CONSTRUCTION CODE (NCC) IN FORCE AT THE TIME OF THE DEVELOPMENT APPLICATION OR CONSTRUCTION CERTIFICATE IS MADE, DEPENDING ON THE STATE OF AUSTRALIA IN WHICH THE PROJECT IS BEING UNDERTAKEN.

1.2.2. UNLESS OTHERWISE SPECIFIED, ANY AUSTRALIAN STANDARD (AS) REFERRED TO IN THIS SPECIFICATION AND THE GENERAL SPECIFICATION MEANS THE EDITION THAT IS ADOPTED BY REFERENCE IN THE ABOVE NCC. IF THE AUSTRALIAN STANDARD IS NOT ADOPTED BY THE NCC, THEN THE LATEST EDITION OF THE STANDARD WILL APPLY.

1.3. CONTRACT DOCUMENTS

1.3.1. THE DOCUMENTS APPLICABLE TO THIS CONTRACT ARE REFERENCED IN THE ATTACHMENT A - SCOPE OF WORKS, AS ISSUED AT THE TIME OF TENDER AND UPDATED FOR CONTRACT AWARD.

1.4. CONTRACT DRAWINGS

1.4.1. THE CONTRACTOR IS TO ALLOW FOR ALL ITEMS OF WORK, SHOWN OR NOT SHOWN ON THE DRAWINGS, WHICH ARE REQUIRED TO COMPLETE THE WORKS IN COMPLIANCE WITH THE DESIGN REQUIREMENTS.

1.4.2. THE DRAWINGS ARE DIAGRAMMATIC AND INDICATIVE ONLY. THEY ARE NOT INTENDED FOR CONSTRUCTION PURPOSE. IN CONJUNCTION WITH THE 'DESIGN REQUIREMENTS' DESCRIBED IN THIS SPECIFICATION, THE DRAWINGS ARE USED TO INDICATE THE GENERAL CONCEPT LAYOUT OF THE SYSTEMS AND TO DESCRIBE THE PERFORMANCE REQUIREMENTS.

1.4.3. THE QUANTITY AND SPECIFICATION OF EQUIPMENT SHOWN ON THE DRAWINGS AND THE ASSOCIATED SCHEDULES ARE THE MINIMUM REQUIREMENTS AND MAY NOT NECESSARILY BE COMPLETE; THE CONTRACTOR MUST PROVIDE ALL DESIGN REQUIREMENTS TO VERIFY THE EQUIPMENT AND ASSOCIATED INSTALLATION THAT IS DELIVERED AND MUST DETAIL ALL SUCH EQUIPMENT AS IS REQUIRED FOR A COMPLETE AND WORKING INSTALLATION TO ATTAIN THE SPECIFIED PERFORMANCE.

2. DESIGN BY THE CONTRACTOR

2.1. GENERAL

2.1.1. THE CONTRACTOR MUST DEVELOP THE CONCEPT DESIGN SHOWN ON THE DRAWINGS INTO A FULLY DETAILED CO-ORDINATED FINAL DESIGN, AND MUST COORDINATE WITH THE ARCHITECT, STRUCTURAL ENGINEER AND OTHER CONTRACTORS TO PREPARE DEVELOPED DESIGN DOCUMENTS AND WORKSHOP DRAWINGS FOR CONSTRUCTION PURPOSES.

2.2. ALTERNATIVE DESIGN

2.2.1. EXCEPT WHERE SPECIFICALLY PRECLUDED IN THIS SPECIFICATION, THE CONTRACTOR CAN OFFER ALTERNATIVE DESIGN TO THE PROJECT MANAGER FOR CONSIDERATION. THE ALTERNATIVE DESIGN MUST BE PRESENTED TO SDC FOR APPROVAL AND COMPLY WITH ALL DESIGN REQUIREMENTS.

2.2.2. AN ALTERNATIVE DESIGN THAT REQUIRES THE RELOCATION OF ANY DESIGNATED PLANT AREAS AND THE LIKE, AND WILL PRODUCE SIGNIFICANT SAVINGS, MAY BE CONSIDERED BY SCENTRE PROVIDING THE COST IMPACT ON OTHER WORK SCOPES DOES NOT OUTWEIGH THE COST BENEFITS TO THIS TRADE.

2.3. SAFETY IN DESIGN

2.3.1. THE CONTRACTOR IS TO ENSURE THAT ALL DESIGN ACHIEVES THE OBLIGATIONS FOR SAFETY IN DESIGN AS REQUIRED UNDER THE WORKPLACE HEALTH AND SAFETY LEGISLATION OF AUSTRALIA AND AS RELEVANT TO THE STATE IN WHICH THE PROJECT IS LOCATED.

2.3.2. IN ADDITION TO THE LEGISLATIVE REQUIREMENTS THE CONTRACTOR MUST ALLOW TO DESIGN, DOCUMENT, COORDINATE AND INSTALL THE WORKS IN ACCORDANCE WITH THE SCENTRE SAFETY IN DESIGN REQUIREMENTS FOR ALL AND ANY WORKS ASSOCIATED WITH THIS TRADE.

2.3.3. MAINTENANCE: THE CONTRACTOR SHALL ENSURE THAT ALL PLANT AND EQUIPMENT WILL BE INSTALLED IN A MANNER THAT ALLOWS FOR SAFE, REASONABLE AND PROPORTIONATE ACCESS FOR MAINTENANCE TO OCCUR.

2.4. DOCUMENTATION STAGES

2.4.1. DILAPIDATION PHASE

2.4.1.1. A DETAILED INVESTIGATION IS TO BE UNDERTAKEN INTO THE EXISTING SYSTEMS THAT WILL BE IMPACTED BY THE NEW DESIGN. THE OUTCOME WILL BE THE PROVISION OF A DILAPIDATION REPORT TO ENSURE THAT THE NEW INSTALLATION WILL NOT HAVE AN ADVERSE IMPACT ON THE OPERATIONAL CENTRE. THE REPORT WILL ALSO PROVIDE ADVICE ON THE LONGEVITY AND CONDITION OF THE PLANT AND EQUIPMENT.

2.4.1.2. THE CONTRACTOR ASSUMES RESPONSIBILITY FOR THE INTEGRATION OF THE NEW AND EXISTING SYSTEMS. THE DILAPIDATION REPORT WILL PROVIDE DETAIL ON WHAT NEEDS TO BE ADDRESSED PRIOR TO ANY WORKS COMMENCING. SCENTRE GROUP WILL PROVIDE DIRECTION WHAT WORKS IF ANY NEED TO BE CARRIED OUT.

2.4.2. DESIGN PHASE

2.4.2.1. PRELIMINARY DRAWINGS AND RETURN BRIEF INDICATING THE CONTRACTORS DESIGN, IN ACCORDANCE WITH THE CONCEPT DESIGN AND SPECIFICATION PROVIDED AT TENDER, WILL BE PROVIDED AS REQUIRED BY THE AGREED DESIGN PROGRAMME.

2.4.2.2. ALL CALCULATIONS, REPORTS AND SUBMISSIONS WILL ALSO BE PROVIDED FOR SCENTRE REVIEW AS STIPULATED BY THIS SPECIFICATION AND WITHIN THE TIMEFRAMES REQUIRED BY THE AGREED DESIGN PROGRAMME.

2.4.2.3. APPROVAL BY AUTHORITIES, OWNERS' NOMINATED INSURER AND/OR ANY OTHER STATUTORY BODIES MUST BE SOUGHT AND OBTAINED, VIA SCENTRE, BY THE CONTRACTOR DURING THIS PHASE.

2.4.2.4. COORDINATE AND ACCEPT RESPONSIBILITY FOR THE TECHNICAL AND SPATIAL ASPECTS OF PLANT AND LAYOUTS, INCLUDING CONSTRUCTION TOLERANCES.

2.4.3. CONSTRUCTION PHASE

2.4.3.1. DRAWINGS SHALL BE UPDATED AS REQUIRED TO MAINTAIN ACCURACY AND CO-ORDINATION WITH ALL DISCIPLINES. PDF'S ARE TO BE UPLOADED ONTO THE WEB BASED DOCUMENT CONTROL SYSTEM IN USE ON THE PROJECT IN ACCORDANCE WITH THE DETAILED DESIGN PROGRAMME.

2.4.4. WORKSHOP DRAWINGS

2.4.4.1. SUBMIT WORKSHOP DRAWINGS IN ACCORDANCE WITH THE DETAILED DESIGN PROGRAMME IN ADEQUATE TIME FOR THE BUILDING CONSTRUCTION PROGRAMME TO BE COMPLIED WITH. ALLOW ADEQUATE TIME FOR THE RETURN OF THE REVIEW BY SCENTRE, ANY AMENDMENTS AND RESUBMISSION IF REQUESTED.

2.4.5. CERTIFICATION

2.4.5.1. SUBMIT DESIGN AND DESIGN DOCUMENTS TO, AND OBTAIN AUTHORITY'S APPROVAL FOR THE DESIGN AND THE DESIGN DOCUMENTS AS REQUIRED. A SCHEDULE IS TO BE ESTABLISHED FOR TRACKING PURPOSES BY THE CONTRACTOR OF ALL REQUIRED AUTHORITY APPROVALS AND ISSUED TO SDC ON A REGULAR BASIS.

2.4.5.2. IF REQUIRED BY THE STATE REGULATIONS, THE DESIGN AND DOCUMENTATION MUST BE CARRIED OUT BY REGISTERED PROFESSIONAL ENGINEERS OR PRACTITIONERS.

2.5. TENANCY LEASE PLANS

2.5.1. THE LOCATION OF THE TENANCY SERVICES AS SHOWN ON THE LEASE PLANS WILL TAKE PRECEDENCE OVER THAT SHOWN ON THE BASE BUILD DRAWINGS. FOR CLARITY - ALL INSTALLATIONS MUST COMPLY WITH THE LEASE PLAN AT THE TIME OF TENANCY CONSTRUCTION AND THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT THE BASE BUILD LAYOUT IS COORDINATED WITH THAT SHOWN ON THE LEASE PLANS.

2.5.2. WHERE ACCESS PANELS ARE REQUIRED WITHIN TENANCIES FOR BASE BUILD SERVICES THIS MUST BE SHOWN ON THE LEASE PLANS.

2.5.3. ANY OF THE CONTRACTORS SERVICES NOT SHOWN ON THE LEASE PLAN AND NOT ABOVE THE REQUIRED SERVICES CLEARANCE ZONE ARE TO BE RELOCATED AT THE CONTRACTORS COST.

2.6. SCHEDULE OF EQUIPMENT

2.6.1. THE CONTRACTOR SHALL NOMINATE EQUIPMENT IN THE SCHEDULE OF EQUIPMENT TO MEET THE REQUIREMENTS OF THIS SPECIFICATION. IF EQUIPMENT OF ALTERNATIVE MANUFACTURE OR MODEL TO THOSE NOMINATED IS OFFERED AFTER THE CONTRACT IS AWARDED, THE ALTERNATIVE EQUIPMENT MUST BE EQUAL OR BETTER IN QUALITY AND PERFORMANCE.

2.6.2. THE BURDEN OF PROOF WILL LIE WITH THE CONTRACTOR TO DEMONSTRATE THAT ANY ALTERNATIVE EQUIPMENT IS EQUAL TO OR BETTER IN PERFORMANCE THAN THAT NOMINATED AND MUST NOT IMPACT ON OTHER TRADES WORKS. ANY SUCH IMPACTS TO OTHER TRADES WILL BE AT THE CONTRACTORS COST.

2.6.3. THE CONTRACTOR EQUIPMENT SCHEDULES NEED TO BE PRODUCED IN ACCORDANCE WITH THE SDC ASSET NAMING CONVENTIONS AND WILL NEED TO BE SITE SPECIFIC. A DETAILED LIST OF EQUIPMENT SCHEDULES WILL NEED GO THROUGH THE APPROVAL PROCESS.

2.6.4. THE PROJECT MANAGER HAS THE DISCRETION OF ACCEPTING OR REJECTING THE ALTERNATIVE EQUIPMENT. THE DECISION OF THE PROJECT MANAGER DOES NOT ENTITLE THE CONTRACTOR TO ANY VARIATION OR EXTENSION OF TIME.

2.6.5. ALL DETAILS REGARDING THE PLANT AND EQUIPMENT UNDER THIS CONTRACT ARE TO BE FORWARDED ONTO THE NFM TEAM FOR INCLUSION IN THE CENTRE ASSET REGISTER AND THE COMPUTERISED MAINTENANCE MANAGEMENT SYSTEM (CMMS).

2.7. DOCUMENTATION TOOLS

2.7.1. GENERAL

2.7.1.1. THE CONTRACTOR IS TO DOCUMENT IN AUTOCAD (OR REVIT IF ADVISED BY SCENTRE) TO THE VERSION IN USE AT THE TIME OF THE PROJECT, TO BE ADVISED ON CONTRACT AWARD.

2.7.2. AUTOCAD DOCUMENTATION

2.7.2.1. PREPARE PROJECT MODEL WORKING DRAWINGS BASED ON THE ARCHITECTURAL PROJECT DRAWINGS.

2.7.2.2. THE SCENTRE GROUP AUTOCAD STANDARDS - AS APPLICABLE TO THE PROJECT. A FULL SUITE OF STANDARDS IS AVAILABLE ON REQUEST AND WILL BE PROVIDED TO THE CONTRACTOR ON CONTRACT AWARD. THE CONTRACTOR'S AUTOCAD DRAWINGS ARE TO BE PRODUCED IN ACCORDANCE WITH THESE STANDARDS AND THE CONTRACTOR WILL BE REQUIRED TO COMPLY WITH THESE DOCUMENTATION STANDARDS.

2.7.2.3. THE CONTRACTOR IS TO ENSURE THAT THE TAGGING AND ASSET NAMING CONVENTIONS ARE FOLLOWED WITHIN THEIR DRAWINGS. THE SDC ASSET REGISTER WILL NEED TO BE POPULATED AS PART OF THE EQUIPMENT SCHEDULES FOR APPROVAL BY THE SDC ENGINEERS.

2.7.3. DATA EXCHANGE

2.7.3.1. ALL DATA EXCHANGE SHALL BE CARRIED OUT VIA ACONEX (OR SIMILAR WEB BASED COLLABORATION SYSTEM). THE CONTRACTOR WILL REQUIRE AN INTERNET CONNECTION OF SUFFICIENT SPEED / CAPACITY FOR DATA EXCHANGE, INCLUDING BOTH SENDING AND RECEIVING PROJECT DRAWINGS AND DATA.

3. EXECUTION

3.1. CERTIFICATES OF COMPLIANCE

3.1.1. THE CONTRACTOR MUST PROVIDE A CERTIFICATE OF COMPLIANCE SIGNED BY A REGISTERED ACCREDITED ENGINEER ACCEPTABLE TO THE AUTHORITIES AND THE PROJECT MANAGER, TO CERTIFY THAT THE ESSENTIAL SERVICES WHICH FORM PART OF THE WORKS, HAVE BEEN DESIGNED IN COMPLIANCE WITH THE RELEVANT BUILDING REGULATIONS, AUSTRALIAN STANDARDS AND AUTHORITY'S REQUIREMENTS. THIS ENGINEER MUST CHECK AND SIGN OFF ALL ESSENTIAL DESIGN AND DOCUMENTATION PREPARED BY THE CONTRACTOR.

3.2. TRAINING

3.2.1. CONDUCT TRAINING FOR SCENTRE'S REPRESENTATIVES AT AN AGREED TIME, USING DRAFT O&M MANUALS - AS A MINIMUM.

3.3. WORKS AS EXECUTED (AS-BUILT) DRAWINGS

3.3.1. GENERAL: AS-BUILT DRAWINGS SHOULD CONTAIN THE FOLLOWING INFORMATION AS A MINIMUM:

3.3.1.1. PROVIDE ALL NECESSARY INFORMATION OF CONTRACTOR'S DESIGNED SYSTEMS NOTING THAT THE AS-BUILT DOCUMENT IS NOT A SHOP DRAWING.

3.3.1.2. CONTAIN SUCH INFORMATION AS, BUT NOT EXHAUSTIVE OF AIR FLOW DIRECTION, AIR VOLUMES, INSTALLATION, SIZING, ETC.

3.3.1.3. ADD ALL RELATED SHOP DRAWINGS TO AS-BUILT DRAWINGS AS AN APPENDIX TO THE DRAWINGS. MAKE SURE THERE ARE REFERENCES ON THE DRAWING PAGE TO THE APPENDIX.

3.3.1.4. UPDATE THE INDEX SHEET TO SHOW THE LATEST DRAWING CHANGES OR ADDITIONS

3.3.1.5. AS BUILT DRAWINGS TO BE ISSUED UPON COMPLETION OF THE PROCESS ABOVE.

3.4. OPERATION AND MAINTENANCE MANUALS

3.4.1. GENERAL

3.4.1.1. THE CONTRACTOR SHALL SUBMIT OPERATION AND MAINTENANCE MANUALS ON THE WEB BASED SYSTEM IN USE BY SCENTRE FOR THIS PROJECT IN ACCORDANCE WITH THE RELEVANT GUIDELINES AND REQUIREMENTS REFERRED TO IN GENERAL SPECIFICATION.

4. STANDARD REQUIREMENTS

4.1. FIRE ENGINEERING REPORT

4.1.1. COMPLIANCE WITH THE FIRE ENGINEERING REPORT IS TO BE INTEGRATED THROUGHOUT ALL ASPECTS OF THE DESIGN.

4.2. FIRE SEPARATION REQUIREMENTS

4.2.1. THE CONTRACTOR IS TO COMPLY WITH THE FIRE SEPARATION REQUIREMENTS AS DETAILED IN THE FIRE ENGINEERING REPORT AND THE ARCHITECTURAL OR FIRE DRAWINGS PROVIDED BY SCENTRE. IT IS INCUMBENT ON THE CONTRACTOR TO ENQUIRE REGARDING THE DIFFERENT FIRE COMPARTMENTS OF THE PROJECT AND INCORPORATE THE REQUIREMENTS IN THE DESIGN.

4.2.2. ALL SERVICES PENETRATING THROUGH A FIRE WALL OR FLOOR ARE TO BE SEALED / PROTECTED TO STANDARD AS REQUIRED BY THE NCC. THE CONTRACTOR IS TO INCLUDE ALL COST OF THIS WITHIN THEIR PRICE AND ASSUME THAT THIS WILL NOT BE ACHIEVED BY ANY FORM OF BUILDERS WORKS BY OTHERS.

4.3. PENETRATIONS

4.3.1. GENERAL

4.3.1.1. THE CONTRACTOR IS TO ALLOW FOR ALL CORE HOLES AND PENETRATIONS AS REQUIRED TO INSTALL THE WORKS. ALL FIRE-SEALING, FIRE COLLARS, ACOUSTIC SEALING, SMOKE SEALING AND WATER PROOFING OF SUCH PENETRATIONS ARE THE RESPONSIBILITY OF THE CONTRACTOR.

4.3.2. WATER-PROOFING

4.3.2.1. WATER-STOP FLANGES SHALL BE PROVIDED AROUND PIPES PASSING THROUGH FLOORS AND WALLS SUBJECT TO WATER INGRESS, OR WHERE THE POSSIBILITY EXISTS FOR WATER LEAKAGE.

4.3.2.2. WATER-STOP FLANGES SHALL BE OF THE SAME MATERIAL AS THE PIPE WITH AN EXTERNAL DIAMETER TWICE THE DIAMETER OF THE PIPE. THE FLANGE SHALL BE INTEGRAL TO THE CASTING, OR WELDED, BRAZED, SILVER SOLDERED OR SEALED TO APPROVAL TO THE PIPING.

4.3.2.3. THE CONTRACTOR SHALL PROVIDE OVER FLASHING WHERE SERVICES PENETRATE THE ROOF OR FACADE. ALL PENETRATIONS SHALL BE SEALED WATERTIGHT AT THE HIGHEST CONSTRUCTION LEVEL TO PREVENT ENTRY OF STORMWATER DURING AND POST CONSTRUCTION.

4.3.2.4. ALL WATERPROOFING SOLUTIONS AND INSTALLATION DETAILS ARE TO BE SUBMITTED FOR APPROVAL BY THE RELEVANT WATERPROOFING/ ARCHITECTURAL SPECIALIST.

4.4. SURFACE MOUNTED AND CAST IN CONDUITS

4.4.1. THE CONTRACTOR IS TO ALLOW FOR THE ITEMS LISTED BELOW THAT SHALL SERVE AS A GUIDELINE FOR CONDUIT INSTALLATIONS WITHIN SCENTRE GROUP ASSETS, WHICH AS A MINIMUM MUST COMPLY WITH AS/NZS3000.

4.4.2. IT SHOULD BE NOTED THAT THE DEFAULT PROCEDURE FOR ALL PROPOSED INSTALLATIONS IS TO RETICULATE ELECTRICAL SERVICES USING SURFACE MOUNTED CONDUIT, OR CABLE MANAGEMENT SYSTEMS FIXED TO THE UNDERSIDE OF SLABS. UNDER NO CIRCUMSTANCES SHALL CONDUITS BE CAST-IN SLABS, UNLESS THE CONTRACTOR HAS OBTAINED WRITTEN APPROVAL FROM THE PROJECT SERVICES MANAGER AND/OR PROJECT MANAGER AND/OR SPECIAL PROJECTS COORDINATOR PRIOR TO THE UNDERTAKING ANY WORKS.

4.4.3. FOR PROPOSED INSTALLATIONS:

4.4.3.1. UNLESS OTHERWISE APPROVED BY SCENTRE GROUP, SERVICES ARE TO BE RETICULATED VIA SURFACE MOUNTED CONDUIT OR CABLE MANAGEMENT SYSTEMS FIXED TO THE UNDERSIDE OF SLABS.

4.4.3.2. CONDUITS RETICULATED FOR ROOFTOP SERVICES (E.G. CAR PARK POLE LIGHTS) SHALL BE RUN IN SLAB WITHIN BEAMS, OR SHALL BE RUN IN CEILING SPACE OF THE LOWER LEVEL, FIXED TO THE UNDERSIDE OF SLAB (WHERE AN EXISTING INSTALLATION IS BEING MODIFIED). ALL CONDUITS SHALL HAVE AN UPTURN AND PENETRATION DIRECTLY BENEATH EACH SERVICE WITH APPROPRIATE MEASURES TAKEN TO WATERPROOF THE SLAB.

4.4.3.3. SLAB ON GROUND CONCRETE POURS ARE TO HAVE CONDUITS INSTALLED BENEATH THE SLAB.

4.4.3.4. CONDUITS FOR GROUND LEVEL SERVICES IN MALLS ARE TO BE INSTALLED WITHIN A "SERVICES ZONE" AND RUN PARALLEL TO EACH OTHER AND BUILDING GRIDS. ACCESS PITS TO BE LOCATED WITHIN MALL AREAS AT EVERY CHANGE OF DIRECTION.

4.4.3.5. CONDUITS RETICULATED WITHIN COLUMN CLADDING TO BE HEAVY DUTY PVC (HD PVC) AND INSTALLED IN A STRAIGHT VERTICAL ARRANGEMENT, AND HAVE THEIR LOCATION IDENTIFIED AT THE TOP OF THE COLUMN OR CEILING. SUBMAINS CABLING OF ALL TYPES SHALL NOT BE RETICULATED WITHIN COLUMN CLADDING OR WALL PARTITIONS/CAVITIES.

4.4.4. FOR PROPOSED INSTALLATIONS WHERE SERVICES CANNOT BE RETICULATED USING THE ABOVE SYSTEMS:

4.4.4.1. IF WRITTEN APPROVAL IS GIVEN TO CAST IN SLABS, CONDUITS ARE TO BE TIED ON BAR CHAIRS WITH A MINIMUM 60MM CLEARANCE ABOVE THE FORMWORK LEVEL AND BE RETICULATED IN BEAMS WHERE POSSIBLE. IN ANY EVENT THE CONDUIT IS TO BE RUN BETWEEN THE TOP AND BOTTOM LAYERS OF REINFORCEMENT.

4.4.4.2. CONDUIT PATHWAYS ARE TO PARALLEL TO GRIDS, BETWEEN FITTINGS AND FIXTURES INSTEAD OF SHORTEST POSSIBLE (OR DIAGONAL) ROUTES.

4.4.4.3. CASTING CONDUITS IN COLUMNS SHOULD BE AVOIDED. IF THERE IS NO OTHER OPTION, CONDUITS CAST IN COLUMNS TO BE LOCATED WITHIN STEEL REINFORCEMENT, AND WRITTEN APPROVAL FROM THE PROJECT SERVICES MANAGER SHALL BE OBTAINED.

4.4.5. FOR FURTHER DETAILS, REFER TO ELECTRICAL SERVICES DRAWING ES99.0000.

4.5. BUILDERS WORKS IN CONNECTION WITH SERVICES

4.5.1. GENERAL

4.5.1.1. PRIOR TO CONTRACT AWARD, THE CONTRACTOR IS TO PROVIDE A COMPLETE LIST OF REQUIRED BWIC (INCLUDING ANY ASSOCIATED STRUCTURAL REQUIREMENTS) THAT HAS BEEN ASSUMED WITHIN THEIR PRICING. THIS LIST WILL DEFINE THE SCOPE OF THE WORKS TO BE PROVIDED BY SCENTRE FOR THE CONTRACTOR AND WILL BE INCLUDED AS PART OF THE CONTRACT DOCUMENTS.

4.5.1.2. ANY ITEMS NOT PROVIDED ON THE AGREED LIST, AND REQUIRED FOR THE INSTALLATION OF THE WORKS, WILL BE UNDERTAKEN BY SCENTRE FOR THE CONTRACTOR, AT THE CONTRACTOR'S COST.

4.5.2. ACCESS TO SERVICES

4.5.2.1. THE CONTRACTOR SHALL SUBMIT MARKED UP REFLECTED CEILING PLANS, CONFIRMING CEILING TILES / PANELS TO BE LEFT OUT FOR COMMISSIONING PURPOSES, TOGETHER WITH ANY PERMANENT CEILING ACCESS POINTS REQUIRED FOR MAINTENANCE OF THE CONTRACT WORKS.

4.5.2.2. ALL ACCESS PANELS WITHIN TENANCIES THAT ARE REQUIRED FOR THE CONTRACTOR'S ADDITIONAL SERVICES TO SUIT THE TENANTS' FITOUT, ARE TO BE INDICATED ON THE TENANTS' DESIGN PLANS AND PROVIDED TO THE SCENTRE TENANCY COORDINATOR, WITH THE FINAL SERVICES LAYOUT, AT THE TIME OF PRICING THE TENANT'S FITOUT WORKS.

4.5.2.3. ANY ACCESS PANELS OR AREAS THAT ARE TO BE LEFT OUT FOR COMMISSIONING AND WHICH ARE NOT SHOWN ON THE DRAWINGS, AND THAT AT A LATER DATE ARE REQUIRED TO BE INSTALLED OR REMOVED AND REINSTATED AS APPROPRIATE, WILL BE CARRIED OUT BY SCENTRE AT THE CONTRACTOR'S COST.

4.6. ON-SITE CO-ORDINATION RESPONSIBILITIES

4.6.1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ALL WORKS ARE COORDINATED BOTH AT THE DESIGN STAGE AND ALSO ONCE ON SITE. NO VARIATION WILL BE PAID FOR THE RELOCATION, MODIFICATION OR OTHERWISE OF ANY SERVICES ONCE INSTALLED DUE TO LACK OF CO-ORDINATION PRIOR TO INSTALL. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONDUCT THE SERVICE TO SERVICES CO-ORDINATION ON SITE. ALL CO-ORDINATION NEEDS TO BE COMPLETED IN ACCORDANCE WITH THE CONSTRUCTION PROGRAMME.

4.7. INTERFACE WORKS

4.7.1. ANY MODIFICATIONS OR INTERFACE WORKS TO THE EXISTING CENTRE SYSTEMS SHALL BE UNDERTAKEN IN SUCH A MANNER SO AS NOT TO ADVERSELY IMPACT THE PERFORMANCE, OPERATIONAL OR OTHERWISE, OF THOSE SYSTEMS.

4.7.2. UTILISATION OF AND INTERFACE WITH EXISTING CENTRE SYSTEMS

4.7.2.1. WHERE THE CONTRACTOR HAS INCLUDED WITHIN THEIR DESIGN TO UTILISE ANY EXISTING SYSTEMS FOR THE PURPOSES OF ANY RE-DEVELOPMENT OR EXPANSION THEN THE CAPACITY / ABILITY OF ANY SUCH SYSTEM IS TO BE VERIFIED BY THE CONTRACTOR.

4.7.2.2. WHERE THE SCOPE OF WORKS INCLUDES WORKS WITHIN AN EXISTING PART OF A CENTRE, THE CONTRACTOR IS TO ENSURE ALLOWANCE IS MADE TO RELOCATE / RECONFIGURE ANY EXISTING SERVICES, OR MODIFY TO SUIT CONNECTION TO ANY NEW SERVICES, AS REQUIRED TO ACHIEVE THE REVISED ARCHITECTURAL LAYOUTS AND THE PROJECT DESIGN DOCUMENTATION AND IN ACCORDANCE WITH THE INTENT DEMONSTRATED BY THE PRELIMINARY OR CONCEPT DESIGN.

4.7.3. HEAD END EQUIPMENT

4.7.3.1. WHERE A NEW SYSTEM IS BEING INSTALLED TO THE AREA OF THE PROJECT, AND THE EXISTING SYSTEM IS BEING RETAINED WITHIN THE EXISTING CENTRE, THE CONTRACTOR IS RESPONSIBLE FOR ENSURING COMPATIBILITY AND FULL CROSS-TALK BETWEEN THE NEW AND EXISTING SYSTEMS.

4.7.4. SHUTDOWN OF EXISTING SYSTEMS

4.7.4.1. WRITTEN APPROVAL MUST BE SOUGHT AND PROVIDED BEFORE COMMENCING ANY SHUT DOWNS TO EXISTING SYSTEMS. AT LEAST 7 DAYS' NOTICE IN WRITING MUST BE PROVIDED OF ANY INTENDED SHUTDOWN. DO NOT INTERRUPT EXISTING SERVICES WITHOUT THE PRIOR CONSENT OF SCENTRE.

4.7.5. BRIDGING WORKS

WHERE A CENTRE IS TO REMAIN OPEN AND IS AFFECTED BY AREAS OF THE WORKS, THE CONTRACTOR MUST ALLOW FOR ALL WORKS AS IS REQUIRED TO ENSURE THE CONTINUOUS OPERATION OF ANY SYSTEMS IN THOSE AREAS. ANY TEMPORARY WORKS THAT ARE UNDERTAKEN TO EXISTING SYSTEMS ARE TO BE REMOVED ON COMPLETION OF THE WORKS AND:

4.7.5.1. THE AFFECTED SYSTEM RE-INSTATED TO FINAL DESIGN, TESTED AND COMMISSIONED IN ACCORDANCE WITH THE REQUIREMENTS OF THIS SPECIFICATION.

4.7.5.2. ANY AREAS OF THE BUILDING AFFECTED BY THE TEMPORARY INSTALLATION TO BE MADE GOOD BY THE CONTRACTOR.

4.8. AESTHETIC CO-ORDINATION

4.8.1. EXTERNAL FAÇADE CO-ORDINATION

4.8.1.1. ALL SERVICES THAT ARE NOT SPECIFICALLY DESIGNED TO BE INSTALLED ON THE EXTERIOR OF THE FAÇADE ARE TO BE DESIGNED AND COORDINATED TO AVOID ANY SUCH SERVICES BEING VISIBLE. PARTICULAR ATTENTION SHOULD BE PAID TO AREAS ADJACENT ENTRIES AND STREET FRONTAGES.

4.8.2. INTERIOR AESTHETIC CO-ORDINATION

4.8.2.1. ANY SERVICES THAT INTERFACE WITH VISIBLE AESTHETIC ELEMENTS - SUCH AS SKYLIGHTS, FEATURE CEILINGS, FEATURE WALLS AND THE LIKE - ARE TO BE DESIGNED AND COORDINATED TO ENSURE THAT THEY ARE NOT VISIBLE FROM ANY POSITION WITHIN THE CENTRE. ALL PLANT, EQUIPMENT, PIPES, CABLES AND SUCH ARE TO BE HIDDEN WITHIN THE STRUCTURE, RECESSED BEHIND CEILINGS OR CONCEALED BY OTHER MEANS AS NECESSARY.

4.8.3. REFLECTED CEILING PLAN COMPLIANCE

4.8.3.1. REFLECTED CEILING PLANS SERVICES LAYOUTS / CONCEPTS ARE SHOWN INDICATIVELY. ALL SERVICES ARE TO BE DESIGNED AND INSTALLED COMPLIMENTARY OF THE DRAWINGS WHILST MAINTAINING COMPLIANCE WITH THE BUILDING CODE, AUSTRALIAN STANDARDS, AND THE TECHNICAL REQUIREMENTS OF THIS SPECIFICATION.

4.8.3.2. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL THE PRECEDING PARAMETERS ARE ACHIEVED AND IS TO PROVIDE REPORTS, CALCULATIONS AND ANY INFORMATION REQUIRED TO DEMONSTRATE TO SCENTRE THAT THE DESIGN COMPLIANCE IS MET.

4.8.4. SERVICES ADJACENT TO BALUSTRADES OR PARAPETS

4.8.4.1. WHERE SERVICES ARE FIXED TO, RUN ALONG OR ADJACENT TO BALUSTRADES OR PARAPETS, THE SERVICES ARE TO BE DESIGNED AND INSTALLED TO ENSURE THAT THE EFFECTIVE HEIGHT OF THAT BARRIER IS NOT IMPACTED. IN THE EVENT THAT THIS CANNOT BE AVOIDED THE CONTRACTOR IS TO ALLOW TO TREAT OR CLAD THE SERVICE IN SUCH A MANNER AS TO MAINTAIN THE ORIGINAL DESIGNED HEIGHT OF THE BARRIER.

4.9. CLEARANCE OF SERVICES IN CAR PARK AREAS

4.9.1. THE MINIMUM CLEAR HEAD HEIGHTS IN CAR PARK AREAS, UNLESS OTHERWISE NOTED WITHIN THIS SPECIFICATION, ARE AS FOLLOWS:

GENERALLY: 2,300MM AFFL;

DISABLED CAR SPACE(S) (DIRECTLY OVER): 2,500MM AFFL; AND

LOADING DOCK(S): 4,600MM AFFL.

4.10. CLEARANCE OF SERVICES ABOVE TENANT CEILING HEIGHT SPACE

4.10.1. ALL WORKS ARE TO BE INSTALLED AT A HEIGHT SUITABLE TO ENSURE THAT THE REQUIRED CLEARANCE IS ACHIEVED ABOVE ALL TENANT CEILINGS. THIS CLEARANCE IS TO INCLUDE THE FREE SPACE REQUIRED FOR THE INSTALLATION OF ANY FITOUT SERVICES AND SHOULD BE A MINIMUM OF 4,200MM AFFL UNLESS OTHERWISE NOTED WITHIN THIS SPECIFICATION.

4.10.2. THE FIRST 3,000MM OF THE TENANCY SHOULD BE ASSUMED AS HAVING A HIGHER CEILING OF BETWEEN 4,600MM AND 5,200MM. ANY SERVICES CROSSING THIS SPACE SHOULD THEREFORE HAVE CONSIDERATION TO A RESTRICTED CEILING SPACE OF POTENTIALLY 300MM MAXIMUM.

4.10.3. WHERE THIS CLEARANCE IS NOT ACHIEVABLE THE LOW HEIGHT AREAS MUST BE IDENTIFIED DURING THE PRELIMINARY DESIGN PHASE SO THAT SDC CAN REVIEW ALTERNATIVE OPTIONS WITH THE CONTRACTOR.

4.10.4. ANY SERVICES THAT REMAIN BELOW 4,000 AFFL, AND ARE APPROVED TO SO BY SCENTRE, NEED TO BE HIGHLIGHTED ON THE CONTRACTORS DOCUMENTATION AND INCLUDED ON THE LEASE PLANS SO THAT THE TENANT CAN BE MADE AWARE FOR THEIR FIT-OUT DESIGN.

4.11. PLANT AND EQUIPMENT ACCESS DESIGN

4.11.1. THE CONTRACTOR MUST LIAISE WITH THE ARCHITECTURAL AND STRUCTURAL DESIGN TEAM TO ENSURE THAT SUFFICIENT SPATIAL PROVISION IS MADE WITHIN THE DESIGN TO PROVIDE ACCESS TO EASILY AND SAFELY MAINTAIN, OR REPLACE AS REQUIRED, ALL PLANT AND EQUIPMENT WITHOUT MODIFICATION TO THE BUILDING ONCE COMPLETED.

4.11.2. THE CONTRACTOR MUST NOT DESIGN OR INSTALL EQUIPMENT IN LOCATIONS THAT INITIATE A REQUIREMENT FOR A CONFINED SPACE PERMIT TO ACCESS THE AREA.

4.11.3. ANY ACCESS OR MAINTENANCE EQUIPMENT, THAT IS REQUIRED TO BE INSTALLED TO ACHIEVE THIS, IS TO BE CERTIFIED BY AN INDEPENDENT ACCESS SOLUTIONS PROVIDER INCLUDING THE PROVISION OF ALL NECESSARY TRAINING ON COMPLETION.

4.12. PROVISION OF SAMPLES AND INSTALLATION OF PROTOTYPES

4.12.1. SAMPLES ARE TO BE PROVIDED FOR SCENTRE APPROVAL FOR ANY ITEMS AS NOTED WITHIN THE PROJECT SPECIFICATION OR FOR ANY FITTINGS THAT MAY BE VISIBLE IN ANY AREA.

4.13. ACOUSTIC

4.13.1. THE CONTRACTOR SHALL ALLOW FOR ALL ACOUSTIC TREATMENT ASSOCIATED WITH THEIR PLANT AND EQUIPMENT INCLUDING ACOUSTIC TREATMENT TO PLANT ROOMS AS REQUIRED, TAKING THE ARCHITECTURAL DESIGN INTO ACCOUNT AT TIME OF CONTRACT AWARD.

4.13.2. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1055 AND AS/NZS 2107 OR AS OTHERWISE REQUIRED / STIPULATED FOR THE PROJECT.

4.13.3. THE CONTRACTOR SHALL ALLOW FOR ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH ALL AUTHORITY, DA AND ANY ACOUSTIC RESTRICTIONS. THE CONTRACTOR WILL DEMONSTRATE COMPLIANCE AS MAY BE REQUIRED VIA REPORTING AND/OR MONITORING.

4.13.4. THE CONTRACTOR IS TO UNDERTAKE AN ASSESSMENT DURING THE COMMISSIONING PHASE OF ALL PLANT AND EQUIPMENT TO VERIFY THAT THE INSTALLATION COMPLIES WITH ALL AUTHORITY AND ACOUSTIC REQUIREMENTS.

4.13.5. THIS CERTIFICATION IS TO BE CARRIED OUT BY AN INDEPENDENT ACOUSTIC CONSULTANT ENGAGED BY THE CONTRACTOR.

4.13.6. ANY AREAS OF NON-COMPLIANCE THAT ARE IDENTIFIED DURING THE CERTIFICATION PROCESS ARE TO BE RECTIFIED BY THE CONTRACTOR AT THEIR COST.

4.14. SEISMIC RESTRAINT

4.14.1. ARRANGE ALL COMPONENTS, OTHER THAN SERVICE ITEMS EXEMPTED IN AS 1170.4, TO RESIST SEISMIC LOADS DETERMINED IN ACCORDANCE WITH AS 1170.4. SECURELY FIX ALL PLANT AND EQUIPMENT TO THE BUILDING STRUCTURE. DO NOT RELY ON GRAVITY AND / OR FRICTION TO RESIST SEISMIC FORCES.

4.14.2. ANTI-VIBRATION MOUNTS ARE TO BE OF HORIZONTALLY RESTRAINED TYPE.

4.15. LABELLING

4.15.1. LABELLING OF ALL PLANT AND EQUIPMENT IS TO BE UNDERTAKEN BY THE CONTRACTOR AND MUST BE CORRECTLY AFFIXED TO EACH ITEM AND BE OF A NON-CORRODIBLE MATERIAL (E.G. TRAFFOLYTE).

4.15.2. HAND-WRITTEN OR "DYMOTAPE" ADHESIVE LABEL TYPES WILL NOT BE ACCEPTED.

4.16. CONVERGED SERVICES NETWORK (CSN)

4.16.1. WHERE THE PROJECT/SITE IS A CSN APPROVED CENTRE, A COMMON IT NETWORK SHALL BE IMPLEMENTED WITH SCG IT TO ALLOW CONNECTION TO BUILDING SERVICES SYSTEMS. REFER TO THE SCG IT BUILDING SERVICES NETWORK STANDARDS AND PROCESS DOCUMENT.

4.16.2. NETWORK SWITCHES ARE TO BE PROCURED, CONFIGURED AND COMMISSIONED THROUGH SCG IT AS PART OF THE DEVELOPMENT PROJECT.

4.17. SYSTEMS PROTOCOL

4.17.1. SCENTRE REQUIRES OPEN NON-PROPRIETARY PLATFORMS TO BE USED FOR ALL BUILDING SERVICES SYSTEMS UNLESS ADVISED OTHERWISE WITHIN THE SCOPE OF WORKS FOLLOWING.

4.18. IN GROUND SERVICES MAPPING

4.18.1. THE ACCURATE MAPPING OF IN GROUND SERVICES IS VERY IMPORTANT FOR THE ONGOING OPERATION AND EXPANSION OF A SITE. THE LOCATION OF ALL IN GROUND SERVICES MUST BE INCLUDED IN THE AS-BUILT DRAWINGS OF THE PROJECT PROVIDED BY THE CONTRACTOR.

5. SCOPE OF WORKS

5.1. REFER TO PROJECT DRAWINGS FOR SCOPE OF WORKS.

6. TECHNICAL REQUIREMENTS

6.1. REFER TO PROJECT DRAWINGS AND GENERAL SPECIFICATION FOR TECHNICAL REQUIREMENTS.

7. TESTING AND COMMISSIONING

7.1. GENERAL

7.1.1. THE CONTRACTOR IS TO UNDERTAKE ALL TESTING, COMMISSIONING FOR THE WORKS IN ACCORDANCE WITH THE AGREED COMMISSIONING PROGRAMME AND AS REQUIRED UNDER THE SCOPE OF THIS SPECIFICATION, ANY GENERAL SPECIFICATION REQUIREMENTS AND/OR OTHER REQUIREMENTS AS MAY BE STIPULATED BY SCENTRE OR THE RELEVANT AUTHORITIES.

7.2. COMMISSIONING

7.2.1. DESIGN FOR COMMISSIONING:

7.2.1.1. THE CONTRACTOR MUST ALLOW FACILITIES IN HIS DESIGN TO ENABLE PROPER COMMISSIONING. THE CONTRACTOR MUST FORWARD HIS DESIGN TO THE INDEPENDENT COMMISSIONING AGENT FOR REVIEW AND THE COMMENTS OF THE INDEPENDENT COMMISSIONING AGENT MUST BE IMPLEMENTED IN THE FINAL DESIGN DOCUMENTS BY THE CONTRACTOR.

7.2.1.2. COMMISSIONING SHOULD BE IN ACCORDANCE WITH AUSTRALIAN STANDARDS OR RECOGNISED INDUSTRY CODES (INCLUDING CIBSE AND ASHRAE COMMISSIONING CODES)

7.3. TESTING

7.3.1. FACTORY OR TYPE TEST: FOR EACH FACTORY OR TYPE TEST PROVIDE A CERTIFICATE FROM THE MANUFACTURER STATING THAT THE RELEVANT ITEM HAS BEEN TESTED AND MEETS THE SPECIFIED REQUIREMENTS. CERTIFY THAT EACH TYPE-TESTED ITEM IS IDENTICAL WITH THE SPECIFIED PRODUCTION ITEM.

7.3.2. AUTHORITIES: PROVIDE DEMONSTRATIONS AND TESTS FOR WITNESSING BY THE STATUTORY AUTHORITIES. COMPLETE TESTING OF SYSTEMS BEFORE WITNESS TESTING BY THE STATUTORY AUTHORITIES.

7.3.3. WHERE TESTING AND COMMISSIONING OF THE SYSTEM REQUIRE SMOKE TESTS, THE CONTRACTOR RESPONSIBLE FOR THE TEST SHALL PROVIDE A SMOKE GENERATOR (NOT SMOKE BOMBS) FOR ALL TESTING REQUIRED BY SCENTRE AND / OR AUTHORITIES.

7.4. DEFECTS LIABILITY PERIOD

7.4.1. FOR DEFECTS LIABILITY PERIOD (DLP) BUILDING TUNING AND FINAL SYSTEM PERFORMANCE VALIDATION, REFER TO SECTION 8.

7.5. SUPPLY OF WARRANTIES

7.5.1. WARRANTIES ARE TO BE PROVIDED AT A MINIMUM UNLESS NOTED ELSEWHERE IN THIS SPECIFICATION OF:

WORKMANSHIP:	1 YEAR
MATERIALS:	1 YEAR, OR GREATER IF AVAILABLE FROM MANUFACTURER OR REQUIRED BY NCC

7.5.2. ALL WARRANTIES ARE TO BE PROVIDED USING THE SCENTRE STANDARD FORM OF WARRANTY AND ARE TO BE ISSUED AT THE DATE OF COMPLETION OF THE PROJECT, OR THE FINAL OPENING DATE - WHICHEVER IS THE LATTER. THE REQUIRED TERM OF WARRANTY WILL TAKE EFFECT ONLY FROM THIS DATE.

8. MAINTENANCE

8.1. GENERAL

8.1.1. MAINTENANCE OF ALL WORKS CARRIED OUT AS PART OF THIS CONTRACT SHALL BE UNDERTAKEN BY THE CONTRACTOR DURING THE DEFECTS LIABILITY PERIOD (DLP), AND FOR EXTENDED PERIODS IF IDENTIFIED IN THE REQUIREMENTS OF THIS SPECIFICATION OR THE CONTRACT, AND SHALL BE CONDUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE MAINTENANCE SPECIFICATION AND TRACKING SCHEDULES FORMING PART OF THIS SPECIFICATION AND / OR THE GENERAL SPECIFICATION(S).

8.1.2. THE CONTRACTOR IS TO PROVIDE THEIR MAINTENANCE PLAN (INCLUDING SEASONAL ACTIVITIES) FOR THE DLP AT THE INITIAL MEETING FOR SDC REVIEW AND APPROVAL.

8.1.3. IT IS INTENDED THAT THE CONTRACTOR SHALL WORK WITH THE INCUMBENT MAINTENANCE CONTRACTOR AND THE FACILITIES MANAGER (FM) DURING THE DLP TO ENSURE THAT THEY UNDERSTAND THE DETAIL AND MAINTENANCE REGIME FOR THIS CONTRACT'S ASSETS SUCH THAT BY THE END OF THE DLP THEY CAN OPERATE AND MAINTAIN THE ASSETS DESIGNED AND INSTALLED BY THE CONTRACTOR TO THE SCENTRE GROUP STANDARD AND THIS HANDOVER OCCURS SEAMLESSLY.

8.1.4. THIS WILL INVOLVE, AS A MINIMUM, MEETING WITH THE INCUMBENT MAINTENANCE CONTRACTOR, THE FM AND THE SERVICES MANAGER (IF AVAILABLE) REGULARLY TO WORK THROUGH THE MAINTENANCE PROGRAM AND DISCUSS ANY ISSUES THAT MAY ARISE DURING THIS TIME. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ARRANGE AND MINUTE THESE MEETINGS AND TO ENSURE THEY ARE MAINTAINING THE ASSET IN ACCORDANCE WITH THE MAINTENANCE PROGRAM. MINUTES ARE TO BE ISSUED FOR ACCEPTANCE NO LATER THAN 48 BUSINESS HOURS AFTER THE DATE ON WHICH THE MEETING WAS HELD.

8.1.5. THE FM MAY, AT THEIR DISCRETION, HAVE MULTI-DISCIPLINE MEETINGS RATHER THAN DISCIPLINE SPECIFIC MEETINGS AT ANY POINT THROUGH DLP.

8.1.6. THE CONTRACTOR SHALL ALSO ALLOW TO ATTEND THE ESSENTIAL SERVICES SYSTEM INTERFACE TESTS (SIT) THAT WILL OCCUR DURING THE DLP FOR THE NEW DEVELOPMENT AREA OF THE CENTRE. THESE SHALL BE COORDINATED WITH THE FM. REFER TO THE HARD SERVICES MAINTENANCE CONTRACT FOR DETAILS OF THE SIT REQUIREMENTS.

8.2. COMPUTERISED MAINTENANCE MANAGEMENT SYSTEM (CMMS)

8.2.1. SCENTRE GROUP HAS IMPLEMENTED A COMPUTERISED MAINTENANCE MANAGEMENT SYSTEM (CMMS), MAINTENANCE CONNECTION, ENABLING ALL STAKEHOLDERS TO OPERATE IN A MORE INFORMED AND PLANNED ENVIRONMENT. THIS ALLOWS FOR A MORE AGILE, EFFECTIVE AND EFFICIENT WAY TO UNDERTAKE INFRASTRUCTURE WORKS AS WELL AS PLANT AND EQUIPMENT ASSET MANAGEMENT WITHIN OUR CENTRES. MAINTENANCE CONNECTION UTILISES MOBILE TECHNOLOGY FOR CONTRACTORS TO ACTION DEFECTS/MAINTENANCE TASKS.

8.2.2. THE CONTRACTOR IS TO ALLOW FOR THE USE OF MAINTENANCE CONNECTION IN RELATION TO THE MANAGEMENT OF ITS MAINTENANCE OBLIGATIONS DURING THE DEFECT LIABILITY PERIOD. SCENTRE GROUP WILL COVER THE COSTS OF THE MAINTENANCE CONNECTION PLATFORM. MAINTENANCE SCHEDULES WILL BE LOADED INTO MAINTENANCE CONNECTION BASED ON THE MAINTENANCE SPECIFICATIONS THAT FORM PART OF THIS CONTRACT AND THE ASSET REGISTER PROVIDED BY THE CONTRACTOR DURING THE DETAILED DESIGN PHASE OF THE PROJECT.

8.2.3. CONTRACTORS WILL BE REQUIRED TO REGISTER EACH INDIVIDUAL USER WITHIN THEIR ORGANISATION WHO COMPLETES WORK DURING THE DLP FOR MAINTENANCE CONNECTION ACCESS. UNIQUE EMAIL ADDRESSES ARE REQUIRED FOR EACH USER AND A SHORT TRAINING SESSION WILL BE PROVIDED PRIOR TO BEING GIVEN ACCESS. ALL USERS WILL BE ABLE TO ACCESS MAINTENANCE CONNECTION VIA A SMART PHONE THAT IS HTML5 COMPATIBLE.

8.3. PLANNED PREVENTATIVE MAINTENANCE (PPM)

8.3.1. PROVIDE A PLANNED PREVENTATIVE MAINTENANCE STRATEGY IN ACCORDANCE WITH THE SCENTRE MAINTENANCE SPECIFICATION FOR APPROVAL BY SCENTRE.

8.3.2. COMPLETE ALL OF THE SCHEDULES IN THE MAINTENANCE SPECIFICATION AND INCLUDE THESE IN THE TENDER.

8.3.3. LIAISE WITH THE PROJECT SERVICES MANAGER AND FM TO ESTABLISH AN AGREED TRANSITION PROGRAM TO PROPERLY EDUCATE AND TRAIN THE INCUMBENT MAINTENANCE CONTRACTOR ON THE NEW DEVELOPMENT'S SCOPE OF WORKS AND THE SERVICES INCLUDED SUCH THAT THE INCUMBENT MAINTENANCE CONTRACTOR CAN:

8.3.3.1. SEAMLESSLY TAKE OVER THE MAINTENANCE OF THE SYSTEMS AT THE COMPLETION OF THE DEFECTS LIABILITY PERIOD THAT HAVE BEEN PROVIDED AS PART OF THIS CONTRACT.

8.3.3.2. ACCEPT RESPONSIBILITY FOR THE WARRANTY AND PERFORMANCE OF THE SYSTEMS INSTALLED BY THIS CONTRACTOR AS PART OF THE PROJECT AT THE COMPLETION OF THE DEFECTS LIABILITY PERIOD.

8.3.3.3. PROVIDE ACCURATE AND COMPLETE COSTS FOR THE CONTINUED MAINTENANCE OF THE SYSTEMS IN ACCORDANCE WITH THE MAINTENANCE SPECIFICATION THAT FORMS PART OF THEIR CURRENT CONTRACT FOR THE REMAINING DURATION OF THAT CONTRACT.

8.4. CORRECTIVE MAINTENANCE

8.4.1. GENERAL: RESPOND TO CALL OUTS FOR BREAKDOWNS OR OTHER FAULTS REQUIRING CORRECTIVE MAINTENANCE. RECTIFY FAULTS AND REPLACE FAULTY MATERIALS AND EQUIPMENT. PROVIDE CONTACT DETAILS INCLUDING AFTER-HOURS AND EMERGENCY MOBILE DETAILS TO PERMIT NOTIFICATION OF EMERGENCY CONDITIONS.

8.4.2. REMEDIAL WORK: CARRY OUT ANY REMEDIAL WORK, INCLUDING TEMPORARY WORK, NECESSARY TO RESTORE THE SYSTEMS TO SAFE AND SATISFACTORY OPERATION. DO NOT LEAVE SITE UNTIL CORRECT OPERATION HAS BEEN PROVED. DO NOT LEAVE THE PLANT IN AN UNSAFE CONDITION. PROVIDE 12-MONTH WARRANTY FOR THOSE ITEMS REPLACED, COMMENCING FROM THE DATE OF REPLACEMENT.

8.4.3. TEMPORARY WORK: PROMPTLY REPLACE TEMPORARY WORK WITH PERMANENT RECTIFICATION.

8.4.4. RESPONSE TIME: ATTEND SITE FOR EMERGENCY SERVICE WITHIN 24 HOURS OF NOTIFICATION. SHOULD THE CONTRACTOR FAIL TO RESPOND TO SITE WITHIN THE SPECIFIED RESPONSE TIME, SCENTRE MAY, WITHOUT INCURRING ANY LIABILITY OR OBLIGATION AND WITHOUT LIMITING ANY OTHER REDRESS, ENGAGE PERSONS OTHER THAN THE CONTRACTOR TO UNDERTAKE EMERGENCY WORK ON THE INSTALLATION. THE CONTRACTOR SHALL FULLY REIMBURSE SCENTRE FOR ANY COSTS INCURRED.

8.5. END OF DEFECT'S LIABILITY PERIOD MAINTENANCE

8.5.1. SHOULD THERE BE A REQUIREMENT FOR ANY SEASONAL COMMISSIONING OF EQUIPMENT, THEN THIS IS TO BE PROGRAMMED NO LATER THAN TWO MONTHS PRIOR TO THE ACTUAL DATE REQUIRED - ANY DEFECTS ATTRIBUTED TO THE EQUIPMENT PRIOR TO SEASONAL COMMISSIONING ARE TO BE RECTIFIED IN ADVANCE.

8.5.2. MEET WITH THE PROJECT SERVICES MANAGER, THE FM, ENGINEERING SERVICES CONSULTANT AND INCUMBENT MAINTENANCE CONTRACTOR TO AGREE ON COMPLETION OF DLP OR LIST OF OUTSTANDING DEFECTS AND PROGRAMME FOR COMPLETION. RELEASE OF ANY RETENTION WILL BE DEPENDENT ON THE OUTCOME OF THIS MEETING.

TO BE PRINTED IN COLOUR ONLY

COSTING ISSUE

DIMENSIONS

ALL DIMENSIONS TO BE CHECKED ON SITE. WRITTEN DIMENSIONS ONLY TO BE USED. REFER TO ALL DETAIL DRAWINGS, STRUCTURAL, MECHANICAL AND SERVICE DRAWINGS BEFORE COMMENCING WORK.
REFER ANY DISCREPANCIES TO ARCHITECTS.

Rev.	Date	By	Chk	Description
A	31.05.2024	NS	KE	CONCEPT ISSUE FOR REVIEW

SITE ADDRESS : 145 OLD PITTWATER ROAD, BROOKVALE NSW 2100

AMP CAPITAL

SCENTRE GROUP
Scentre Design & Construction
"people protecting people"

General Note
ALL DIMENSIONS TO BE CHECKED ON SITE, WRITTEN DIMENSIONS ONLY TO BE USED. REFER TO ALL DETAIL DRAWINGS, STRUCTURAL, MECHANICAL & SERVICES DRAWINGS BEFORE COMMENCING WORK. REFER ANY DISCREPANCIES TO THE ARCHITECT. DO NOT SCALE FROM DRAWINGS.
COPYRIGHT OF THE DESIGN SHOWN HEREIN IS RETAINED BY SCENTRE DESIGN AND CONSTRUCTION. WRITTEN AUTHORITY IS REQUIRED FOR ANY REPRODUCTION.

SCENTRE GROUP
Creating Extra-ordinary Places, Connecting & Enriching Communities

WARRINGAH

Scentre Design and Construction Pty Limited
85 Castlereagh Street. Sydney NSW 2000
Phone (02) 9358 7000 Fax (02) 9028 8500
GPO Box 4004 Sydney NSW 2001
ACN 000 267 265

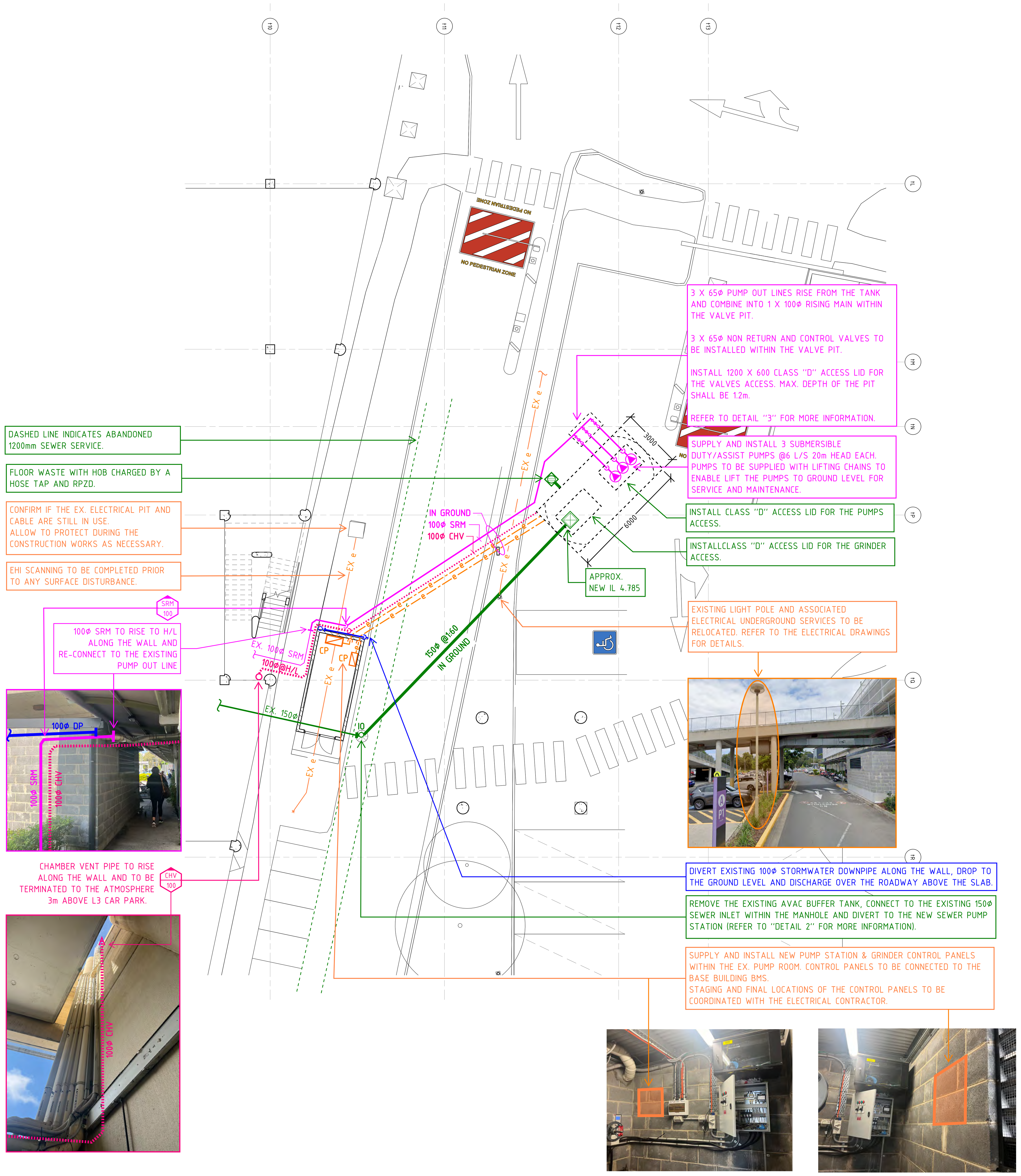
Title
AVAC SEWER PUMP REPLACEMENT HYDRAULIC SERVICES PROJECT SPECIFICATION

Drawing Scale: NTS
Scale Bar 1:1 (0, 10, 20, 30, 40, 50)
Project No.: C130139
Plot Date: 04/04/2024 3:00:55 PM
Drawing No.: SDC-HYD-00.0001
Revision: A

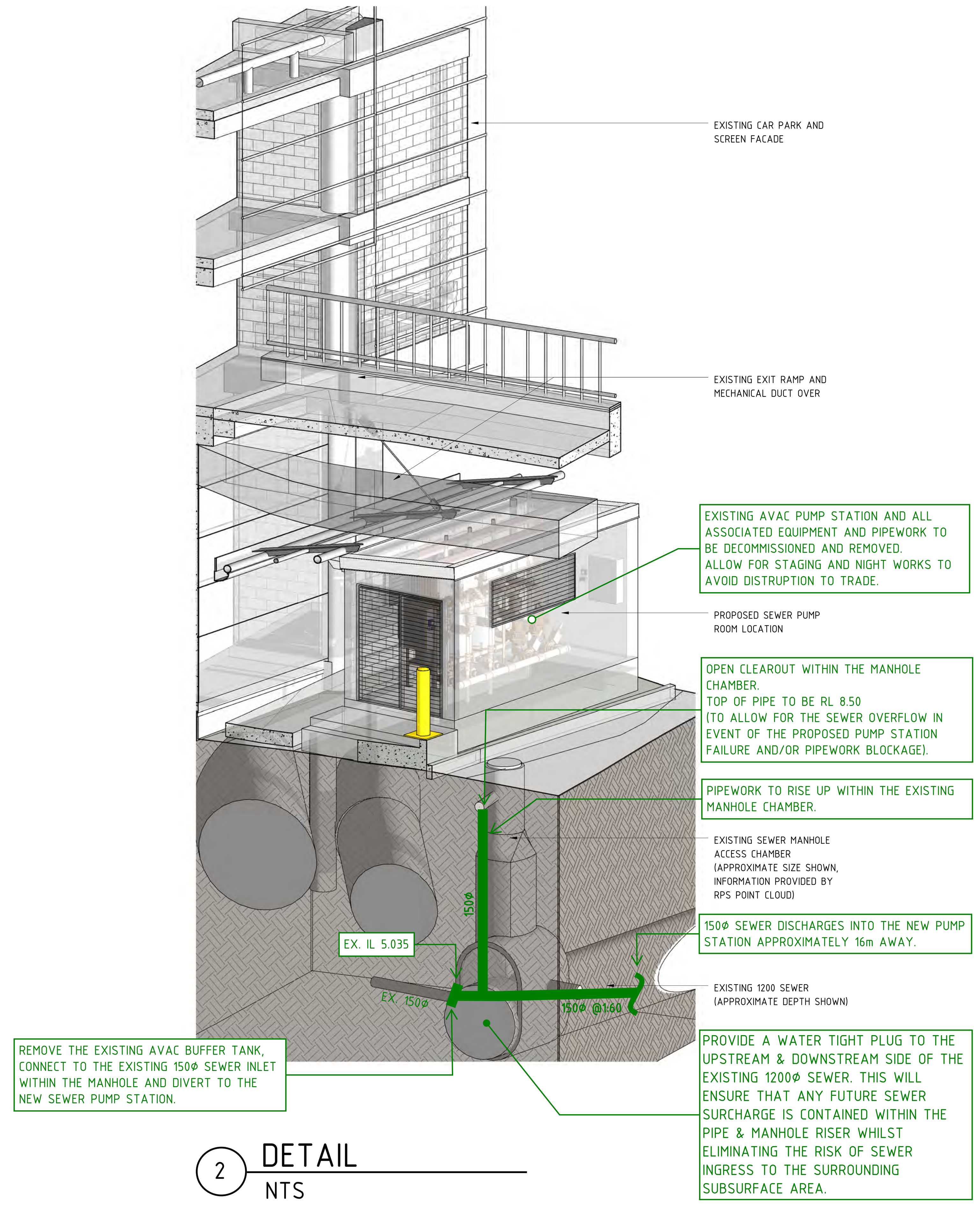
WML-C130139-SDC-HYD-00.0001 [A]

CAD Filename - C:\Users\jguan\Documents\SDC_WR_C130139_SHEETS_RVT20_JGuanVVL48.rvt

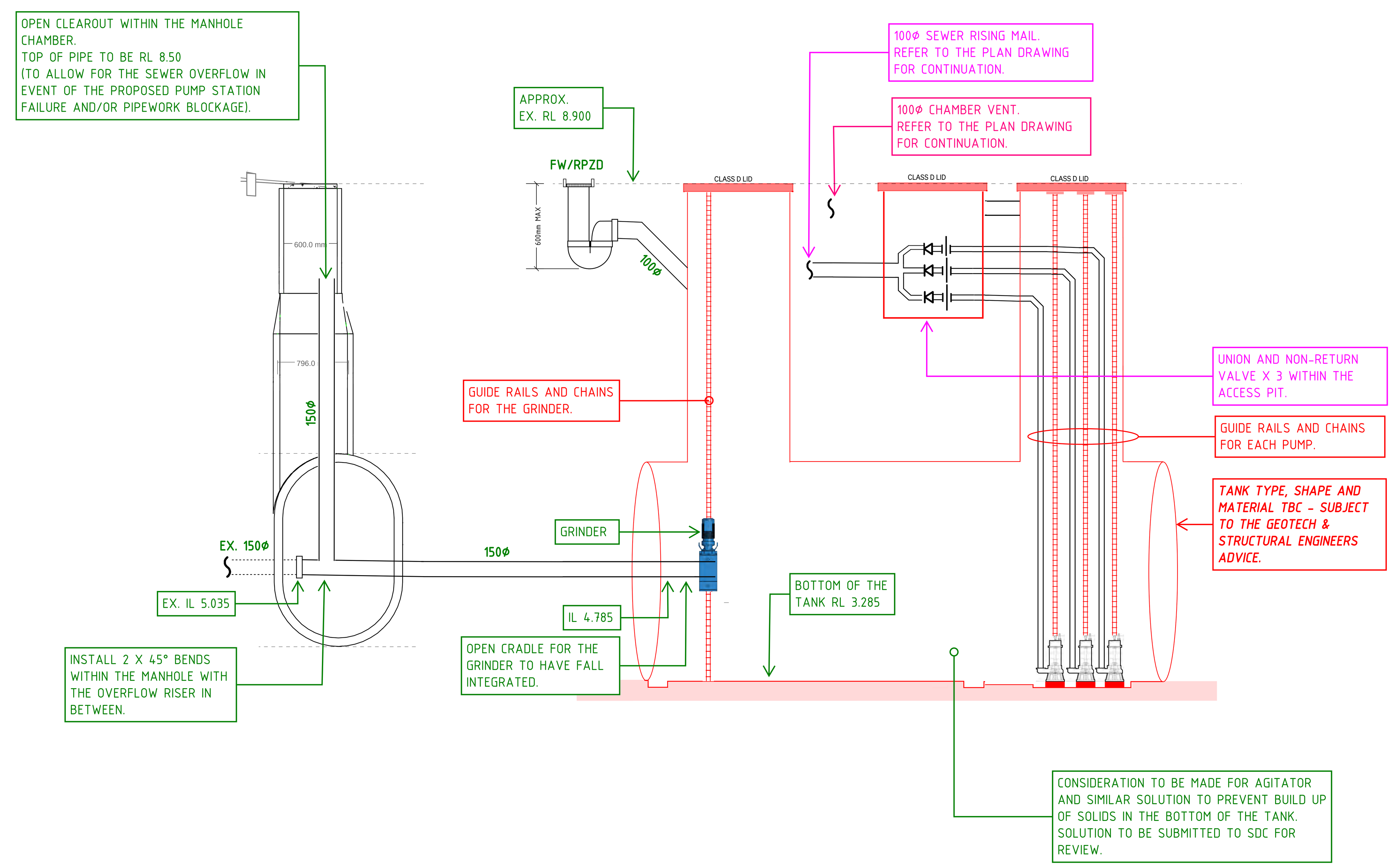
WML-C130139-SDC-HYG-10.0000 [B]



1 PROPOSED - AVAC SEWER PUMP STATION REPLACEMENT
1 : 100



2 DETAIL
NTS

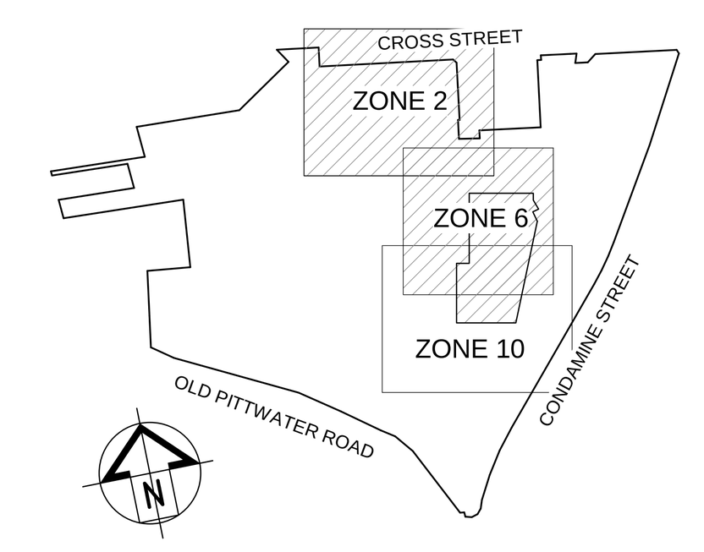


3 DETAIL
NTS

TO BE PRINTED IN COLOUR ONLY

Rev.	Date	By	Chk	Description
B	01.10.2024	NS		REVISED COSTING ISSUE
A	31.04.2024	NS	KE	COSTING ISSUE

SITE ADDRESS : 145 OLD PITTWATER ROAD, BROOKVALE NSW 2100



AMP CAPITAL

SCENTRE GROUP
Scentre Design & Construction
"people protecting people"

SCENTRE GROUP
Creating Extra-ordinary Places, Connecting & Enriching Communities
WARRINGAH

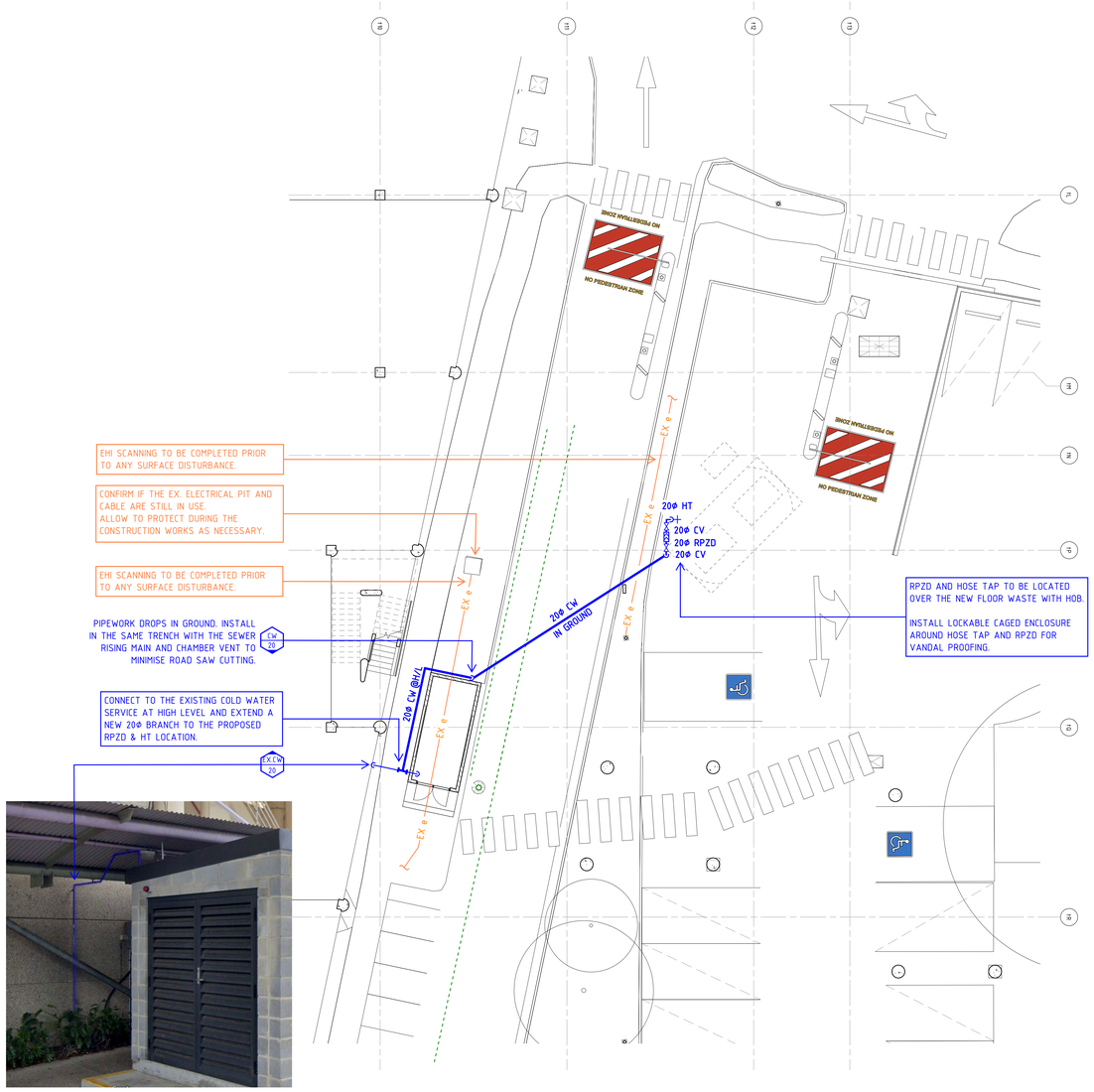
Scentre Design and Construction Pty Limited
85 Castlereagh Street. Sydney NSW 2000
Phone (02) 9358 7000 Fax (02) 9028 8500
GPO Box 4004 Sydney NSW 2001
ACN 000 267 265

Title
AVAC SEWER PUMP REPLACEMENT
HYDRAULIC SERVICES
SD & SW SERVICES DEMOLITION & PROPOSED LAYOUT

Drawing Scale	Scale Bar 1:1
AS SHOWN	0 10 20 30 40 50
Project No. C130139	Plot Date 04/04/2024 3:00:55 PM
Drawing No. SDC-HYG-10.0000	Revision B

COSTING ISSUE

CAD Filename : C:\Users\jguan\Documents\SDC_WR_C130139_SHEETS_RVT20_JGuanVVL48.rvt



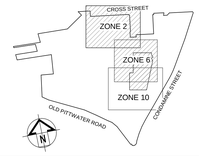
2 PROPOSED - AVAC SEWER PUMP STATION REPLACEMENT
1 : 100

WRM-C130139-SDC-HYP-10.0000 [B]

TO BE PRINTED IN COLOUR

Rev	Date	By	Chk	Description
A	01.10.2024	NS		REVISED COSTING ISSUE
A	31.05.2024	NS	KE	COSTING ISSUE

SITE ADDRESS : 145 OLD PITTWATER ROAD, BROOKVALE NSW 2100



AMP CAPITAL

SCENTRE GROUP

Scentre Design & Construction

"people protecting people"

General Note:
ALL DIMENSIONS TO BE CHECKED ON SITE, WRITTEN DIMENSIONS ONLY TO BE USED. REFER TO ALL DETAIL DRAWINGS, STRUCTURAL, MECHANICAL & SERVICES DRAWINGS BEFORE COMMENCING ANY WORK. ANY DISCREPANCIES TO BE REPORTED TO THE SUPERINTENDENT. COPYRIGHT OF THE DESIGN SHOWN HEREIN IS RETAINED BY SCENTRE DESIGN AND CONSTRUCTION. WRITTEN AUTHORITY IS REQUIRED FOR ANY REPRODUCTION.

SCENTRE GROUP

Creating Extra-ordinary Places, Connecting & Enriching Communities

WARRINGAH

Scentre Design and Construction Pty Limited
85 Castlereagh Street. Sydney NSW 2000
Phone (02) 9358 7000 Fax (02) 9028 8500
GPO Box 4004 Sydney NSW 2001
ACN 000 287 265

Title:

AVAC SEWER PUMP REPLACEMENT
HYDRAULIC SERVICES
CW SERVICES
PROPOSED LAYOUT

Drawing Scale	Scale Bar 1:1
AS SHOWN	0 10 20 30 40 50
Project No. C130139	Plot Date 04/04/2024 3:00:55 PM
Drawing No. SDC-HYP-10.0000	Revision B

COSTING ISSUE

PRINT IN COLOUR

CAD Filename - C:\Users\jguan\Documents\SDC_WR_C130139_SHEETS_RVT20_JGuanVVL46.rvt