

HYDE PARK PLACE - 248 UNLEY ROAD, HYDE PARK

Project No: LCE14462

Fire Services Specification

Tender Issue

Revision T1

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1 GENERAL

1.1 CROSS-REFERENCES

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

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

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

1.2 PROJECT DETAILS

The works described within this specification pertain to the Fire Services installation at 248 Unley Road, Hyde Park.

The works involve the installation of an internal fire hydrant and hose reel system, automatic fire sprinkler system, fire detection and alarm system, occupant warning system, fire extinguishers and fire blankets.

1.3 DEFINITION OF TERMS

Consulting Engineers	-	Lucid Consulting Australia
Proprietor	-	Client or end user of the proposed building
Head Contractor	-	Building Contractor appointed to carry out the construction of the building. Fire Contractor shall enter contract to undertake the Fire Services installation with the successful Head Contractor.
Contractor	-	Installer undertaking the works, who shall be appropriately licensed and a member of the NFIA and/or the FPA
Works	-	As described within this specification
Provide	-	Supply, install, commission, and place into service
Equal Approved	-	Alternative product/method of installation which is presented to the consulting engineer and written approval is received.
Local Power Authority	-	SA Power Networks
Local Gas Authority	-	Envestra (APA Group)
Local Water Authority	-	SA Water

Local Fire Authority - South Australian Metropolitan Fire Services (SAMFS)

1.4 CONTRACT

Fixed Price Lump Sum Contract

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

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

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

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

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

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

1.5 DRAWINGS

Refer to the following drawings accompanying this specification:

Drawing No.	Title	Revision
LCE14462-F000	COVER SHEET AND DRAWING INDEX	T1
LCE14462-F001	GENERAL NOTES AND LEGEND OF SYMBOLS	T1
LCE14462-F100	SITE PLAN	T1
LCE14462-F200	BASEMENT FIRE SERVICES ARRANGEMENT	T1
LCE14462-F201	GROUND FLOOR FIRE SERVICES ARRANGEMENT	T1
LCE14462-F202	1ST FLOOR FIRE SERVICES ARRANGEMENT	T1
LCE14462-F203	2ND FLOOR FIRE SERVICES ARRANGEMENT	T1
LCE14462-F204	3RD FLOOR FIRE SERVICES ARRANGEMENT	T1
LCE14462-F205	4TH FLOOR FIRE SERVICES ARRANGEMENT	T1

LCE14462-F206	5TH FLOOR FIRE SERVICES ARRANGEMENT	T1
LCE14462-F207	6TH FLOOR FIRE SERVICES ARRANGEMENT	T1
LCE14462-F300	DETAILS	T1
LCE14462-F301	FIRE DETECTION AND OCCUPANT WARNING SCHEMATIC	T1
LCE14462-F302	FIRE HYDRANT, HOSE REEL AND FIRE SPRINKLER SCHEMATIC	T1

The arrangements and details indicated on the above drawings are approximate only. Check all dimensions and building details prior to commencement of the work.

A 3-dimensional "Revit" design model shall be made available, via request, to the head contractor. The Revit model shall be used as an interpretation tool only for scope clarity and co-ordination with structure and other services. Under no circumstances shall it remove the obligation from the contractor to produce a construction set of documents (workshop drawings) for the proposed installation as nominated within this specification. Accuracy of the model shall not be relied upon for preparation of construction drawings, fabrication or installation.

1.6 LEGISLATIVE REQUIREMENTS

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

The works must comply with the rules and regulations:

Reference Name	Authority/Corporation	Document(s)
Local government	SA Government	Development Act 1993
		Development Regulations 2008
	Australian Building Codes Board	National Construction Code 2016
Local water authority	SA Water	Conditions of Connection
Local power authority	SA Power Networks	Supply Regulations
Local fire authority	South Australian Metropolitan Fire Services	Conditions of Connection
		Policies and Guidelines
Work, Health and Safety authority	Safe Work South Australia	Work Health and Safety Act 2012
		Work Health and Safety Regulations 2012

Technical Codes and Standards applicable to each fire services system installation are listed within each section of this specification.

1.7 SCOPE OF WORKS

The work covered by this specification includes the following.

1.7.1 General Requirements

- The detailed design, supply, installation, testing, commissioning, maintenance, service and warranty and all sundry and material items, whether mentioned in detail or not, required to complete the installation and place into working order.
- The planning, scheduling, procurement of components and installation to meet the programme, coordination and liaison with the head contractor and other trade packages.
- Full responsibility for the execution of the complete installation in accordance with this specification and drawings.
- The provision of a Fire Services installation that satisfies all statutory legislative, local authority, code requirements and satisfies the general details herein.
- Compliance with all relevant Work Health and Safety legislation and best practice including any site-specific requirements or regulations such as attendance at site inductions and adherence to the procedures covered in such inductions.

1.7.2 Description of the Installation

Site Infrastructure

- Application to the water authority for a Ø150mm towns mains connection from the Ø200mm main in Unley Road, for the fire services water supply. Allow for payment of all associated fees and charges.
- Provision of a testable double check valve for backflow prevention at high level within the basement carpark, in accordance with the requirements of the local water authority and the Office of the Technical Regulator.
- Provision of fire water tank liner, fittings, accessories, equipment and the like, for firefighting purposes. Tank to be a 10kL break tank located within the basement level car park. Design and installation of tank walls to be undertaken by the Structural consultant and the builder.
 - The contractor shall note that an application has been lodged with SA Water to utilise in-line pumping and omit the break tank from the system. The outcome of this application will be forwarded once received.
- Provision of a single diesel fire pumpset to serve combined fire sprinkler/hydrant system including provision of lagged diesel exhaust and weatherproof discharge to atmosphere.
- Provision of remote pump controls at the Fire Detection Control and Indicating Equipment (FDCIE).

- Pressure maintenance pump and pressure vessel.
- Combined fire sprinkler/hydrant suction and booster facility complying with the requirements of the local fire authority and AS2419.1-2005.

Fire Hydrant System

- Provision of internal fire hydrant system including provision of a ring main with all required isolation valves and fire hydrant valves.
- Provision of an external fire hydrant adjacent townhouses, complete with oval spindles to deter vandalism.
- Fire hydrant system block plans. Fire hydrant block plans shall clearly indicate that ensuites and balconies are outside of standard hydrant coverage, in accordance with the requirements of the Fire Engineering Report.
- Performance (flow/pressure) testing and fire authority/independent commissioning as required.
- Application to fire authority for booster testing of the combined sprinkler/hydrant system (upon completion of works) including payment of associated fees.

Fire Hose Reels

- Fire Hose Reels located as indicated on drawings including associated statutory signage.
- Provisions of vandal and weather resistant enclosures as nominated.

Automatic Fire Sprinkler System

- Fire Sprinkler Control assemblies compliant to AS2118.6 connected to the Fire Hydrant ring main, located within the Southern fire isolated stairway as indicated on the drawings.
- Fire sprinkler installation throughout all areas in accordance with AS2118.1:2017 including:
 - Exposed fast response sprinkler heads to Ordinary Hazard Group II classification within the car park areas.
 - Fast response sprinkler heads to Ordinary Hazard Group III classification within retail areas.
 - Fast response sprinkler heads to Light Hazard classification within concealed ceiling spaces and public areas such as corridors and public toilets.
 - Fast response residential sprinkler heads to Light Hazard classification (4 sprinklers operating) within apartments and associated areas.
- Provision of sprinklers to the top and bottom of lift shaft, each incorporating a dual solenoid valve dry tail arrangement.
- Pressure/Flow switches at the fire sprinkler control assemblies and interface to the Fire Detection Control and Indicating Equipment for fire authority notification and occupant warning system activation.

- Remote test valves located within the fire stair connected to the most remote range on that floor via Ø25mm pipework, back to the Ø50mm fire sprinkler test drain riser in the fire stair. Provide one valve for each AS2118.6 assembly, to facilitate sprinkler system testing.
- Performance (flow/pressure) testing and fire authority/independent commissioning as required.
- Provision of sixteen (16) additional fire sprinklers to account for coordination with all architectural and structural features, other services and the like. Should these fire sprinklers not be utilised during project works, allow to handover to the client at practical completion in original packaging.

Portable Fire Extinguishers and Fire Blankets

- Portable fire extinguishers of type and at locations as nominated on the drawings, including signage in accordance with AS 2444.
- Provision of fire blankets at locations as nominated on the drawings, including signage in accordance with AS 2444.

Fire Detection and Alarm System

- A microprocessor based Fire Detection Control and Indicating Equipment (FDCIE) configured with Analogue Addressable Loops to connect to addressable devices. The Fire Detection Control and Indicating Equipment shall incorporate generic software and be connected to a 240V power supply to be provided by the electrical services trade.
- FDCIE to incorporate Fire Fan Control Panel for Carpark Exhaust Fan control, including rotary switches/push button fire fan controls and LED status indication.
- FDCIE to incorporate an AS1670.4 style Occupant Warning Control Panel (ECP) to facilitate the incorporation of evac/alert tones, pre-recorded voice messages, and multiple evacuation tones as required by the Fire Engineering Report.
- FDCIE shall be fitted with a high level interface to connect to the Occupant Warning Control Panel (ECP).
- Provision of external fire alarm sounder and fire alarm strobe adjacent the main entrance complete with statutory 'FIRE' signage. The final location is subject to approval by the project architect.
- Provision of addressable fire detectors as indicated on the drawings in accordance with the requirements of the Fire Engineering Report.
- Addressable smoke detection system in the ground floor entry lobby, in recesses in external walkways, outside lift shafts, outside/inside fire isolated stairways, supply air fans, lift shafts in accordance with AS1670.1.
- Provision of smoke detector within each cabinet containing an electrical switchboard or communications cabinet. Refer electrical services drawings for locations and extent.

- Smoke sampling devices within air conditioning outside air fans for non-latching shut down upon detection of smoke. Alarms raised from these detectors shall not notify the fire authority.
- Manual Call Points adjacent the stair entry on each level as indicated on drawings, as required by the fire engineering report.
- Green strobe light adjacent pool plant room exit on Level 1.
- Analogue addressable input/output devices as necessary to allow all required fire systems interfaces and fire signals for fire hydrant/sprinkler system monitoring, sound system shutdowns and Smoke Control System controls.
- Fire cabling and termination of cabling to mechanical services fan control equipment for fire mode operation. Termination within control equipment by Mechanical contractor.
- Fire cabling to gas solenoid valve for fire mode shutdown.
- Fire cabling to access control/security system to release electronically controlled doors in fire mode.
- High Level Interface for BMS.
- Alarm Signalling Equipment (ASE) located within FDCIE including assisting the client in making the application to Telstra and Optus for dual carrier 3G wireless network connections to the ASE. The Fire Services Trade shall purchase and install the ASE and arrange with fire authority/monitoring company for line testing prior to hand-over.
- Cabling associated with the above works as per cabling schematic and that required to achieve compliance with AS1670, AS/NZS3000, AS/NZS3013 and AS/ACIF:S009.
- Casting in conduits into slab within fire isolated stairways for detection and cabling to sprinkler control valves.
- Where fire cabling to be run exposed, install within conduit and fix hard to ceiling/structure.
- Selex/Dymo labelling of all field devices, including input/output devices indicating exact address as per FDCIE programming and display and block plans.
- Fire alarm block plans, sleeved within clear plastic protectors and within bound folder (two off copies) located within the Fire Panel enclosure, including index of all devices and corresponding addresses. Ensure fire alarm block plans are presented in accordance with local authority requirements.
- Provision of sixteen (16) additional detectors to account for coordination with all architectural and structural features, other services and the like. Should these detectors not be utilised during project works, allow to handover to the client at practical completion in original packaging.

Occupant Warning System

- Provision of six (6) zone tone generator and amplifiers within the FDCIE. Tone generator shall incorporate generic software and be connected to the FDCIE 240V power supply.
- Provisions to incorporate emergency public address facility within the FDCIE.
- Provision of recessed ceiling speakers, horn speakers and associated cabling to achieve sound levels stipulated in AS1670.1.
- Provision of occupant warning speakers within each of the town houses located above the carpark, as per the requirements of the Fire Engineering Report. Speakers within the town houses shall activate on car park sprinkler alarm.
- Provision of green strobe light in Level 1 pool plant room adjacent the exit door, as per the requirements of the Fire Engineering Report.
- Provision of recessed ceiling speaker to lift contractor to enable installation within lift car including provision of trailing cable loom. Allow to wire to lift car control panel. Final terminations at this panel are to be undertaken by the lift contractor.
- Provision of sixteen (16) additional speakers/horns to account for coordination with all architectural and structural features, other services and the like. Should these speakers/horns not be utilised during project works, allow to handover to the client at practical completion in original packaging.

General

- Testing, commissioning, service and warranty.
- Operating and Maintenance Manuals (three copies off) including all related approval documentation e.g. Electrical certificates of compliance, completed installer's statements.
- Preparation of work-as-executed drawings.
- Preparation of Fire Safety Log Books for all required fire safety systems.
- Application to the fire authority for testing of the entire system (upon completion of works) including wet system booster testing and payment of all associated fees and charges.
- Application to the fire authority for testing of the entire smoke detection and alarm system (upon completion of works) including payment of all associated costs, fees and charges.
- Maintenance, warranty and defects liability extending for a period of 52 weeks from date of practical completion of the project. Maintenance procedures to be strictly in accordance with the requirements of the relevant legislation.
- Provision of completed maintenance certificate at the end of the 52 weeks defects and liability period. The maintenance certificate shall state that the systems operate in accordance with the requirements of the relevant legislation. The certificate shall take the format required within the relevant legislation.

- All associated building work unless specifically nominated below. This work shall include setting out and providing penetrations for all floor and wall penetrations for pipework and cabling, fire stopping penetrations, making good and painting.
- Painting, identification and labelling of all plant, equipment and piping systems.
- Seismic restraint of all plant, equipment and piping systems.
- All other items necessary to form a complete and approved system.
- All rubbish is to be disposed of in the designated waste disposal area as directed on site. All rubbish is to be disposed of in this manner the same day that it is generated.
- Works to be coordinated with management to ensure continuity of trade. Maintain clear communications with Building Owners representative at all times.
- Provision of all statutory signage as required by AS1670, AS2118, AS2419, AS2441, AS2444, and local brigade requirements unless otherwise nominated as being the responsibility of other trades.
- Associated works as necessary to complete the installation and as set out below.

1.7.3 Variations to the Scope

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

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

1.7.4 Substitutions

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

1.7.5 Associated Works

The following works related to the fire services installation shall be carried out by the Head Contractor's related trades. Provide any additional work required for the completion and full operation of the fire services works.

Mechanical Services

- Provision of relays and termination strips within local controllers to accept fire shut down signals for all nominated supply air fans, outside air fans, general exhaust fans and air conditioning units. Cabling from the FDCIE to the mechanical services switchboard or local controllers to be provided by the fire services trade and terminations at the switchboard

to be undertaken by the mechanical services trade. Mechanical services trade to configure equipment fail safe off.

- Provision of relays and termination strips within local controllers to accept fire signals for control of all nominated smoke exhaust fans, smoke spill fans, supply air fans, outside air fans, general exhaust fans and stairway pressurisation fans. Cabling from the FDCIE to the mechanical services switchboard or local controllers to be provided by the fire services trade and terminations at the switchboard to be undertaken by the mechanical services trade.
- Provision of fan status indication (pressure differential switch or transducer) to all nominated smoke spill fans, supply air fans, outside air fans, general exhaust fans as required. Mechanical contractor to extend fire rated cabling from sensors back to mechanical switch boards and provide termination strips within these boards for connection of fire cabling by fire services contractor. Cabling from the FDCIE to the mechanical services switchboard to be provided by the fire services trade and terminations at the switchboard to be undertaken by the mechanical services trade.

Electrical Services

- Provision and termination of 240V 10A single phase power supply to Fire Detection Control and Indicating Equipment.
- Provision and termination of 240V 15A single phase power supply to automatic jacking pump.
- Provision and termination of 240V 10A single phase power supply to diesel pump set control panel.
- Coordinate timing of installation of detectors within switchboard and communications cupboards with the electrical services contractor to avoid being 'built out'. The fire services contractor shall coordinate segregation requirements and provide conduit around detection cabling within cabinet to avoid issues with segregation.
- Provisions of terminal strips at the access control panel/security control panel for signal cabling to release doors in fire mode.
- Provision of smoke alarms within the apartments, for local occupant warning.

Hydraulic Services

- Provision of sump for fire water test drains located within the fire pump room for tank overflow and pump cooling water discharge.
- Provision of trapped sump for sprinkler test drain within the fire isolated stairwell at basement level.

Lift Contractor

- Allow to coordinate timing and installation of warning speaker within lift car. The fire trade shall wire to the lift car control panel and final terminations within the panel are to be undertaken by the lift contractor. The fire trade shall allow to provide necessary speakers, and the speakers/cable loom shall be fitted off by the lift contractor.

- Coordinate timing of the installation of fire sprinklers and smoke detectors within the lift shaft to avoid being 'built out'. The fire services shall ensure that the installation is sufficiently protected from damage during the remainder of construction.

Structural Contractor

- Provision of concrete walls and formed penetrations within walls for fire tanks on ground floor level. Fire trade to coordinate with the structural concrete contractor for set out of all penetrations, fixings and the like.
- The building works trade shall allow to bund and fall the fire pump room to the floor drain to be provided by the hydraulics services trade.

Building Related Trades

- Provision of sleeved penetrations in concrete slabs for pipework/cable penetrations.
- Patching and fire rating around penetrations to retain fire-rated integrity.
- The building works trade shall provide a fire booster enclosure including powder coated sheet metal doors with budget locks and concrete plinth with weep holes falling a minimum of 40mm towards the front over the depth of the cabinet in accordance with AS2419.1-2005. Fire services trade to ensure the building related trade undertakes this works to compliant arrangement.
- The building works trade shall provide formed penetrations in glazed panels for the provision of window wetting fire sprinklers. Fire services trade shall allow for any escutcheons required to complete the fire sprinkler installation.
- The building works trade shall allow to bund and fall the fire pump room to the floor drain to be provided by the hydraulics services trade.

1.8 PERFORMANCE SOLUTIONS

The fire services design outlined within this specification incorporates deviations from the Deemed-to-Satisfy Provisions of the Building Code of Australia. These deviations have been justified and accepted as Performance Solutions through consultation and documentation with the project stakeholders.

The table below is a summary of the proposed alternative solutions and associated requirements of the FER over and above the Deemed-To-Satisfy requirement of the BCA. The fire protection services contractor is to ensure they have a copy of the current FER during the production of shop/design/working drawings and ensure that the requirements of FER are incorporated including in block plans, O&M Manuals etc which shall be made available by the head contractor. The summary below is provided for convenience only, it remains the fire protection contractor's responsibility to familiarise themselves with the Fire Engineers Report, and to make due allowance to provide the safety measures outlined within the report.

No.	Proposed Performance Solution
1	To permit glazed walls separating the Level 1 public corridor from the Ground Level entry void.

2	Locating skylights in the pool area on Level 2 within 3 metres of the boundary.
3	Placing the fire brigade booster assembly away from the line of sight from the main entrance.
4	Situating the Class 1 townhouses above the Class 7a carpark.
5	Fire Hydrant coverage to balcony and ensuite areas.
7	Open access path within the basement to the fire pump room.
8	Egress distance to a point of choice from the pool plant room on Level 1 of up to 25m.
9	Provision of open access walkways and internal courtyard on Level 2 to 6 as open balconies.

Refer to the Fire Engineering Report for further details surrounding these Performance Solutions.

2 CONTRACT SUBMISSIONS

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

2.1 TENDER SUBMISSIONS

The submissions required at tender shall incorporate, as a minimum, all information defined within the Appendices of this Specification. Any appendices not completed in entirety will be rejected.

2.2 PRE-CONSTRUCTION SUBMISSIONS

2.2.1 Samples

Submit the following sample equipment prior to commencing construction:

- Fire Detection Control and Indicating Equipment – brochure with technical data acceptable
- Occupant Warning Control Panel – brochure with technical data acceptable
- Fire Pumps – brochure with technical data acceptable
- Diesel Fire Pump Muffler – brochure with technical data acceptable
- Fire Tank Liner – brochure with technical data acceptable
- Tank Infill Valves – brochure with technical data acceptable
- Fire sprinkler pipe hot dip galvanising methodology complete with references of galvanising provider – brochure acceptable
- All fire pipe and cable supports and catenaries proposed for the installation – brochure acceptable
- Fire sprinkler heads – brochure with technical data acceptable
- Smoke/Heat Detector– brochure with technical data acceptable
- Emergency Warning Speaker– brochure with technical data acceptable
- Manual Call Point – brochure with technical data acceptable
- Signage

Do not commence work affected by the samples until approval for the sample has been obtained.

2.2.2 Workshop Drawings

The contractor must prepare workshop drawings from which the contract works shall be built.

Submit one copy of drawings (digital or print) for approval prior to commencing manufacture or installation.

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

Workshop drawings shall cover the following parts of the work:

- All wall, floor and ceiling penetrations.
- Pipework layouts including details of construction supports, seismic supports, anchoring, expansion, fixing, dimensions, etc.
- Coordinated reflected ceiling plans indicating all sprinklers, fire detectors, occupant warning devices, air outlets and lights.
- Fire sprinkler workshop drawings shall be consistent with Appendix G2 of AS2118.1-2017 for approval.
- Pipework and Detection schematics
- Fire booster, Fire pump room, Fire tank and Sprinkler Control Valve Cabinet details and set-out (minimum 1:20 scale).
- Fire Panel construction details and circuit diagrams.
- All signage locations on plans and elevations.

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

The Fire Services Trade Contractor shall coordinate with all other trades to ensure non-clashing of services.

Submit shop drawings with due account for the construction programme. Allow for 7 days for the return of such drawings. If requested submit a full document issue sheet detailing all shop drawing issue dates, return dates, re-submission dates and dates for outstanding drawings.

2.2.3 Calculations

The contractor shall allow undertaking of all relevant calculations for the works including the following:

- Hydraulic calculations using an approved proprietary program i.e. Hyena or approved equal
- Battery calculations for the Fire Detection Control and Indicating Equipment and Occupant Warning Control Panel

All calculations shall be submitted to the consulting engineer for review prior to the order of any equipment.

2.2.4 Factory Test Certification

Provide factory test certificates for the following:

- Fire Detection Control and Indicating Equipment
- Occupant Warning Control Panels
- Fire Pumpset including Jacking Pump
- Fire Tank Liners

2.3 CONSTRUCTION SUBMISSIONS

2.3.1 Authorities, Permits, Fees, Certificates and Approvals

All works shall be carried out in accordance with the requirements of the local authorities including but not limited to the local water authority, electricity authority, local fire authority, the building certifier and to the satisfaction of the Superintendent. Allow to pay all fees relevant to the fire services package.

All fire service installations shall be inspected by the local fire authority prior to practical completion on the project. The contractor shall allow for payment of all associated inspection and testing fees.

All in-ground pipework shall be tested to the requirements of the relevant water supply authority and hydrostatically tested as detailed in this specification. The contractor shall allow for payment of all associated inspection and testing fees (if applicable).

The contractor shall upon completion of testing and commissioning, certify that the works have been completed and in accordance with the National Construction Code and relevant Australian Standards. Any alternative solutions to the deemed to satisfy provisions of the Building Code of Australia shall also be included within this certification.

This certification shall take the format of an 'Installer's Statement' as specified in the relevant legislations. Where not required by the relevant legislation, provide certification as outlined within the Appendices of the relevant installation standards.

In addition to the installer's statement, the Contractor shall procure a certificate of practical completion indicating a satisfactory installation from all relevant authorities and lodge same with Superintendent on completion of the Contract.

The final certificate for payment will not be issued until this requirement has been fulfilled.

2.3.2 Commissioning and Witnessing Plans

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

2.3.3 Commissioning Reports

The contractor shall submit for approval a detailed commissioning report including the above methodology undertaken and the results obtained. Commissioning results shall be recorded as necessary for the preventative maintenance of the facility.

2.4 POST-CONSTRUCTION SUBMISSIONS

2.4.1 As-Installed Drawings

Prior to practical completion, "As-Installed" drawings shall be submitted for approval.

As-Installed drawings shall be based from the approved Workshop drawings, amended to accurately reflect the final equipment selections and system installations on site.

Hard copies of the approved As-Installed drawings, along with a digital copy on a CD or USB flash drive, shall be included within the Operating and Maintenance Manuals.

2.4.2 Operating and Maintenance Manuals

One (1) hard copy of the Operations and Maintenance Manuals shall be submitted to the Consulting Engineer for review and comment prior to practical completion being achieved. Operating and Maintenance manuals shall be written in clear concise English, containing a title page listing suppliers' names, addresses and telephone numbers, a table of contents, and as a minimum include the following sections:

- Table of Contents
- Contractor's Name, Address, Telephone number and emergency telephone numbers available 24 hours
- General description of the installation, written as briefly as possible, consistent with providing a general understanding of its features and operation.
- Written text on the method of operation of all installed systems
- Suppliers contact details
- Schedule of Technical Data
- Equipment/Manufacturer's specifications and relevant datasheets, including a list of all documents included for reference
- List of guarantees and warranties of Equipment Suppliers
- Commissioning documentation including Installer's Statements
- Summary of Performance Solutions pertaining to fire services installations
- Test data and authority certificates
- Hydraulic calculations
- Battery calculations

- Sound level testing results
- Diesel pump exhaust sound pressure level testing
- Routine and Preventative inspection and maintenance requirements and procedure as specified in the referenced legislation, or manufacturer's specifications
- As installed drawings (Full size and A3 size)
- Fire Alarm Block plans including nomination of Gas Meter and Main Switch Board location (as applicable).

The Operating and Maintenance manual shall be A4 in size (with A3 drawings), printed or typed on durable printing paper, with each page consecutively numbered, and neatly bound in durable red vinyl hard back covers with embossed gold lettering on the front and on the spine.

Each section shall be separated with a divider and shall include a printed list identifying the information contained within.

Following review of this Operations and Maintenance Manual by the consulting engineer, the contractor shall make all relevant modifications to documentation and provide a minimum of three (3) hard copies in A4 lever arch folders and three (3) soft copies in PDF format on a write-protected USB 'flash drive'.

3 DESIGN, QUALITY AND WORKMANSHIP

3.1 GENERAL

The tender drawings indicate the sizes of pipes and the approved pipework routes throughout the building. They do not, however, purport to show all minor pipework offsets, hangers, method of fixing and clearances, all of which must be coordinated with other trades, measured on site and in accordance with AS 2419.1 and AS 2118. All piping arrangements shall be shown in detail on shop drawings and approved in general detail prior to commencement of installation.

All work shall be installed in an approved manner to meet structural and architectural conditions.

3.2 DESIGN REQUIREMENTS

Design criteria below forms the basis of the design of the works inclusive of any alternative solutions pertaining to the Building Solution.

3.2.1 Design for Environmental Conditions

The following general design criteria are applicable to the entire installation. Equipment and pipework systems shall be selected and installed with guarantee to operate without fault or failure under the nominated conditions for each component.

Criterion	Requirement
Extreme ambient conditions (maxima) under which all systems and services shall operate	46°C dry bulb 24°C wet bulb Full solar load
Extreme ambient conditions (minima) under which all systems and services shall operate	2.0°C dry bulb

Componentry located externally to the building and exposed to the ambient environmental conditions shall be suitably selected and installed for protection against corrosion, and ingress of moisture and dust.

3.2.2 Design for Earthquake Actions

All fire services componentry must be designed to resist earthquake actions, in accordance with the requirements of AS 1170.4-2007, without exception.

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

Criteria	Symbol	Factor
Importance Level	I	3
Annual Probability of Exceedance	yr	1:1000

Criteria	Symbol	Factor
Soil Classification	P	De
Hazard Factor	Z	0.1
Probability Factor	Kp	1.3
Structural Classification	EDC	2

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

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

All restraints and supports shall be issued to the structural engineer to review the adequacy of the structure to support the services loads, including seismic forces. Proof of formal review and approval by structural engineer shall be provided as part of the shop drawing review process.

Where internal expertise is not available to the contractor, formal engagement of a registered structural engineer shall be sought for design of earthquake restraints. Cost of engagement shall be included in Tender pricing and listed as a separate item when applicable.

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

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

Services components and supports shall have a minimum of 50 mm clearance from all ceiling hangers and the ceiling grid.

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

3.3 UNIFORMITY

Uniformity of type and manufacturer of each individual device and fitting shall be maintained throughout the project.

All devices and equipment shall be approved and listed by CSIRO ActivFire, and/or FM Global and Underwriters Laboratories as applicable.

3.4 WARRANTIES

All equipment and workmanship to be provided with a warranty.

Warranties shall commence at date of practical completion and shall extend for a minimum of 12 months.

3.5 PAINTING

All concealed pipework and metal surfaces, excepting galvanised surfaces, shall be supplied with one coat of red zinc chromate primer applied. The paint shall be undiluted and in accordance with the appropriate SAA Code. All surfaces to be painted shall be thoroughly dry, cleaned down, free from weld splatter, burrs, dust, rust, cement and grease and the like.

Exposed pipes, valves, conduits, wiring ducts, cable trays, brackets, frames, covers, etc. shall be painted with at least two coats of best quality oil paint in non-contrasting colours with surrounding architectural features. Confirm colour selections with project architect prior to painting.

Items of equipment e.g. pumpsets, switchboards, control panels etc. shall be painted off site. Where damage occurs to the paintwork of such equipment, the damaged item shall be refinished with primer and final coats to restore the surface to its specified conditions of colour, finish and quality.

All switchboards, control panels and the like shall be cleaned down and polished with automotive polish prior to practical completion.

Galvanised surfaces shall be etch-primed before painting.

Damaged or unsatisfactory painting shall be made good.

3.6 FIRE-STOPPING PENETRATIONS

Where services penetrate fire walls, floors or other fire-rated barrier, sealant for those penetrations shall be sealed to the approval of the relevant Authorities.

Tenderers shall note the specific requirements to fire stop all pipework and cable penetrations through each floor and fire-rated wall.

Submit details of proposed fire resistant sealants for approval prior to installations.

Upon completion of the project, provide written confirmation to the Superintendent that the above requirement has been complied with.

3.7 FIRE SERVICES DURING CONSTRUCTION

3.7.1 Progressive Installation

The Fire Services Contractor shall program their works so that the construction site is provided with an operational fire hydrant service in accordance with BCA clause E1.9. The required hydrant booster connection must be installed early in the programme to enable the fire brigade to utilise the hydrant risers during construction.

The Fire Services Contractor shall allow to meet with the local fire brigade operations crew on site to discuss and agree the configuration of firefighting facilities on the site during construction.

The Fire Services Contractor shall allow to update the existing block plans and device labelling at the completion of each stage of works unless otherwise agreed by the local fire brigade and the site representative.

The Fire Services Contractor shall allow to reprogram the FDCIE and OWP at the completion of each stage of works unless otherwise agreed by the local fire brigade and the site representative.

3.7.2 Protection of Equipment

System installations shall occur with minimal disruptions to the operation of the existing fire systems. Replacement systems shall be installed in parallel with existing systems, and existing systems shall be decommissioned and removed only once the new installation is complete, tested, commissioned, and operational to the satisfaction of all relevant parties.

At all times during storage and during installation, pipes shall have snug fitting covers in place over open ends. Rag, wood plugs, etc., shall not be used to cover ends of pipes. Suitable covers shall be of pressed steel or plastic.

Electronic equipment shall be stored in protected areas or provided with shrouds once installed to prevent damage from weather, dust, spills and the like.

Protective caps for sprinkler heads and fire detection devices shall be fitted until all installation works have been completed. Remove caps prior to final inspections.

Where construction works introduce risk to installed components, provide suitable protection to prevent damage, or remove from site.

4 SITE WATER SUPPLY

4.1 GENERAL

The water supply for the site fire services systems shall consist of the following:

- Single connection to the towns' mains in Unley Road.
- 10,000L break tank.

The water supply shall be a single supply in accordance with AS 2118.1-2017.

4.2 AUTHORITY APPLICATIONS

The Contractor shall be responsible for making applications to the water authority for fire water connections to the town's mains. The Contractor shall pay all associated fees.

4.3 BACKFLOW PREVENTION

Provide all necessary backflow prevention valves in accordance with the requirements of the local water authority and as nominated on drawings.

Provide a testable double check valve on the incoming site water supply, located at high level within basement level in an accessible location.

Refer to Section 11 for valve specifications.

5 FIRE WATER STORAGE

5.1 GENERAL

Fire water tanks shall be provided in accordance with AS2118.1, AS2419.1, and fire authority policies and guidelines applicable to the system installed.

Fire water tanks shall be provided with a physical air gap to comply with AS3500.1 and the requirements of the local water authority.

Fire water tanks shall be provided and shall generally consist of:

- 10,000 L Concrete break tank
- 150 mm dedicated fire services tank infill from towns mains via Philmac Servo valve or equal approved
- 150 mm combined sprinkler and hydrant suction manifold.

The contractor shall note that an application has been lodged with SA Water to utilise in-line pumping and omit the break tank from the system. The outcome of this application will be forwarded once received.

5.1.1 Cross-References

Refer to Section 4 for water supply details.

Refer to Section 6 for fire pumpset details.

Refer to Section 7 for fire brigade booster assembly details.

Refer to Section 8 for fire hydrant system requirements.

Refer to Section 10 for fire sprinkler system requirements.

Refer to Section 11 for pipework material specifications and connection of pipework to pumpsets for movement and vibration isolation.

Refer to Section 16 for testing and commissioning requirements.

5.2 DESIGN CRITERIA

The minimum design criteria that the fire water storage system must achieve are listed as follows:

Criterion	Requirement
Tank Type	Formed concrete tank
Material	Concrete
Liner	Yes
Internal/External to Building	Internal

Minimum effective capacity	10,000 L
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5.2.1 Codes and Standards

The following Codes and Standards are applicable to the installation and must be adhered to in all respects unless otherwise noted.

Code/Standard	Year	Description
AS 2118.1	2017	Automatic Fire Sprinkler Systems – General requirements
AS 2419.1	2005	Fire Hydrant Installations: Part 1: System design, installation and commissioning
AS 3500.1	2015	Plumbing and Drainage – Water Services
AS 3735	2001	Concrete structures containing liquids

5.3 TANK CONSTRUCTION

The concrete structure of the fire water storage tank shall be designed, certified, and provided by a qualified Structural Engineer and their related trades. The supply, installation and coordination all tank components, fittings, accessories and liner systems to achieve required function of the fire water break tank remains the responsibility of the fire services contractor.

The water storage tank shall have an effective capacity as stated in the Design Schedule and provide all allowances for the type of take-off, overflow, air gap and freeboard, etc., as nominated in the relevant Standards.

The tank shall be provided with:

- Concrete tank walls to be manufactured as per AS3600-2009 and meet the supplementary requirements of AS3735-2001 for class B1, B2 and C exposure classifications.
- Sheet metal panelling above concrete construction to prevent pest and insect incursion.
- Access ladder including lockable 800 x 800 inspection hatch in sheet metal panelling.
- Heavy Duty Internal Polyliner sealed appropriately around all penetrations.
- 150mm dedicated fire services automatic tank infill from towns mains via quick infill Bermad dual level float valve model 'FP450-66'. Any proposed alternative must be approved by the consulting engineer.
- 25mm dedicated fire services automatic tank top up float valve for maintenance from towns mains via Philmac float valve. Any proposed alternative must be approved by the consulting engineer.
- Localised baffle for tank infill and fire pump testing pipework to prevent wave action and aeration under vortex inhibitor.
- 150mm inlet for receipt of pump performance flow testing water

- Puddle flange for the pump suction from the tank.
- 150mm bottom suction combined sprinkler and hydrant suction manifold including vortex inhibitor positioned at the opposite end to the infill and test discharge pipework
- 150mm tank overflow of the bell mount bend type to discharge into sump provided by hydraulic services contractor, positioned and sized to handle the maximum possible tank inflow while maintaining the regulation air gap.
- Low level 80mm sludge/drain outlet locked closed and labelled as per AS 2304-2011.
- Signage as stipulated in AS 2419.1-2005, AS2118.1-2017
- Hot dipped galvanised steel internal and external ladders complying with AS 1657 and AS/NZS 4791 and AS/NZS 4792
- 'Cat and mouse' type water level indicator to serve each tank compartment shall include:
 - Indication divided into 100mm increments.
 - Stainless steel cable and pulley arrangement.
 - Point of scale type visible from a minimum distance of 25m. (Water tube type indicator not permitted.)

Minimum 15 year Design and Construction Guarantee.

Comply with earthquake restraints and provisions.

Submit calculations in respect of earthquake conditions.

Identify provisions included for 'wave action' baffles, bracing and overall tank physical restraint.

Provide connections to meet the minimum requirements of:

- Flange to Table 'E' type.
- Suction outlet each per compartment.
- Overflow outlet complying with AS 3500.1 each per compartment.
- Drain outlet each per compartment.
- Pump test return inlet.
- Fit with isolating valve each per compartment.
- Install float operated servo type water filling valve, Bermad or equal approved, with operating range 10kPa – 2000kPa each per compartment.

5.3.1 Materials

Fabricated tank puddle pieces shall be from medium black steel pipe and hot dip galvanised to relevant Standards.

All fabricated internal and external ladders shall be hot dip galvanised.

All flanges shall have machined joint face and shall be assembled with gaskets to approved manufacture.

Tank overflow, tank drain and tank top up and automatic inflow connections through tank wall shall be brass.

6 PUMPS

6.1 GENERAL

The work covered by this section of the specification includes the finishing of all labour, equipment, materials and performance of all control functions associated with the Fire Services Pumps.

Comply with AS 2941-2013, AS 2118.1-1999, AS 2419.1-2005 and AS 2118.6-2012 and supply and install pumps designed and constructed in accordance with these Standards.

The following pumps shall be provided:

- Single diesel pumpset located within the fire pump room on basement level. The pump shall be capable of meeting the system duty requirements and shall be configured as the primary pumpset.
- Electric-drive automatic jockey pump to maintain uniform mains pressure in the system.

6.1.1 Cross-References

Refer to Section 4 for water supply details.

Refer to Section 5 for fire water storage tank details.

Refer to Section 6 for fire pumpset details.

Refer to Section 8 for fire hydrant system requirements.

Refer to Section 10 for fire sprinkler system requirements.

Refer to Section 11 for pipework material specifications and connection of pipework to pumpsets for movement and vibration isolation.

Refer to Section 16 for testing and commissioning requirements.

6.2 DESIGN CRITERIA

The minimum design criteria that the fire pumps must achieve are listed as follows:

Pump	Designation	Drive	Duty Point 1	Duty Point 2
Fire Protection Pump 1	FP-1	Diesel	26 L/s @ 718 kPa	25 L/s @ 1000 kPa
Jockey Pump	JP-1	Electric	1 L/s @ 1,000 kPa	N/A

In addition to the above, allow an additional 50 kPa (minimum) for pump degradation, and meet the requirements for 130% flow rate at 80% of pressure as per AS2941.

6.2.1 Codes and Standards

The following Codes and Standards are applicable to the installation and must be adhered to in all respects unless otherwise noted.

Code/Standard	Year	Description
AS 2118.1	2017	Automatic Fire Sprinkler Systems – General requirements
AS 2419.1	2005	Fire Hydrant Installations: Part 1: System design, installation and commissioning
AS 2941	2013	Fixed fire protection installations – Pumpset systems

6.3 FIRE PROTECTION PUMPS – DIESEL TYPE

Use pumps and drivers of identical manufacture and type. Pumps shall be centrifugal, close coupled, single stage, end suction, single discharge, single suction and diesel/electric powered.

Ensure engines have ample capacity to carry system demands without overloading, with maximum impeller fitted, at the specified speed and minimum head.

Allow to provide fire sprinkler protection within the fire pump room. Where the pump room is remote from the building, allow to connect these fire sprinkler heads directly off the pump discharge manifold. Where fire sprinklers are prone to high temperature, allow to select appropriate fire sprinkler bulbs. Fit wire guards to all fire pump room fire sprinkler heads.

Where pump churn pressure (pressure at zero flow) exceeds 1100kPa, pumps are to be provided with a pump pressure relief valve between pump discharge and discharge non-return valve.

Interface to electrical power and controls/alarms as nominated and allow to provide remote fire pump controls at the FDCIE.

6.3.1 Internal Combustion Engines

Engines shall be either naturally aspirated or turbocharged diesel engine and shall incorporate integral heat exchanger for diesel engine cooling system and dry type air filter on air intakes.

Engines shall incorporate fuel tank, starting motor, two sets of batteries, generator, voltage regulator, exhaust system, fuel system, oil bath, air cleaner, gauges, spare parts and tools.

Incorporate a circulation relief valve.

6.3.2 Heating and Ventilation

The diesel engine shall be fitted with a thermostatically controlled electric crankcase or water jacket heater wired from the control panel to warm the engine so that full load can be accepted immediately after starting up.

6.3.3 Exhaust Flue

Provide an exhaust flue and silencer, to discharge high level via ground floor for each diesel pumpset.

Exhaust flue shall be constructed of stainless steel and shall be lagged with a minimum of 50 mm thickness of approved mineral fibre insulation where radiating heat may be a danger to personnel or to comply with codes where passing through the building structure. Provide 0.5 mm stainless steel sheath to all insulated lengths of flue. Sheath shall be painted to architect's approval.

Allow to provide weatherproof chrome discharge flap above ground level Final location of weatherproof flap is to be coordinated on site.

Refer to Section 6.5 for noise control specification.

6.3.4 Reserve Fuel

Provide within the fire pump room a 205 L drum of reserve diesel fuel when diesel pump sets are installed.

Stand drum on hardwood timbers inside a 1.2 mm thick galvanised sheet metal drip tray, 100 mm deep.

Install a permanent manual operated rotary pump within fuel drum complete with oil impervious flexible connection pipe.

Install fixed copper piping from drum pump to diesel pump set fuel tank, complete with isolating valve at discharge over tank fill point. The pipe connection shall be configured to provide a minimum of 50 mm sludge space at the bottom of the tank and the sludge space shall be provided with a valved drain at the lowest point of the tank.

6.3.5 Spares and Equipment

Provide diesel pump spares including two off fuel filters, air filters, oil filters and primary drive belts.

Locate within dedicated sheet metal cabinet, appropriately labelled.

6.4 PRESSURE MAINTENANCE PUMPS

Provide pressure maintenance pumps in accordance with AS 2941-2013 as scheduled.

6.4.1 Jockey Pumps

A jockey pump shall be provided to maintain uniform pressure within the complete system. The jockey pump shall operate to maintain pressure above the setpoint at which the fire protection pumpsets are initiated.

Provide pumps as follows:

- Single stage, direct coupled, in-line, vertical pump (similar to Grundfos CR Series).
- Stainless steel shaft, impeller, guide vanes and outer sleeve. Cast iron pump head, base and coupling. The shaft shall have a mechanical seal and separate anti-friction bearings.

- Jockey pump shall be automatically operated and be powered from the main pump control panel's 240V power supply. Provide manual on/off switch and weatherproof GPO within control valve assembly. Jockey pump shall be self-priming.
- Standalone jockey pumps shall be mounted on galvanised steel stand, bolted to floor slab utilising galvanised Dynabolts or similar. Jockey pumps associated with booster pumps may be mounted to a common pump skid.

6.4.2 Pressure Vessel

Provide pressure vessel for pressure dampening to the system to prevent overload of automatic pressure maintenance pumps.

Pressure vessel is to be sized to suit system capacity but should be not less than 24 litres nominal capacity.

Ensure vessel is suitably pressured during pump system commissioning.

6.5 NOISE AND VIBRATION

6.5.1 Noise Control

Achieve specified noise and vibration level criteria.

Provide mufflers/silencers on combustion air intake and lagged exhaust pipe from each pump. Provide a muffler capable of sufficiently attenuating sound pressure levels at the point of discharge to atmosphere to no more than 65 dB(A). Verify this sound pressure level via testing during the commissioning stages of the project.

Silencers shall be provided with flanges or clamps to enable future replacement and shall be installed in accordance with equipment manufacturer's recommendation for size and location.

Statically and dynamically balance rotating machinery.

Complete systems, including individual components, shall not exceed satisfactory levels as set out in AS 1359.0 and AS 2625.

6.5.2 Vibration Control

Select anti-vibration mounts/hangers for life cycle of building.

Selection and installation of anti-vibration mounts shall not conflict with the requirements or performance of systems intended for earthquake control to comply with AS 1170.4-2007. Refer to Section 3.2.2 for seismic design requirement.

Separate from the structure with double thickness neoprene pads or equal, all static equipment in plant rooms with suspended floors.

Construct plinths for all floor mounted equipment.

Select and install anti vibration mounts and hangers in locations to prevent transmission of undue vibration to adjoining areas and distortion or fatigue of equipment, connecting piping and cabling.

Select vibration isolation mounts/hangers to allow for deflections of building structures and finishes and for minimum static deflection as specified.

Use approved methods of electrical cabling/conduit vibration control where connected to rotating equipment.

Neoprene Pads shall:

- Use up to 9mm static deflection.
- Provide loading not greater than 400kPa per pad.
- Protect from grease, oil or sunlight.

6.5.3 Plinths and Inertia Bases

Provide plinths for pressure maintenance pumps and fire hose reel pumps as follows:

- Minimum 150mm high.
- Rigid fabricated galvanised sheet steel surround, 1.2mm thick.
- Structural grade concrete filled with reinforcing mesh insert, trowel finished.

Provide inertia bases for fire protection pumps and relay pumps as follows:

- Independent fabricated steel support channel frame with internal reinforcing mesh and structural quality concrete infill to minimum 75mm thick.
- 3mm thick galvanised steel for frame on equipment up to 450kg and rolled steel channel form for weights over 450kg.
- Support brackets welded/bolted to sides of channel suitable for number/type of anti-vibration springs.
- Inertia weight base not less than 1.5 times the total weight of equipment being supported.
- Inertia base with springs mounted on standard fixed plinth.

6.6 CONTROLS

6.6.1 Fire Protection Pumps

Control Panel

Provide an individual control panel for each fire protection pump.

Incorporate jockey pump controls onto one of the fire protection pump control panels.

Use remote control panels for each pump (not directly mounted to pumpset). A minimum of 800mm clear shall be provided in front of each control panel to enable safe access for maintenance and pump operation.

6.6.2 Pressure Maintenance Pumps

Jockey Pump

The jockey pump shall operate automatically as necessary to maintain uniform pressure within the system.

Incorporate jockey pump controls onto one of the fire protection pump control panels.

6.6.3 Pressure Setpoints

Nominal pressure setpoints for control and alarm of the fire protection pumps and pressure maintenance pumps are as follows. These setpoints are indicative only and must be adjusted and verified to suit the final design and installation during the commissioning phase.

Fire Hydrant and Sprinkler System

Pressure shall be measured at the pump discharge annubar.

Pressure	Action
800 kPa	Fire Protection Pump switches ON
900 kPa	Jockey Pump switches ON
1,000 kPa	Target sustained system pressure
1,050 kPa	Jockey Pump switches OFF
1,150 kPa	Pressure relief valve
1,400 kPa	High pressure alarm

6.7 ALARMS AND INDICATION

Comply with AS2941 for all alarms, warnings and indicators including but not limited to those below.

Duty Pump Automatic Run:

- Activate red strobe and audible alarm at pump room and fire booster
- Audible alarm on control panel affected

Jockey Pump Automatic Run:

- Activate red strobe and audible alarm at pump room and fire booster

Low fuel / Low oil pressure / Engine Over speed:

- Activate amber strobe and audible alarm at pump room
- Activate alarm at control panel affected

- Activate secondary alarm on ASE

6.8 TESTING FACILITIES

6.8.1 Flow-Measuring Facility

Provide a 150 mm diameter test pipe from the common manifold from the fire protection pump, with spigot fittings appropriate for connection of a flow metering device.

Pipe shall extend to return all discharge water to the fire water break tank.

Spigot fittings shall be located to ensure appropriate dimensions from valves and elbows are achieved.

Provide two geared butterfly valves complete with isolator. Upstream valves to be locked closed and tamper proof.

6.9 PRESSURE REDUCING STATION

Provide a 150 mm diameter BERMAD FP-420 or approved equivalent pressure reducing station for the retail tenancy sprinklers, consisting of pressure gauge monitored isolation valves, strainer and pressure relief valve. Pressure settings to be adjusted to achieve no greater than 60kPa and minimum 60L/m at the most remote sprinkler within retail tenancy.

7 FIRE BRIGADE BOOSTER ASSEMBLY

7.1 GENERAL

Provide a fire brigade booster assembly as located on drawings. The booster assembly shall generally incorporate the following components:

- Isolation valve
- Quad-headed feed fire hydrant from the town's mains supply
- Combined quad-headed fire hydrant and sprinkler system boost (inlet) connections
- Pressure gauges to each system and pressure zone
- Operational and safe working pressure signage
- Flow direction arrows on pipework
- Block plans

Refer to drawings for specific arrangement and details.

7.1.1 Cross-References

Refer to Section 4 for water supply details.

Refer to Section 5 for fire water storage tank details.

Refer to Section 6 for fire pumpset details.

Refer to Section 8 for fire hydrant system requirements.

Refer to Section 10 for fire sprinkler system requirements.

Refer to Section 11 for pipework material specifications.

7.2 DESIGN CRITERIA

The minimum design criteria that the fire brigade booster assembly must achieve are listed as follows:

Criterion	Requirement
Number of combined hydrant/sprinkler system booster connections	4
Number of feed hydrant connections	4
Minimum flow rate per feed hydrant	10 L/s
Minimum pressure at feed hydrant	200 kPa

7.2.1 Codes and Standard

The following Codes and Standards are applicable to the installation and must be adhered to in all respects unless otherwise noted.

Code/Standard	Year	Description
AS 2118.1	2017	Automatic Fire Sprinkler Systems – General requirements
AS 2419.1	2005	Fire Hydrant Installations: Part 1: System design, installation and commissioning

7.3 ENCLOSURE

The booster assembly shall be located within an enclosure adjacent the site sub-station constructed by the Head Contractor.

Doors shall be lift-off type.

Provide handles and locks in accordance with AS 2419.1-2005.

Provide a concrete base for the booster assembly enclosure to the following specification:

- Minimum 150 mm high.
- Rigid fabricated galvanised sheet steel surround, 1.2 mm thick.
- Structural grade concrete filled with reinforcing mesh insert, trowel finished.
- Provide sloping floor where the enclosure is not lifted above the surface to allow drainage of surface water. Refer to AS 2419.1-2005 Section 7.8.

7.4 SIGNAGE

The fire services trade shall provide all internal signage and labelling within the enclosure as per the requirements of AS 2419.1-2005 and AS 2118.1-2017. Head Contractor shall provide external signage to the enclosure as per the requirements of AS 2419.1-2005. The fire services trade shall provide guidance to the Head Contractor to ensure signage is correctly provided.

Signage shall be as follows:

- Lettering shall be not less than 50 mm high, in a colour contrasting to the background.
- Signage shall state: "COMBINED SPRINKLER AND HYDRANT BOOSTER".
- "FH" symbols shall be provided as per the requirements of the relevant Standard where a feed hydrant is located within the enclosure.

8 FIRE HYDRANT SYSTEM

8.1 GENERAL

The fire hydrant system shall reticulate throughout the building via the combined fire sprinkler and hydrant system.

8.1.1 Cross-References

Refer to Section 4 for water supply details.

Refer to Section 5 for fire water storage tank details.

Refer to Section 6 for fire pumpset details.

Refer to Section 7 for fire brigade booster assembly requirements.

Refer to Section 11 for pipework material specifications.

8.2 DESIGN CRITERIA

The minimum design criteria that the fire hydrant system must achieve are listed as follows:

Criterion	Requirement
Number of hydrants required to flow	2
Minimum flow rate per hydrant, unassisted	5 L/s
Minimum pressure per hydrant, unassisted	700 kPa
Minimum flow rate per hydrant, assisted	10 L/s
Minimum pressure per hydrant, assisted	700 kPa

8.2.1 Codes and Standards

The following Codes and Standards are applicable to the installation and must be adhered to in all respects unless otherwise noted.

Code/Standard	Year	Title/Description
BCA Section E1.3	2016	Fire Hydrants
AS 2118.1	2017	Automatic Fire Sprinkler Systems – General requirements

AS 2419.1	2005	Fire Hydrant Installations: Part 1: System design, installation and commissioning
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8.3 FIRE HYDRANT VALVES

Provide fire hydrant valves in accordance with the local fire authority requirements within the fire isolated stairways as indicated on drawings. Ensure that final fire hydrant and standpipe locations do not impede on egress requirements and that clearances around the fire hydrant valve are maintained in accordance with AS2419.1.

Ensure that each fire hydrant valve is provided with caps provided with captive chains and maintenance tags.

Ensure that all external fire hydrant up stands and valves are painted signal red (R13 as per AS2700).

8.4 RING MAIN ISOLATION VALVES

Ensure that ring main isolation valves are provided to fire hydrant system to ensure that each pressure zone can be isolated in 25% increments whilst maintaining not less than 50% of the fire hydrants required to protect each fire compartment or storey of the building.

Isolation valves shall be located as per the requirements of AS2419.1-2005 Clause 8.5.6 and shall be monitored by the FDCIE and shall be strapped and padlocked open.

Signage shall be provided on each valve stating 'FIRE MAIN VALVE – SECURE OPEN' in letters not less than 8mm in height.

Where isolation valves are located above ground, isolation valves shall be of the Outside Screw and Yoke (OSY) variety.

9 FIRE HOSE REELS

9.1 GENERAL

Provide fire hose reels as indicated on the drawings. Fire hose reels must be located no further than 4 metres from exit doors in accordance with the BCA, unless otherwise specified.

9.1.1 Cross-References

Refer to Section 4 for water supply details.

Refer to Section 11 for pipework material specifications.

9.2 DESIGN CRITERIA

The minimum design criteria that the fire hose reel system must achieve are listed as follows:

Criterion	Requirement
Minimum flow rate at nozzle	0.45 L/s
Minimum pressure at nozzle	210 kPa

9.2.1 Codes and Standards

The following Codes and Standards are applicable to the installation and must be adhered to in all respects unless otherwise noted.

Code/Standard	Year	Description
AS 1221	1991	Fire hose reels
AS 2441	2005	Installation of fire hose reels
AS 2419.1	2005	Fire Hydrant Installations - System Design, Installation and Commissioning

9.3 MANUFACTURE

Fire hose reels shall be manufactured in accordance with AS 1221. Fire hose reels shall be equipped with 19 mm x 36 m long fire hose reels and approved nozzle.

9.3.1 Colours and Finishes

Fire hose reels shall generally be of standard colour and finish, with exceptions as noted on drawings or as follows:

Location	Finish
All areas	Powder coat Red

9.4 INSTALLATION

Fire hose reels shall be installed with heights and clearances as nominated in AS 2441-2005 unless otherwise noted.

9.4.1 Water Supplies and Isolation

Water supplies for fire hose reels shall be from the combined fire hydrant/sprinkler system as indicated on drawings.

Provide isolation valves on the water supply for all fire hose reels. Isolating valves shall be fitted with an interlock, such that the fire hose nozzle may not be removed until the valve is opened.

Where the fire hose reel system reticulates from the fire hydrant system and serves two or more fire hose reels from a single point, an isolation valve shall be provided at the point of connection. This isolation valve shall be secured in the open position and provided with a Lockwood 003 key. Provide a label to the isolation valve in accordance with AS 2419.1-2005 as follows:

- Lettering not less than 8 mm high, in a colour contrasting to the background.
- Label shall state: "FIRE SERVICE VALVE - CLOSE ONLY TO SERVICE FIRE HOSE REELS".

9.4.2 Signage

Statutory signage must be installed as nominated on drawings and as per the requirements of AS 2441.

Obtain approval for locations of signage from the architect or consulting engineer on site prior to installation.

9.4.3 Installation in Cabinets

Where indicated on drawings, fire hose reels shall be concealed within cabinets or enclosures, generally in accordance with AS 2441.

Joinery cabinets shall be provided by other trades as nominated by the head contractor. Sheetmetal cabinets shall be provided by the fire services trade.

Extended guide arms shall be fitted and must extend beyond the open cabinet door to reduce the risk of damaging or tangling the hose during operation.

Sheetmetal cabinets shall be provided as follows:

Location	Cabinet Type	Finish/Colour	Handle/Lock
Carpark	Wall-mounted	Standard red	Flush handle
Tenancies	Wall-mounted	Standard red	Flush handle

Sheetmetal cabinets located externally to the building shall be weatherproof.

Where indicated on drawings, sheet metal cabinets shall extend to floor level to house portable fire extinguishers mounted below the fire hose reel.

10 AUTOMATIC FIRE SPRINKLER SYSTEM

10.1 GENERAL

Provide automatic fire sprinkler protection throughout the entire building in accordance with AS 2118.1 and the BCA DTS Provisions.

The fire sprinkler system shall reticulate from the combined fire sprinkler and hydrant system and connect via a series of control assemblies located on each level of the building within the Southern fire isolated stairway.

Allow to undertake hydrostatic testing of system upon completion of all works to sprinkler system pipework before pressurising with water.

Commission and coordinate performance flow testing upon completion of the works and allow for payment of all associated fees. Ensure that performance flow testing is undertaken simultaneously with fire hydrant testing if the fire sprinkler and hydrant systems are combined. Ensure all testing is scheduled with sufficient notice so as not to delay practical completion.

10.1.1 Cross-References

Refer to Section 4 for water supply details.

Refer to Section 5 for fire water storage tank details.

Refer to Section 6 for fire pumpset details.

Refer to Section 7 for fire brigade booster assembly requirements.

Refer to Section 8 for fire hydrant system requirements.

Refer to Section 11 for pipework material specifications and connection of pipework to pumpsets for movement and vibration isolation.

Refer to Section 16 for testing and commissioning requirements.

10.2 DESIGN CRITERIA

The minimum design criteria that the automatic fire sprinkler system must achieve are listed as follows:

Criterion		Requirement		
Area	Hazard	Flow Rate/Discharge	K-Factor	Sprinkler Spacing
Basement and Ground Floor Carpark	OH II	60L/m each for 12 sprinklers	8	Ordinary Hazard
Ground Floor Retail	OH III	60L/m each for 18 sprinklers	8	Ordinary Hazard

Residential Areas	LH	As per head requirements based on spacing selected	As per head requirements	Residential
Common Areas (Lift Shaft, External Walkways) and Concealed Spaces	LH	68 L/m each for 6 sprinklers	8	Light Hazard

10.2.1 Codes and Standards

The following Codes and Standards are applicable to the installation and must be adhered to in all respects unless otherwise noted.

Code/Standard	Year	Description
AS 2118.1	2017	Automatic Fire Sprinkler Systems – General requirements
AS 2419.1	2005	Fire Hydrant Installations: Part 1: System design, installation and commissioning

10.3 SPRINKLER CONTROL VALVE ASSEMBLIES

10.3.1 Main Componentry

Fire sprinkler control valve assemblies shall consist of (at minimum) the following componentry:

- Stop valve. The valve shall be strapped and padlocked in the normal operating position. Valve position to be monitored by the Fire Detection and Alarm System.
- Alarm valve. A swing check valve or approved equivalent which shall be arranged to admit water to the installation upon fire sprinkler head operation.
- A system test valve shall be installed to allow testing of the installation through it into the fire sprinkler drain. System drain down shall occur at basement level.
- An alarm test valve which shall be arranged so that it may be used for testing the operation of the check valve and pressure switch without the operation of any sprinkler.
- Listed pressure switch. Pressure switch shall incorporate a manual reset function to enable any alarm to be 'locked in' until reset by authorised personnel when returning system to normal status.
- Pressure gauges, which shall be of the 100 mm dial Bourdon type and shall be arranged to indicate the water pressure on either side of the check valve seat. Alarm setpoints shall be monitored by the Fire Detection and Alarm System. The gauges shall be provided with shut-off valves.
- Flow test facility appropriately sized for the sprinkler design duty point.

All valves (with the exception of drain valves) shall be clearly marked to indicate the direction of rotation and shall have indicators to show whether valve is open or closed. Hand over three (3) sets of all necessary keys to Head Contractor on completion.

10.3.2 Alarm Signalling Equipment

Alarm Signalling Equipment (ASE) shall be provided for direct brigade alarm monitoring of the sprinkler pressure switch, monitored isolation valves and ASE power supply.

The ASE shall be provided with a dedicated power in accordance with the local brigades conditions of connection with mains power general supply and monitored battery back as if the ASE were the fire detection control and indication equipment.

The ASE and power supply shall be contained within a Lockwood 003 keyed lockable water resistant IP66 rated enclosure mounted within the sprinkler control valve enclosure. The water proof enclosure shall be configured such that the test key cannot be left in if the enclosure is closed as per a fire detection control and indication equipment arrangement.

Assist the client in making the application to Telstra for PSTN telephone line to the ASE. The Fire Services Trade shall purchase and install the ASE and arrange with fire authority/monitoring company for line testing prior to hand-over.

10.3.3 Ancillary Equipment

The sprinkler control valve installation shall be provided with the following ancillary items:

- System block plan.
- A diagram of the valve arrangement.
- Emergency instructions in accordance with AS2118 complete with copy of 'as installed' drawings.
- A water- and fade-resistant block plan in accordance with AS2118.1 Clause 8.3 shall be installed in the sprinkler valve enclosure.

10.3.4 Location Identification

The door to the sprinkler control valve assembly cabinets shall be clearly identified with fade-resistant signage as follows:

- With the lettering "SPRINKLER CONTROL VALVE".
- The lettering shall be minimum height 50 mm in a colour contrasting with that of background.

10.4 SPRINKLER HEADS

10.4.1 General

Sprinkler heads shall generally be of the type as described below.

Unless otherwise clarified, all sprinkler heads shall be of the quartzoid bulb type, suitably rated and designed for fusing temperatures as follows:

Criterion	Requirement
- Carpark Areas	- 68°C 15 mm fast response brass upright or pendent type.
- Basement Pump Room	- 93°C 15 mm fast response brass upright or pendent type.
- Ground Floor Lobby	- 68°C 15 mm fast response semi-recessed type, with white powder coated flush mounted two (2) piece screwed cover escutcheon plate.
- Ground Floor Retail Tenancies (Cold Shell)	- 68°C 15 mm fast response brass upright or pendent type.
- Lift Shafts	- Fire Sprinklers shall have a temperature rating in excess of 100°C and shall be provided with mechanical protection.
- Bin chutes	- 93°C 10mm side wall sprinkler heads at alternate levels, complete with wire guards and shall be provided with mechanical protection.
- First Floor Pool Plant Room	- 93°C 15 mm fast response brass upright or pendent type. - 93°C 10mm side wall sprinkler heads complete with wire guards.
- First Floor to Sixth Floor Apartments	- 68°C 15 mm fast response semi-recessed type, with white powder coated flush mounted two (2) piece screwed cover escutcheon plate.
- First Floor Tenancy	- 68°C 15 mm fast response semi-recessed type, with white powder coated flush mounted two (2) piece screwed cover escutcheon plate.
- First Floor Storage Room	- 68°C 15 mm fast response semi-recessed type, with white powder coated flush mounted two (2) piece screwed cover escutcheon plate.
- Second Floor Pool Area and Fitness Room	- 68°C 15 mm fast response stainless steel semi-recessed type, with white powder coated flush mounted two (2) piece screwed cover escutcheon plate.

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|---------------------------|---|
| - Second Floor Sauna Room | - 93°C 15 mm fast response stainless steel semi-recessed type, with white powder coated flush mounted two (2) piece screwed cover escutcheon plate. |
| - Public Corridors | - 68°C 15 mm fast response semi-recessed type, with white powder coated flush mounted two (2) piece screwed cover escutcheon plate. |
| - Balconies | - 93°C 15 mm fast response semi-recessed type, with white powder coated flush mounted two (2) piece screwed cover escutcheon plate. |
| - Concealed Spaces | - 68°C 15 mm fast response concealed space brass upright or pendent sprinklers. |

The numbers and arrangement of required sprinkler heads are indicated on the drawings but notwithstanding this, the entire sprinkler installation shall strictly conform to the requirements of AS2118.1.

All sprinkler heads selected shall be listed and approved by CSIRO Activfire, FM Global and/or Underwriters Laboratories.

Installation of sprinkler heads shall be in accordance with Manufacturer's Data sheets.

10.4.2 Escutcheon Plates

Escutcheon plates shall be fabricated from steel, aluminium or brass and shall be flat, convex or top hat (recessed) profile to the requirements of the architect or as specified.

Painted escutcheons shall be factory finished with colours as specified by the architect.

10.4.3 Guards

Wherever sprinkler heads are subject to damage or if the head is less than 2300mm from finished floor level the sprinkler heads shall be protected with a passivated zinc plated steel guard suitable for the sprinkler head type installed. The guard shall not affect the spray pattern or function of the sprinkler head.

10.4.4 Baffles

Baffles shall be provided where necessary to prevent sprinkler heads from discharging directly onto electrical switchgear, motors etc. Shields shall be fabricated from galvanised steel and painted to match the surroundings.

10.4.5 Water Shields

Water shields shall be provided where necessary to shield from water discharge from other sprinklers. Shields shall be semi-spherical malleable iron fittings to fix flush to wall and not affect the spray pattern or function of the sprinkler head.

10.5 SPARE SPRINKLERS

A stock of spare sprinklers shall be provided in the Sprinkler Control Valve Cabinet. Spare sprinklers shall be stocked for all types and/or temperature ratings installed within the protected building in accordance with AS 2118.

10.6 TESTING FACILITIES

10.6.1 Remote Test Valve Assemblies

Provide a remote test valve assembly at the end of the most remote range pipe served by each sprinkler control valve set.

Test piping shall be minimum 25 mm nominal bore and shall extend to drain to waste adjacent the sprinkler control valve.

Provide an isolation valve for each assembly in an accessible location. This isolation valve shall be secured in the closed position and provided with a Lockwood 003 key. Provide a label to the isolation valve as follows:

- Lettering not less than 8 mm high, in a colour contrasting to the background.
- Label shall state: "SPRINKLER REMOTE TEST VALVE – TO BE LOCKED SHUT".

Provide a pressure gauge adjacent each isolation valve in a visible location.

11 PIPEWORK AND VALVES

11.1 GENERAL

Provide pipework and valves for fire suppression systems as applicable in accordance with this specification.

11.1.1 Cross-References

Refer to Section 7 for fire brigade booster assembly details.

Refer to Section 8 for fire hydrant system details.

11.2 DESIGN CRITERIA

Final sizing of pipes shall be subject to final hydraulic calculations carried out by the Fire Services Trade incorporating the performance characteristics of the type of sprinkler head utilised in the installation.

The design, fabrication and installation for piping installed in the Works shall be suitable for a design working pressure of 1200 kPa and a maximum working pressure of one and one half times the design working pressure.

11.2.1 Codes and Standards

The following Codes and Standards are applicable to the installation and must be adhered to in all respects unless otherwise noted.

Code/Standard	Year	Description
AS 2118.1	2017	Automatic fire sprinkler systems – General systems
AS 2118.9	1995	Automatic fire sprinkler systems – Piping support and installation
AS 2419.1	2005	Fire hydrant installations -System design, installation and commissioning

11.3 PIPEWORK MATERIALS

All above ground pipework unless otherwise nominated shall be either medium wall thickness steel, or light wall galvanised steel

CPVC pipework will not be accepted.

Ultra light wall or extra light wall pipework will not be accepted.

Copper piping will not be accepted for above ground installations.

Pipework between the boundary check valve and the town's main shall be copper type A, double Denso wrapped, and where necessary cast into the concrete footing. Ensure the Water

Authority (or their representative) inspects the pipework prior to pouring of concrete or backfilling trench.

Flexible droppers will not be accepted unless:

- The installing contractor provides a written statement confirming that all flexible droppers are installed in accordance with the applicable standards and technical data.
- At the completion of works, all flexible droppers are realigned where necessary.
- At practical completion, all flexible droppers are realigned where necessary.
- The installing contractor undertakes an audit upon practical completion and provides an as-installed statement that the installation conforms with all applicable standards and technical data.

Comply with the following pipework manufacturing codes and standards:

- AS 1074 for steel piping, medium weight grade as a minimum.
- AS 1432 for copper piping, Grade 'B' as a minimum.
- AS/NZS 2280: for ductile iron piping.
- AS/NZS 1477: for UPVC pipes.
- AS 4130 for HDPE pipes
- Comply with pipe fitting manufacturing Codes.
- BS 1640 and BS EN 10241
- ASME B16.9
- ASME B16.28
- Comply with AS/NZS 4791/4792 for hot dipped galvanising.

Do not utilise copper hydrant pipework within non-sprinkler protected buildings unless expressly directed by the Consulting Engineer.

HDPE or UPVC pipework to be utilised for in ground pipework only outside the building perimeter. Utilise Type A copper or 316 stainless steel (double Denso wrapped) below building footings and slabs.

All underground pipework fittings shall match the pipework material. In the case of UPVC fittings, provide ductile iron, epoxy coated fittings.

Utilise approved Densomastic petrolatum based wrapping system (two coats) for corrosion protection of all underground steel pipework. Extend wrapping 150mm above finished ground level.

Utilise heavy duty pipework support systems where installing galvanised steel hydrant pipework within non-sprinkler protected buildings. Provide sample of proposed pipework support system to the Consulting Engineer for approval prior to installation.

All hydrant pipework to be minimum PN (16) rated unless otherwise stated.

11.3.1 Corrosion Protection

Wherever pipework is installed in damp or exposed locations and excessive corrosion may occur or where the Superintendent directs, all piping, supports or other mild steel components shall be corrosion protected by means of hot dipped galvanising or an approved equivalent.

All steel bolts and nuts installed in the locations noted above shall be corrosion protected by means of cadmium plating or approved equivalent.

11.3.2 Fabrication of Steel Piping

Steel piping generally shall be prefabricated at the Fire Sprinkler contractor's factory, using welded, flanged and/or screwed joints and fittings and shall be delivered to site ready for assembly. Welding on site shall not be permitted.

Long lengths of pipe and permanent joints shall be used except where otherwise specified. Pipe offcuts shall not be used to fabricate lengths of pipe.

All pipes shall be cut square with the run of pipe, preferably with a hacksaw, formed to the correct shape for welding and/or threading, ground off smooth and all sharp edges and burrs removed from the bore of the pipe.

11.4 FITTINGS AND PIPE COUPLINGS

For small bore pipework up to DN 50 size concealed from view, utilise screwed, welded or rolled groove fittings as specified below.

For small bore pipework up to DN 50 size exposed to view, utilise screwed or welded fittings as specified below.

For pipe sizes greater than DN 50 size concealed from view utilise welded, flanged or rolled groove fittings and couplings as specified herein.

For pipe sizes greater than DN 50 size exposed to view utilise welded, flanged or rolled groove fittings and couplings as specified herein.

Pipework shall comprise in-line galvanised coating of minimum weight 100 gm/m² in accordance with AS 1650 External Coatings, for pipes up to and including 100 DN and external/internal coating for pipes over 100 DN.

11.4.1 Screwed Fittings

Screwed fittings shall be selected for working pressure not exceeding 1000 kPa.

Malleable iron fittings shall be in accordance with BS1256 - 1968 Malleable Cast Iron Screwed Pipe Fittings, etc., or approved equal.

Screwed joints shall be kept to a minimum, pipes greater than 65mm NB shall not be screwed. Hexagon nipples may be used. Long threads and barrel nipples will not be approved.

Screwed tees shall be kept to a minimum, where range pipe take-offs occur and/or where sprinkler heads are to be installed, either screwed sockets or welded components similar to "Thredolets" shall be used.

11.4.2 Screwed Joints

Screwed pipe threads shall be in accordance with AS 1722 - 1976 Pipe threads of Whitworth Forms.

Male threads shall be tapered and cut long enough to screw to full depth of female threads (sockets).

Screwed joints shall be sealed with a non-hardening material such as Teflon tape, spun yarn of New Zealand flax, white hemp or sintered PTFE mixed with a soft setting mineral lubricant, inert, non-toxic and solvent free. Only one type of jointing compound shall be used throughout the Works.

11.4.3 Butt Welded

Butt welded fittings shall be in accordance with BS 1640 Steel Butt Welding Pipe Fittings etc.

11.4.4 Fabricated

Fabricated tees, elbows and similar pipe fittings may be fabricated from steel pipe as previously specified. The Fire Sprinkler Trade Contractor shall submit for approval samples of proposed fittings, before commencing manufacture of same.

11.4.5 Mechanical Grooved Couplings

Pipes may be joined by mechanical grooved couplings consisting of an approved combination of couplings, gaskets and grooves.

Grooves shall not be cut in pipes and rolled grooves shall be dimensionally compatible with coupling.

Gaskets shall be suitable for continuous service for both air and water in the temperature range -40 deg C to 150 deg C, and shall be pliable, smooth and free of obvious surface porosity and mould flash.

When coupling is assembled, gaskets shall be fully enclosed within the housing of the coupling.

11.4.6 Connection to Valves and Other Components

Where valves and other screwed components of plant are indicated, a union or flanged type joint shall be provided in the vicinity of the valve or component to enable same to be screwed without dismantling an extensive amount of piping.

11.5 INSTALLATION OF PIPING

11.5.1 General

All piping installed shall be set out in accordance with the directions of the related Tender documents and shall be installed to secure a neat and workmanlike appearance.

All piping shall be arranged, supported, graded, and drained to suit the duty and/or service conditions applicable and shall be installed complete with all fittings and components connected up and ready for testing.

11.5.2 Expansion and Contraction

The piping shall be arranged with bend and offsets so that the system is sufficiently flexible to absorb the whole of its own expansion and contraction without developing excessive stress in the piping, or in the supporting structure.

11.5.3 Grading and Drainage of Pipes

Sprinkler piping shall be so installed that the system can be thoroughly drained. As far as practicable, all pipes shall be graded to drain to the installation drain valves.

11.5.4 Cleaning Out of Piping Systems

All piping shall be thoroughly cleansed of loose scale and dirt before erection and following erection and sealing of joints shall be thoroughly cleaned out in the presence of and to the satisfaction of the Superintendent.

All piping shall be flushed through with clean water at the highest practicable velocity and the flushing out process shall continue until all foreign matter is removed. The water used shall be progressively discharged from selected points in the system, either to drain or other suitable location.

11.5.5 Pipe Sleeves and Cover Plates

Unless otherwise indicated or approved where pipes exposed to view, pass through walls, floor and ceilings, approved galvanised steel cover plates and sleeves shall be provided, except that where pipe sleeves are located in concealed spaces, plant room etc., cover plates are not required.

Pipes passing through ceiling shall be offset sufficiently to prevent fouling of cornices, mouldings etc.

Grouting in of pipes of size larger than 50mm NB where they pass through walls and/or floors, will not be permitted. Loose fitting cover plates will not be accepted.

11.6 UNDERGROUND PIPEWORK

11.6.1 Segregation

Pipe installed below ground must be adequately segregated from other pipework e.g. stormwater, sewage, domestic water by a minimum of 300 mm. It is the Contractor's responsibility to liaise with other trades to ensure this segregation is maintained at all times.

Thrust blocks shall be installed as required at any change in direction or other locations as specified in the manufacturer's specifications.

11.6.2 Trench Identification

The Contractor shall provide adequate trench identification for all pipework installed.

11.6.3 Trench Excavation

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

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

Trenches are to be excavated to the correct line and level with vertical sides at least 300 mm wider (150 mm on each side) than the external diameter of the pipes to be laid in them. Sufficient extra width and depth is to be excavated at each joint to allow the pipes to be properly jointed.

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

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

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

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

Excavated material shall be removed off site. All cartage costs and tipping fees shall be paid by the Fire Contractor. The cost of all works specified above shall be included in the scheduled item for the supply delivery and laying of pipes.

11.6.4 Trench Backfilling

No joints shall be covered or trench backfilled until pipe laying and jointing has been approved by the Superintendent and relevant authorities.

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

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

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

- In paved areas or under buildings - quarry sand

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

- In paved areas or under buildings - 95% Modified Compaction Maximum Dry Density
- Fire contractor to employ independent contractor to perform a minimum of 3 compactions tests with results forwarded to the superintendent and architect. A copy is to be inserted in the hydraulic manuals defining locations of the tests.

11.6.5 Reinstatement of Surfaces

Where surfaces require reinstatement by the fire services contractor, the following shall apply:

For lawn areas: provide 150mm of loam and re-sow the lawn over the trench and other disturbed areas.

- Paving and Roads: reinstate to match adjacent road or paved surfaces and reinstate assets disturbed or removed during excavation of trenches.
- Concrete Surfaces: reinstate concrete surfaces to the original level. If required, provide steel reinforcement fixed to the adjacent concrete and laid to prevent the reinstalled concrete from subsiding and cracking.
- Bituminous Surfaces: Provide crushed rock base and sub base to match the adjacent areas. Prime coat the edges of the existing surfacing with bitumen. Lay and compact asphalt so that the edges are flush and centre is cambered 10mm above the existing pavement. Asphalt thickness must be equal to adjacent pavement thickness but must not be less than 50 mm.

11.7 PIPE SUPPORTS

Pipe supports shall generally be in accordance with AS 2118.9.

Unless otherwise approved or directed, supports shall be of a design which provides for longitudinal movement of the piping. Supports except where otherwise specified, shall be fabricated from substantial mild steel sections and shall be securely fixed in position. Supports and their fixings shall be of adequate strength to withstand the hydraulic and/or other forces to be encountered.

Unless otherwise directed, all pipe supports shall be adjusted prior to painting.

11.7.1 Pipe Support Attachments for Steel Piping

Straps or clips for steel piping shall be of mild steel of the single pear-shape type and shall be of approved proprietary manufacture.

11.7.2 Saddle Type Support

Saddle type supports shall be of rolled steel section of 25mm wide x 1.6mm thick double side type and the saddle shall be securely fixed to the building member or supporting structure.

Saddle type supports will not be approved as a means of supporting pipes over 50mm NB.

A neoprene strip shall be provided between the pipework and support saddle in all locations.

11.7.3 Bolts and Nuts

All bolts and coach screws shall be sized to suit the load but in no case shall the diameter be less than 8mm.

11.7.4 Span of Supports

The distance between pipe supports shall not exceed that specified in manufacturer's specifications or Australian Standards.

Exposed pipework risers shall be secured at floor and ceiling; pipes up to 25 NB shall have at least two intermediate supports.

11.7.5 Fastening of Supports

Where the structure is of masonry or concrete, the supports shall be fastened with approved expanding type bolts.

Explosive powder fastening tools shall only be used where specifically approved beforehand by the Superintendent.

Coach screws shall be used for fastening supports to timber. All coach screws must be hot dipped galvanised.

11.8 FIRE RESISTANCE

For fire hydrant, fire hose reel, and window-wetting sprinkler pipework located outside the fire isolated stairway in a non-sprinkler-protected area, it shall be provided with a means of protection from the effects of fire for a minimum duration of 60 minutes. This may be via:

- Enclosing fire hydrant pipework with fire-rated construction; or
- Provision of fire-rated treatment to the pipework supports to achieve a FRL not less than 60/-/- whilst maintaining a pipe-support temperature of 500°C when tested in accordance with AS 1530.4; or
- Other measures to prevent early collapse when exposed to fire.

11.9 NOISE AND VIBRATION

Achieve specified noise and vibration level criteria.

Acoustically seal pipework penetrations through plant rooms, sound-rated walls and acoustic enclosures.

11.9.1 Spring Hangers

Isolate pipework hangers or brackets to prevent vibration and noise transmission, particularly for pipework connected to pumps, as follows:

- Incorporate neoprene inserts to hangers.

- Use up to 40mm static deflection.
- Include for minimum 99% isolation efficiency.
- Provide loading relevant to code pipe hanger spacing requirements.

11.9.2 Flexible Connections

Stainless steel braided flexible connections shall be installed to the discharge and intake of the fire pump sets to prevent vibration transmission throughout the building. Connections shall be installed in accordance with the manufactures and approvals requirements. Flexible connections shall be FM approved or UL Listed.

11.10 VALVES

11.10.1 General

All valves utilised within the fire system shall be FM Listed or UL Approved for use in fire systems.

All valves utilised in contact with potable water supplies, such as from the town's main connection up to and including the backflow prevention device and associated isolation valves, shall be Water Marked approved in accordance with the NCC.

11.10.2 Backflow Prevention Valves

Backflow prevention valves shall be provided in accordance with the following:

- WaterMark approved testable double check valve assembly with resiliently seated gate valves
- Emerson Valvcheq DC03 or equal approved
- Minimum PN16 rated

11.10.3 Isolation Valves

Isolation valves shall be provided in accordance with the following:

- Multi-turn gear-activated type.
- Right-handed.
- Complete with position indication via rising spindle, stem, or indicator flag.
- Complete with monitoring facility where nominated on drawings and required by the relevant system Standard.
- Resiliently seated Watermark-approved if used as part of a backflow prevention valve assembly.

11.10.4 Geared Butterfly Valves

Geared butterfly valves shall be Victaulic butterfly valves or equal approved in accordance with the following:

- Series 705 Firelock.

11.10.5 Valve Monitoring and Security

Valve monitoring devices (tamper switches) shall be IP-rated, waterproof, weatherproof and of robust construction. The devices must be rigidly secured to the valve assembly in a position protected from damage.

All isolating valves shall be padlocked in the open or closed position as applicable. Padlocks shall be keyed Lockwood 003.

All alarm cocks shall be padlocked in the open position.

12 PORTABLE FIRE EXTINGUISHERS AND FIRE BLANKETS

12.1 GENERAL

Supply and install all portable fire extinguishers and fire blankets to the locations shown on the drawings, including mounting brackets, location and identification signs.

Final location of all portable extinguishers and associated signage is to be determined by site inspection and approval from the local fire authority prior to installation.

12.2 DESIGN CRITERIA

12.2.1 Codes and Standards

The following Codes and Standards are applicable to the installation and must be adhered to in all respects unless otherwise noted.

Code/Standard	Year	Description
AS 2444	2001	Portable Fire Extinguishers and Fire Blankets – Selection and location.
AS 1841.1	2007	Portable fire extinguishers – General requirements
AS 1841.5	2007	Portable fire extinguishers – Specific requirements for powder type extinguishers.
AS 1850	2009	Portable Fire Extinguishers – Classification, rating and performance testing.

12.3 PORTABLE FIRE EXTINGUISHERS

Provide portable fire extinguishers of the following type in the locations and quantities nominated on drawings:

Level/Area	Type	Capacity	Rating
Generally	Dry chemical	4.5kg	4A:80B:E
Adjacent switchboards	Carbon dioxide	5.0kg	10BE
Levels 1-6 (SOU levels)	Dry chemical	2.5kg	2A:40B:E
Plantroom	Dry chemical	9.0kg	6A:80BE
Plantroom	Carbon dioxide	5.0kg	10BE

Obtain architect's approval of locations on site prior to installation.

12.4 FIRE BLANKETS

Supply and install fire blankets as indicated on drawings.

Obtain architect's approval of locations on site prior to installation.

13 FIRE DETECTION AND ALARM SYSTEM

13.1 GENERAL

The work covered by this section of the specification includes the finishing of all labour, equipment, materials and performance of all control functions associated with the Fire Detection and Alarm System (FDAS) as indicated on the drawings and specified herein. The Fire Detection and Alarm System shall be installed by an authorised Fire Alarm installer in accordance with this specification and drawings and to the approval of the local Fire Brigade and relevant authorities.

All equipment and devices used in the installation shall be tested, certified and listed by CSIRO ActivFire.

13.1.1 System Configuration

The FDAS shall generally comprise the following systems and components:

- Fire Detection Control and Indicating Equipment (FDCIE)
- Fire detection devices
- Manual Call Points (MCPs)
- Occupant Warning System (OWS)
- Alarm Signalling Equipment (ASE)

The FDCIE, ASE, and OWS central control equipment components shall be mounted together in a common Fire Panel. Refer to drawings for location and mounting arrangements.

13.1.2 Cross-References

Refer to Section 17 for electrical wiring installation details.

13.2 DESIGN CRITERIA

The minimum design criteria that the fire detection and alarm system must achieve are listed as follows:

Criterion	Requirement
Basement and Ground Carpark	Speakers to provide 65dB(A) as stipulated in the BCA and AS1670.1:2015.
Ground Floor Entry Lobby	Addressable smoke detection in accordance with AS1670.1:2015 and the Fire Engineering Report. Speakers to provide 65dB(A) as stipulated in the BCA and AS1670.1:2015.
Ground/Level 1 Retail Tenancies and BOH	Speakers to provide 65dB(A) as stipulated in the BCA and AS1670.1:2015.

Apartment Floors (Common Areas/BOH)	Addressable smoke detection in accordance with AS1670.1:2015 and the Fire Engineering Report in external walkway recesses. Speakers to provide 65dB(A) as stipulated in the BCA and AS1670.1:2015.
Apartment Floors (Apartments)	Speakers adjacent each bed head to provide 75dB(A) as stipulated in the BCA and AS1670.1:2015.
Lift Shafts	Smoke detectors shall be located at the top and bottom of the lift shaft.
Fire Isolated Stairways and Corridors	Located beneath each landing at each level to which there is access to the stair as required by AS1670.1. Conduits to be cast into concrete slab prior to pouring of concrete.
Switchboard Cabinets	Located within each cabinet containing a low voltage switchboard. Coordinate timing of installation with electrical services contractor. Provide conduit to ensure segregation is achieved between low voltage and extra low voltage cabling.

13.2.1 Codes and Standards

The following Codes and Standards are applicable to the installation and must be adhered to in all respects unless otherwise noted.

Code/Standard	Year	Description
NCC Section E2.2	2016	National Construction Code Building Code of Australia, Smoke Hazard Management – General Requirements
AS 1603.4	1987	Automatic fire detection and alarm system – Control and indicating equipment
AS 1670.1	2015	Fire detection, warning, control and intercom systems - System design, installation and commissioning Fire
AS 1851	2012	Routine service of fire protection systems and equipment
AS/NZS 3000	2007	Electrical Installations - Wiring Rules
AS 7240 Set	-	Fire Detection and Alarm Systems
AS/ACIF S009	2006	Installation requirements for customer cabling
SAMFS	-	Conditions of Connection

13.3 FIRE PANEL

The Fire Panel shall be a wall-mounted cubicle with an internal hinged frame. All equipment shall be of modular plug in design, with the field terminations and power supply accessible by opening the internal frame.

The Fire Panel shall contain components as nominated in Section 13.1.1.

Detection zone block plans shall be securely mounted within the Fire Panel cubicle in an easily accessible location.

The cubicle doors shall have signage to identify the panel within.

A locked door keyed to 003 shall secure the control sections of the equipment. All controls and indicators shall remain visible with door closed.

The colour finish shall be manufacturer's standard finish.

13.4 REMOTE PUMP CONTROLS

Remote pump controls shall be provided at the FDCIE as required by SAMFS.

13.5 FIRE DETECTION CONTROL AND INDICATING EQUIPMENT

Provide a Grade I CIE for the Fire Detection and Alarm System.

The FDCIE shall be an Analogue Addressable Microprocessor-based system.

13.5.1 Panel Controls and Indicators Operation

The FDCIE shall have membrane touch and front panel controls with audible feedback, LCD display featuring operator prompts and common system status indicators.

All essential controls shall be grouped together as per the Fire Fighters Facility layout in AS4428.3 irrespective of whether the panel is manufactured to comply with AS4428 or AS7240.

13.5.2 Fire Brigade Panel

Incorporate a Fire Brigade Panel (FBP) into the FDCIE fascia.

Evacuate isolate: Shall isolate / de-isolate the evacuation output.

External bell isolate: Shall isolate / de-isolate the bell output.

Firefighter facility in accordance with AS4428.1

Zone indication in accordance with AS7240.2 and SAMFS Conditions of Connection (if applicable).

Multiple Alarms shall be displayed as individual devices (in lieu of zones only) in accordance with the SAMFS conditions of Connections.

13.5.3 Essential Indicators

Common alarm indicator (RED led): Shall flash until all incoming alarm signals are acknowledged then shall become steady.

Common isolate/disable indicator (AMBER led): Steady indicator and shall remain on while any zone or device is isolated/disabled.

Common fault indicator (AMBER led): Steady indicator and shall remain on until all faults are removed from system.

Liquid crystal display: The LCD display shall be a 14 line X 40 character display with sections dedicated to displaying specific information or including the Fire Brigade Controls.

13.5.4 System Controls

The front panel shall have a menu button, which is not password protected and allows access to the following system functions.

No Password Protection

- Alarms: Shall display all devices / zones in alarm.
- Pre Alarms: Shall display all devices / zones in pre alarm.
- Isolates/Disables: Shall display all devices / zones that are isolated.
- Faults: Shall display all devices / zones in fault.

Password Protection Level 2

- Status: Shall display the status of loops, modules, power supply, brigade outputs, all inputs, all outputs, the system and analogue values of individual devices.
- Tests: Shall allow testing of alarms, faults, the system and panel indicators.
- The front panel shall have a button, which has level 2 and 3 password protection and allows access to the following system functions
- Date: Shall allow the date to be altered.
- Time: Shall allow the time to be altered.
- Day/Night: Shall allow the day / night sensitivity change over times to be altered.
- Logs: Shall have five separate logs of 300 events for alarms, faults, isolates, system events and configuration changes.
- Tests: Shall allow single person operation alarm testing of devices and detectors.
- Inputs / Outputs: Shall allow the manual control of all inputs and outputs.
- Access to allow alterations via the front panel keypad of descriptors, types, configuration, detector sensitivity, and default relay outputs.

- Access to add or change passwords.

13.5.5 Alarm Operation

On receipt of an alarm the common alarm indicator shall flash and ancillary equipment will activate as programmed.

The LCD shall display the exact location of the device in alarm, the type of device and the alarm sequence. All controls related to the LCD shall become inoperable except for the alarm acknowledged and the next / previous buttons, once acknowledge other system operations can proceed.

The LCD display shall always register the first alarm received with subsequent alarms cued in order of receipt, accessible by scrolling.

13.5.6 Fault Indicator

The common fault indicator and the LCD shall display the first open circuit fault. On an analogue/addressable loop the LCD shall display the exact section of cable where the fault has occurred by indicating the last two devices it is able to communicate with in each direction.

13.5.7 Common Outputs

Provide at least one of each of the following:

- Common Alarm Output
- Common Fault Output
- Common Isolate Output
- Common Bell Output (Monitor for line fault)
- Common Ancillary Output (Monitor for line fault)
- Common Sounder Output (For External beacon)

13.5.8 Configuration

The FDCIE shall be configured as an analogue/addressable system with up to 200 analogue/addressable devices per loop. The installer shall determine the number of loops to suit the installation including a spare capacity of 20%.

A minimum of four (4) addressable loops shall be provided. Final configuration shall be agreed with Consulting Engineer.

The FDCIE shall be capable of displaying the identity of each device with groups of devices allocated to zones.

On power up the panel will perform a 'self-learn' which reports back the type of device located at each address. If a panel has not been configured then the 'self-learn' information will be automatically saved. Default descriptors and outputs will be provided for each device. If a configuration is loaded into the panel at power up the self-learn will identify any discrepancies

between the configuration, the field devices and the internal panel modules. These differences can be incorporated into the configuration or deleted.

Programming the system shall be carried out either on the manufacturer's premises, via a modem link, or on site via a portable computer. A functional brief shall be submitted for review and approval by the Consulting Engineer prior to programming.

13.5.9 Fire Alarm Zoning

Common area detectors on each floor shall form a separate alarm zone (one zone per floor). Note that fire isolated stairwells, lift shafts, and in-duct sampling detectors shall each be assigned to individual zones, supplementary to the primary zones listed below.

13.5.10 Power Supply

Standard: to AS4428.3, 4428.5, 7240.2, 7420.4

Mains supply shall be 240V AC (+6% - 10%) at 50Hz and installed in accordance with AS/NZS 3000:2007 and AS1670-2015.

Sealed Batteries: Shall be capable of powering door hold open devices for a period of 24 hours in the event of power failure.

13.5.11 Fire Fan Control Panel

Incorporate a Fire Fan Control Panel (FFCP) within the FDCIE for all controls of air handling plant and equipment associated with the smoke control system. Refer to Section 15.3.2 for a schedule of all plant.

The FFCP shall incorporate the following components:

- Individual control key switches for all designated fans and dampers required to be controlled for the smoke control system.
- Fan status indicator light panels for each fan required to operate in fire mode.
- Spare space for two (2) additional key switches and two (2) additional status indicator panels in addition to those scheduled.

All controls and indicators to be individually labelled, permanently engraved on the panel face adjacent the control for clear identification.

Utilise Fire Service approved Lockwood '003' key.

Provide shop drawing for approval prior to manufacture.

13.5.12 High Level Interface

Provide a RS232/RS485 High Level Interface (HLI) card within the FDCIE to facilitate connection to other equipment. The HLI shall use a recognised programming language, BACnet, LonWorks, MODBUS or similar.

13.6 FIELD DEVICES

All field devices shall:

- Designed and installed in locations with a view to minimise the detrimental effects of moisture, dust, insects and other foreign materials.
- Be installed in accordance with manufacturer's recommendations.
- Ideally have in-built short unit isolators.

13.6.1 Detectors

All detectors shall:

- Be installed in accordance with AS1670 and in locations as detailed on drawings.
- Be fully approved by an approved testing authority and be batch tested by CSIRO ActivFire.
- Be Analogue photo optical, ionisation, carbon monoxide and heat as indicated on the drawings.
- Ideally have in-built short circuit isolation.

13.6.2 Analogue Detector Bases

All detector bases shall:

- Be no larger than 100mm in diameter.
- Not have any electronics.
- Signal Fire Detection Control and Indicating Equipment if detectors removed.
- Ability to be remotely tested at Fire Detection Control and Indicating Equipment.
- Ability for remote LED's to be connected.

13.6.3 Input/ Output Devices

All input/output devices shall:

- Have a unique address programmed with DIP switches or be able to be addressed via the FDCIE.
- Obtain and send information to equipment such as relays, solenoids, airflow, switches etc. The input shall monitor for a short or open circuit.
- Provide loop outputs to mechanical plant, etc.
- Ideally have in-built short circuit isolation.

13.6.4 Input Devices

All input devices shall:

- Have a unique address programmed with DIP switches.
- Obtain change of condition from equipment such as pressure switches, monitored valves etc. The input shall monitor for a short or open circuit.

13.6.5 Manual Call Point

'Break Glass' manual call points shall be incorporated as part of the Fire Detection Control and Indicating Equipment and as indicated on drawings. The manual call points shall:

- Be approved to AS1603.5.
- Have a unique address programmed with DIP switches.
- Be fully approved by an approved testing authority.

13.6.6 Short Circuit Isolators

All short circuit isolators shall:

- Be installed to protect the analogue/addressable loop against wire-to-wire short circuits.
- In their normal state pass data as required for normal system operation. In the event of a short circuit the loop shall be disconnected between isolators.
- Automatically reset when the wiring short circuit has been repaired.
- Isolation bases shall be provided for every 20 detectors (maximum)

13.6.7 Fire Alarm Warning Beacon

Comply with the following:

- Warning beacons shall be 24V DC red low profile weatherproof type.
- The alarm shall have a neat and unobtrusive appearance.
- Strobe shall be mounted on a "FIRE" sign worded in letters no less than 25mm in height as per the requirements of AS1670.1.

13.7 OCCUPANT WARNING SYSTEM

Provide a multi-zone, minimum six (6) zone, occupant warning system incorporating speakers, strobes and isolation controls for each zone within the Fire Detection Control and Indicating Equipment.

The primary function of the Occupant Warning System (OWS) is to transmit the evacuation signal and verbal address clearly and reliably via speakers in emergency zones.

The OWS shall automatically initiate evacuation procedures or be manually operated.

The Evacuate tone shall be transmitted in accordance with the requirements of AS1670.1 Clause 3.22 (b).

13.7.1 Signal Generator

This shall generate the Evacuate signal to comply with AS 1670.4-2015.

When the alert signal is first initiated to a zone, the signal bursts shall increase in amplitude, starting at 50dB (A) down and increasing at 10dB (A) increments to full output by the sixth step.

13.7.2 Amplifier Rack Frame

Each Amplifier Rack Frame shall house a maximum of eight zone amplifiers numbering from the bottom frame left hand side. Each amplifier is to be powered at 40, 120 or 240 Watts RMS 100 V line to suit the speaker zone load and be totally self-contained including the output transformer.

13.7.3 Standby Power Amplifier

The system shall be equipped with a minimum of 1 standby amplifier. The standby amplifier will automatically replace any 1 faulty amplifier. The standby amplifiers shall be appropriately rated to handle the largest speaker zone load.

13.7.4 Zone Volume Adjustment

Each Amplifier shall have a volume adjustment on the front edge of the module.

13.7.5 Fan Module

A Fan Module will be provided to draw air through the cabinet to maintain an acceptable working temperature for all the equipment.

The fan module shall be controlled by detecting temperature increase in the power supply or by receiving a signal or input from the EWIS.

13.7.6 Occupant Warning Speakers

All ceiling speakers shall:

- Comply with AS7240.24
- Have a multi-tap transformer
- Be supplied with a matching grill, white in colour
- Be 100mm diameter recessed ceiling mount
- Incorporate water/fire resistant backing cover.

All horn speakers shall:

- Be reflex horn type with a multi-tap transformer

- Be 15 W rated power with a corresponding sound power level of 110 dB @ 1 metre/1 watt or similar approved.

13.7.7 Audio Visual Alarms

Provide 24V DC powered and red base colour with integral red strobe.

Sound level set to "high".

All devices to be surface mounted utilising shallow base.

Devices to have in-built synchronising capability activated upon commissioning.

13.7.8 Strobe Light Alarms

Provide 24V DC powered with integral green strobe.

All devices to be surface mounted utilising shallow base.

Devices to have in-built synchronising capability activated upon commissioning.

13.7.9 Occupant Warning Zones

Zones to be as follows:

Occupant Warning Zone	Location
Evac Zone 1	Townhouses
Evac Zone 2	Basement floor
Evac Zone 3	Ground floor
Evac Zone 4	Level 1
Evac Zone 5	Levels 2-6
Evac Zone 6	Spare

13.8 INTERFACES

13.8.1 Access Control System

Provide signal cabling from the FDCIE to the building's Access Control Panel to enable release of doors in the event of a fire alarm. Door strikes shall be provided by door hardware supplier and wiring by the Electrical Sub-Contractor. Fire contractor to undertake terminations at the Fire Detection Control and Indicating Equipment only.

Operation

Electric door strikes shall release upon removal of power supply. Automatic doors are to drive open in the event of a fire alarm. Internal automatic doors are to be manually operated from the FDCIE via a rotary switch.

14 ELECTRICAL WIRING INSTALLATION

14.1 WIRING METHODS

Each wiring method shall comply with the requirements of the relevant clauses within this specification.

All cables shall:

- Be adequately fixed and supported with appropriately sized purpose made clips, cleats, straps or saddles. Fire rated cables shall be fixed and supported by suitable fixings in accordance with local requirements.
- Be installed in accordance with the manufacturer's recommendations.
- Be installed between equipment without any joints.
- Be installed so that it can be readily renewed, repaired and relocated without effecting building finishes and construction.
- Be in accordance with an approved colour code, so that all wires are readily distinguishable.
- Be provided with the appropriate state approval markings in accordance with AS/NZS 5000.2:2006.
- Have adequate cross-sectional area so that on particularly long wiring runs the integrity of system operation is not compromised by excessive voltage drops, and in any case these voltage drops shall not reduce the voltage across particular items of equipment to a level below the manufacturers recommended operating parameters. Confirm the relevant specifications with the manufacturer.

All detector wiring shall be completely separated from low voltage wiring and where it crosses low voltage wiring a separating bridge of rigid non-conducting material shall be supplied and installed between the fire alarm and low voltage wiring (AS/NZS 3000:2007). In general, detector cables must be so spaced from all other wiring or otherwise protected, such that the magnitude of induced voltage in the detector circuit cannot cause a false alarm.

14.2 FAIL SAFE CONTROL/ALARM CIRCUITS

Circuit Provisions:

- TPS cabling red sheathed.
- Use of voltage free normally open (de-energised state) contacts with normally energised relays. On alarm, relay de-energises and contacts open.
- Provides alarm/control as per AS 1670.

Systems Served:

- Smoke/Fire detection alarms.

- Valve monitoring.
- Pressure switch indicators.

14.3 NON-FAIL-SAFE CONTROL CIRCUITS

Circuit Provisions:

- Radox FR or MIMS cabling to AS/NZS 3013.
- Use of voltage free normally open (de-energised state) contacts with normally de-energised relays. On alarm, relay energises and contacts close.
- Provides alarm/control to AS 1670.

Systems Served:

- External alarm bell.
- FDCIE to ASE.
- Building fire mode, including Mechanical for status and operation.
- Supply air smoke detectors
- Door hold open devices.

14.4 SUPERVISED CONTROL CIRCUITS

Circuit Provisions:

- Red sheathed or engraved sheath identification as to purpose.
- Monitors via equipment for open circuit and closed circuit, i.e. addressable.
- Can provide integration for both fail safe and non fail-safe functions in one multi-core cable with fire resistant rating to AS/NZS 3013 as for non fail-safe control circuits.
- Must include loop (redundant path) circuiting.
- Must include a minimum of 2 loop circuits.
- Must provide a mixing of alarm/control points from various compartments/zones throughout the building, inter-connected across 2-3 loops for additional redundancy.
- Must not include all alarm/control points for a building compartment/zone connected to 1 loop.
- Incorporate 25% spare capacity points per circuit loop for future use.

14.5 ANALOGUE/ADDRESSABLE LOOPS

The analogue/addressable loop/s shall be cabled in red twisted TPS, unless detectors/devices are performing smoke control system functions. For smoke control system functions, the loop shall be fire-rated RADOX or approved equivalent. All loops are to have a maximum loop resistance of 50 ohms with a maximum distance of 2km when 2.5mm² cable is used.

Two core screened twisted pair cable originating from FDCIE extending through the protected areas and returning to the FDCIE shall be utilised for loops not requiring a fire rating.

Cable Specifications:

- Capacitance of 100 picofarads per metre or less
- Resistance of 100 milliohms per metre or less
- Impedance of loop typical 100 to 120 ohms

Maximum distances between modules 1km providing cable meets above specifications.

Recommended cable type:

- Hartland HC2335 (non fire-rated)
- Radox FR Communication 1.5mm 1 pair (fire-rated)

The analogue/addressable loop/s shall consist of a two core cable originating from the FDCIE extending through the protected areas and returning to the FDCIE or remote addressable module. The use of multicore wiring containing both outgoing and incoming circuits is not acceptable.

A maximum number of 120 devices (comprising not more than 96 detectors or 32 control modules) shall be connected onto any one analogue/addressable loop. A minimum of 4 addressable loops shall nevertheless be allowed for in the tender and shall not be varied unless approved by Consulting Engineer.

Wiring between addressable devices and equipment such as pressure switches etc. shall be monitored for an open circuit.

14.6 WARNING SPEAKERS

A two-core cable from each amplifier shall be installed to the first speaker and then looped to the other speakers in that zone. An 'End of Line' resistor shall be installed across the 100V line at the last speaker of each zone.

15 FIRE MODE CONTROLS AND OPERATION

15.1 GENERAL

Allow for complete and automatic control systems with manual override as specified.

Provide controls of an approved manufacture which has comprehensive stocks held locally and of the same type throughout the project, to enable feasibility of service and consistency.

Use tradesmen for installation of the control system who are familiar with and are regularly engaged in such works.

Select equipment that will provide correct operation within the required specified set point and operating range limits.

Provide controls which are electric throughout generally operating on 240V AC, or 24V DC where integrated directly with fire alarm equipment and as required where interfacing with other electrical controls equipment.

Allow commissioning of all control equipment by the control equipment manufacturer and adjust all controls to operate to approval.

15.1.1 Cross-References

Refer to Section 15 for fire detection and alarm system details.

Refer to Section 17 for electrical wiring installation specifications.

15.2 FIRE SERVICES SYSTEMS

Ensure that the system operation functions as per the following sections for each type of system alarm.

Refer to Section 15.3 for specific smoke control system requirements, to be interfaced and coordinated with the Mechanical Services trade.

15.2.1 Fire Sprinkler Alarm

Upon activation of an automatic fire sprinkler, the alarm protocol shall be as follows:

- Provide alarm or control by loss of pressure within the system.
- Allow water flow to the operating fire zone.
- Transmit sprinkler alarm signal to monitoring company/fire authority by system pressure switch operation, duplicated via the ASE.
- Identify fire zone by system pressure switch, incorporate all sprinkler zones on FDCIE.
- Activate local alarm bell/gong.
- Provide occupant alarm to area of sprinkler operation.

- De-energise door hold open to release closed.
- Provide manual reset of system after auto activation.

15.2.2 Fire Detection Alarm

Upon activation of a smoke or heat detector, the alarm protocol shall be as follows:

- Activate local alarm bell/gong.
- Provide occupant alarm to area of detector operation.
- Transmit detection alarm signal (excluding supply air smoke detectors) to fire authority via the ASE monitoring facility.
- De-energise door hold open devices to release closed (Occupant Warning zone in Alarm)
- Provide shutdown, start up or retain in operation, major mechanical supply air ventilation plant to building zones as nominated.
- Start up or retain in operation, the smoke exhaust fans within the building zone of 'fire alarm' origin.
- Activate fire damper (in-duct) to open to smoke spill mode.
- Smoke detector to activate adjacent smoke spill fan in accordance with National Construction Code requirements.
- Use non-fail safe control method as a 'control function' for smoke exhaust fan activation.
- Ensure fire alarm signal compatibility with control relays.
- Ensure correct number of fire alarm signals for number of building fire zone functions.

15.2.3 Manual Call Point Alarm

Upon activation of a manual call point, the alarm protocol shall be as follows:

- Send signal to the FDCIE.
- Transmit fire alarm signal to fire authority via the ASE monitoring facility.
- De-energise door hold open devices to release closed (Occupant Warning zone in Alarm)
- Does not initiate any building fire mode or shut down systems (smoke hazard management control).

15.2.4 Monitored Valve Alarm

Upon activation of the anti-tamper monitoring system, the alarm protocol shall be as follows:

- Transmit monitoring alarm to FDCIE for local alarm.
- Transmit local alarm signal to fire authority as required.

- Provide manual reset for 'normal' status.
- Use fail safe control method as a 'control function'.

15.2.5 Pump Operation Alarm

Upon activation of a fire protection pump, the alarm protocol shall be as follows:

- Transmit monitoring alarm to FDCIE for local alarm.
- Activate secondary alarm on ASE / Transmit local alarm signal to fire authority as required.
- Provide manual reset for 'normal' status.
- Use fail safe control method as a 'control function'.
- Activate LED light on FDCIE
- Activate external fire alarm bell and strobe

15.3 SMOKE CONTROL SYSTEMS

15.3.1 General Configuration

Provide building shut down or fire mode as designated, for smoke hazard management control.

15.3.2 Smoke Control System Plant

The smoke control system plant, provided by the Mechanical Services trade, is as follows.

Designation	Description	Location	Area Served
TBC	Car park exhaust fan	Carpark	Basement

Carry out co-ordination with other trades to ensure effective and consistent plant/equipment designation across all documentation.

Utilise firm numbering and naming of equipment, controls, layouts and key plans to approval.

Utilise listed provisional numbering/naming of rooms or areas for construction purposes.

Remote control of all systems shall be provided by way of a Fire Fan Control Panel within the FDCIE. Refer to Section 13.5.11.

15.3.3 Fire Mode Operation

Upon receipt of a fire alarm in a designated zone (referred to as the fire zone), the mechanical services plant shall generally operate in accordance with the following principles:

- Smoke exhaust fans, stairwell pressurisation fans and designated air handling plant shall shut down or operate, depending on their location in reference to the fire zone, and the overall smoke control strategy.

- Smoke exhaust fans when in operation shall run at 100% capacity.
- Smoke migration to another fire zone shall operate plant in the fire mode arrangement as if it was the fire zone of origin. This is a sequential arrangement for start-up of all fire zones (for smoke control).
- Smoke and air dampers shall open or close, depending on their location in reference to the fire zone, and the overall smoke control strategy.
- Any regular timeclock or other programming functions shall be overridden during fire mode operation.

16 TESTING AND COMMISSIONING

16.1 GENERAL

Prepare and submit Inspection and Test Plans 10 working weeks prior to the scheduled testing and commissioning period for review and approval.

Provide sufficient notice (minimum 5 working days) so that all testing and commissioning may be witnessed by the Building Services Consulting Engineer for the purposes of certifying to the Building Owner that all work has been completed in accordance with specification requirements.

Ensure the correct phase sequence is maintained throughout the installation.

Provide test certificates and Certificates of Compliance for approval. Include copies within Installation Manuals.

Obtain approval before energising newly installed or reconnected wiring or equipment.

During testing, replace any component and equipment damaged as a result of incorrect installation work.

16.2 TESTING

16.2.1 Fire Water Storage

- Test remote infill facility to fire water tanks.
- Test liquid level indicators.

16.2.2 Pumps

Measure vibration levels at positions to be agreed (in the event that vibration levels exceed acceptance criteria and are clearly perceptible).

Measure and record vibration signatures in both radial and axial directions for major equipment.

Measure vibration signatures with equipment/system completely assembled and in full working order.

Scheduled equipment to be equipped with permanent mounting points for accelerometers within the octave band range 10 Hz to 10,000 Hz.

16.2.3 Pipework

Each pipework system shall be tested in sections as the work proceeds in accordance with the relevant Australian Standard Code and with the following requirements:

- Test pressure shall be applied during the construction period, with each section being blanked until further tests are made.

- All equipment, material and labour necessary for testing shall be provided and all necessary "blanking off" shall be done to prevent excessive pressure to equipment, seals or other similar parts of the system.
- Open and close all control valves under water pressure to ensure proper operation.
- Apply a test pressure of 1400kPa (sprinkler), 1700kPa (hydrant), and 1500kPa (window-wetting sprinkler) to the section under the test, or 1.5 times the system working pressure, whichever is the greater and;
 - Retain section under test without makeup pressure for the longer duration of two hours or the time necessary to inspect all joints in the test section.
 - The test section shall be considered satisfactory if there is no pressure drop for the duration of the test and no leaks are apparent in the test section.
 - All defects disclosed during testing shall be immediately rectified and fresh tests carried out as required by the Superintendent.
- Pressure testing shall be carried out as follows:
 - Before piping is boxed in or otherwise covered.
 - Before ceilings are replaced or installed and finishing trades have commenced their work.

The Fire Services Trade shall submit a programme indicating proposed sections of pipework system to be tested. All pressure testing dates, duration and pressure are to be noted on a record set of drawings.

16.2.4 Portable Fire Extinguishers

Portable fire extinguishers shall be factory-tested prior to delivery to site.

Test mounting brackets and the like for robustness and ease of operation.

16.3 COMMISSIONING

16.3.1 Pumps

- Arrange with fire authority or independent commissioning authority to attend site and carry out flow test of hydrant system simultaneously with sprinkler flow test.

16.3.2 Fire Brigade Booster Assembly

Commission and coordinate booster flow testing upon completion of the works and allow for payment of all associated fees. Ensure that booster testing is scheduled with sufficient notice so as not to delay practical completion.

16.3.3 Fire Hydrant System

- Undertake independent performance testing (i.e. flow and pressure testing) to ensure the minimum performance criteria are achieved.
- Arrange with fire authority or independent commissioning authority to attend site and carry out verification performance flow test of the hydrant system.

16.3.4 Fire Hose Reels

- Arrange with independent commissioning authority to attend site and carry out flow test of fire hose reels simultaneously with sprinkler flow test.

16.3.5 Automatic Fire Sprinkler System

- Arrange with fire authority or independent commissioning authority to attend site and carry out flow test of hydrant system simultaneously with sprinkler flow test.

16.3.6 Fire Detection and Alarm System

- Test the operation of all smoke detectors in accordance with AS1670.
- Confirm operation of alarms.
- Confirm alarm signal transmission to the fire authority or monitoring company.
- Test the operation of the Occupant Warning System on a zone-by-zone basis.
- Confirm free-release of all required exit doors during fire mode.

16.3.7 Controls and Interfaces

- Test fire-mode interface of all systems.
- Confirm operation of shutdowns.
- Test Fan operation for stairwell pressurisation and smoke exhaust.
- Test smoke damper operation on the fire and non-fire-affected floors.

17 SERVICE AND MAINTENANCE

17.1 SERVICE CONTRACT

Provide 24-hour emergency call-out services and arrive on site to rectify defective items within 2 hours of notification of a defective item.

17.2 MAINTENANCE WORKS

The maintenance period shall be 12 months from the date of Practical Completion.

After commissioning of the system, provide full maintenance support through the maintenance period. This support shall include all action necessary to maintain the system operating correctly as specified, and shall include but not be limited to:

- Carry out weekly tests as required by the relevant standards;
- Carry out monthly inspections and perform maintenance work at the frequencies and following the procedures recommended by the manufacturers of the supplied equipment;
- Repair and/or return of faulty modules, printed circuit boards or any other item or sub-system comprising the total system.
- Promptly rectify faults. Replace faulty materials and equipment.
- Test the operation of FDCIE circuits on a monthly basis.
- Routine adjustment and servicing of all equipment including ancillary equipment.
- Supply of consumable spares such as fuses and lamps that require replacement from time to time.

During the Warranty and Maintenance Period, this general maintenance support shall be free of charge to the Proprietor. Maintenance support costs shall be deemed to be included in the Tender price.

Provide maintenance check sheets and arrange for signing of these by the nominated site representation. Provide a copy of the check sheets to the principal on a monthly basis.

17.3 ONGOING TRAINING

Coinciding with Commissioning and routine inspection visits, at times to be agreed with the principal, instruct the Principal's operational maintenance staff in the recommended methods of operation and maintenance of the systems.

In addition, provide a time allowance of 8 hours for the initial instruction in the operation of all systems.

17.4 CERTIFICATION

At 12 months from the date of practical completion, allow to provide a maintenance certificate in accordance with the relevant legislative requirements.

At the end of the maintenance period make a final service visit and, upon satisfactory completion of the above procedures, certify in writing that the installation is operating correctly.

Approval for the release of retention monies will not be granted until 12 consecutive monthly check sheets have been received by the Proprietor.

APPENDIX A TENDER PRICE BREAKDOWN

This schedule is required to be filled out at time of Tender Submission. The amounts indicated in the total Tender price including administration costs and profit for sections of the work are as follows:

ITEM	AMOUNT TENDERED
Site Water Supply	
Authorities Towns Mains Water Supply Connection	\$
Back Flow Prevention	\$
Other	\$
Sub-Total	\$
Fire Water Storage	
Fire Tank Liner	\$
Pipework and Valves	\$
Other	\$
Sub-Total	\$
Pumps	
Combined Fire Hydrant/Sprinkler Pumps	\$
Jockey Pumps	\$
Controls and Interfaces	\$
Other	\$
Sub-Total	\$
Booster Assembly	
Pipework, Valves and Fittings	\$
Enclosure, Plinth and the like	\$
Other	\$
Sub-Total	\$
Fire Hydrant System	
Pipework, Valves and Fittings	\$
Controls and Interfaces	\$

Other	\$
Sub-Total	\$
Automatic Fire Sprinkler System	
Sprinklers	\$
Pipework, Valves and Fittings	\$
Controls and Interfaces	\$
Other	\$
Sub-Total	\$
Fire Detection and Alarm System	
Fire Detection Control and Indicating Equipment	\$
Occupant Warning Panel	\$
Public Address and Remote Paging Facilities	\$
Detection, Manual Call Points, Speakers and associated cabling	\$
Alarm Signalling Equipment	\$
Controls and Interfaces	\$
Other	\$
Sub-Total	\$
Fire Hose Reels	
Pipework, Valves and Fittings	\$
Other	\$
Sub-Total	\$
Portable Fire Extinguishers and Fire Blankets	
Extinguishers and Fire Blankets	\$
Other	\$
Sub-Total	\$
General provisions including	
Workshop Drawings	\$

O&M Manuals/Block Plans	\$
Testing and Commissioning	\$
Fire Authority Commissioning	\$
User Training	\$
12 months defects liability period including maintenance.	\$
Other (specify)	\$
TOTAL (EXCL. 10% GST)	\$
GST	\$
TOTAL (INCL. 10% GST)	\$

APPENDIX B SCHEDULE OF RATES

The following rates will be used to price variations including any fit out works and shall include all costs, profit and GST associated with the design, supply, installation, testing, commissioning and defects liability associated with such works. The rates shall allow for all materials, workshop drawing alterations, system programming, labour, cartage, freight, tools, plant scaffolding, painting appliances, etc.

Should the Tenderer require differing rates for variation additions as distinct from variation omissions or reductions or differing rates during the various stages of construction and defect liability period, then these additional rates shall be provided in addition to the following:

Fire Hydrant/Hose Reel System

Internal hydrant valve, complete with 1.0m of Ø100 pipework and connection to internal fire hydrant pipework complete with drain down and recharge of hydrant system.	\$
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Fire hose reel complete with sheet metal enclosure, complete with 2.0m of Ø32 pipework, connection to fire hose reel/fire hydrant pipework, drain down, and recharge of system.	\$
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Automatic Fire Sprinkler System

Ceiling mounted semi recessed type fire sprinkler including pipework modifications, excluding drain down and recharge	\$
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Ceiling mounted semi recessed residential type fire sprinkler including pipework modifications, excluding drain down and recharge	\$
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Ceiling mounted flush type fire sprinkler including pipework modifications, excluding drain down and recharge, incorporating cover plate.	\$
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Ceiling mounted exposed type fire sprinkler including pipework modifications, excluding drain down and recharge	\$
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Concealed space fire sprinkler including pipework modifications, excluding drain down and recharge	\$
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Wall Wetting fire sprinkler head including pipework excluding drain down and recharge	\$
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Side-wall fire sprinkler head including pipework excluding drain down and recharge	\$
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Extra cost for custom colour flush plate	\$
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Extra cost for wire guard	\$
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Extra cost for 1.2m (length) Ø25 flexible dropper	\$
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Lift assembly dry tail assembly, including solenoid valves and drain down facilities, excluding drain down and recharge	\$
Pressure switch	\$
Flow Switch	\$
Unit rate for cut in to existing/installed pipework, excluding drain down and recharge	\$
Unit rate for 1 off drain down and recharge of fire sprinkler installation.	\$
Unit rate for 1 off new / modification of dry fire block plan	\$

Automatic Fire Detection and Alarm System

Duct mounted photo optical (addressable) detector approved to AS/NZS 1668 allowing 10 metres of wiring including all connections.	\$
Input/output interface unit	\$
Ceiling mounted occupant warning speaker allowing 10 metres of wiring including all connections	\$
Extra cost for custom colour speaker	\$
Horn speaker allowing 10 metres of wiring including all connections	\$
Green strobe light allowing 10 metres of wiring including all connections.	\$
Fan flow switch	\$
Fan pressure switch	\$
Manual call point allowing 10 metres of wiring including all connections	\$
Photo-optical (addressable) detector allowing 10 metres of wiring including all connections	\$
Heat detector (addressable) allowing 10 metres of wiring and all connections.	\$
Extra cost for custom colour detector	\$
Unit rate for 1 off reprogram of FDCIE for 1 zone modification including output functions after system commissioned.	\$
Unit rate for 1 off new / modification of dry fire block plan	\$

Cabling, complete with termination at equipment and FIP (\$/m)

Audio cable	\$
Audio cable (fire rated)	\$
Data cable	\$
Data cable (fire rated)	\$
Smoke alarm cable	\$
Network cable	\$
Catenary wiring	\$
Ø25 Conduit (above ground)	\$
Ø32 Conduit (above ground)	\$
Ø25 Conduit (below ground)	\$
Ø32 Conduit (below ground)	\$

Fire Extinguisher

Supply and installation of a 3.5 kg CO2 extinguisher including brackets and signage.	\$
Supply and installation of a 4.5 kg dry chemical powder extinguisher including brackets and signage.	\$
Supply and installation of a 9 litre air-water type extinguisher including brackets and signage.	\$

	Ø150	Ø100	Ø80	Ø65	Ø50	Ø40	Ø32	Ø25
Valves/Ancillary	\$	\$	\$	\$	\$	\$	\$	\$
Above ground isolation valve	\$	\$	\$	\$	\$	\$	\$	\$
Extra cost for monitoring of above ground valve, complete with wiring and termination at FIP	\$	\$	\$	\$	\$	\$	\$	\$
In ground Sluice Valve	\$	\$	\$	\$	\$	\$	\$	\$
Above ground Check Valve	\$	\$	\$	\$	\$	\$	\$	\$
Pipework	\$	\$	\$	\$	\$	\$	\$	\$
Pipework Above Ground (\$/m)	\$	\$	\$	\$	\$	\$	\$	\$
Pipework Below Ground (\$/m)	\$	\$	\$	\$	\$	\$	\$	\$

GENERAL

The following trades shall be charged at the rates per hour:

Trade	Normal	Time/Half	Double Time
Sprinkler Fitter	\$	\$	\$
Site Electrician	\$	\$	\$
Shop Electrician	\$	\$	\$
Draftsman	\$	\$	\$

APPENDIX C SCHEDULE OF TECHNICAL DATA – SUPPRESSION SYSTEMS

Complete this schedule of material items proposed and include with Tender. All items shall comply with the specification unless the Tender nominates and includes details of the nonconformity.

1 .Sprinkler Heads – Ceiling Mounted (Internal)

Make

Model/Nos

2 .Sprinkler Heads – Ceiling Mounted (External)

Make

Model/Nos

3. Sprinkler Heads – Concealed Space

Make

Model/Nos

5. Sprinkler Heads – Window Wetting (External)

Make

Model/Nos

6. Sprinkler Heads – Exposed

Make

Model/Nos

7. Sprinkler Heads – Side Wall

Make

Model/Nos

8. Alarm Valve

Make

Model/Nos

9. Pressure Switch

Make

Model/Nos

10. Valve Monitoring Device

Make

Model/Nos

11. Fire Pumpset

Make

Model/Nos

12. Automatic Jacking Pump

Make

Model/Nos

13. Isolation Valve

Make

Model/Nos

14. Check Valve

Make

Model/Nos

15. Backflow Prevention Valve

Make

Model/Nos

DETAIL – EQUIPMENT CONFORMITY

Items below all points where tendered items differ from the specification:

APPENDIX D SCHEDULE OF TECHNICAL DATA – DETECTION, ALARM AND WARNING

Complete this schedule of material items proposed and include with Tender. All items shall comply with the specification unless the Tender nominates and includes details of the nonconformity.

1. Fire Detection Control and Indicating Equipment

Make

Model/Nos

2. Occupant Warning Panel

Make

Model/Nos

3. Smoke Detector

Make

Model/Nos

4. Green Strobe Alarm

Make

Model/Nos

5. Manual Call Point

Make

Model/Nos

6. Ceiling Speakers

Make

Model/Nos

7. Horn Speakers

Make

Model/Nos

8. Fire Detection Cabling

Make

Model/Nos

9. Occupant Warning Cabling

Make

Model/Nos

10. Fire Rated Cabling

Make

Model/Nos

DETAIL – EQUIPMENT CONFORMITY

Items below all points where tendered items differ from the specification.

APPENDIX E SCHEDULE OF SUBCONTRACTORS AND PERSONNEL

Identify below Sub-Contractors included within the tender submission.

ITEM	SUB-CONTRACTOR
Wet Systems
Dry Systems
Trenching and Excavation
Testing and Commissioning
Other

Identify key personnel identified to be involved in the project:

Personnel	Name	Years' Experience	Years with Company
Project Manager
Foreman