

B Functional Brief for the Upgrade of Building Services

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Consultants Pty Ltd

FUNCTIONAL BRIEF

for the

UPGRADE

of the

BUILDING SERVICES

as part of the

WHITEHORSE CENTRE

REDEVELOPMENT

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BUILDING SERVICES

1 GENERAL

1.1 Overview

This services brief covers the minimum design requirements of all building services in relation to the redevelopment of the Whitehorse Centre. The brief should be read in conjunction with the architectural brief, theatrical brief and room data sheets.

The design however should be flexible, meeting latest industry standards relevant to a performing arts complex.

All system shall be design to achieve a 20-30 year return on investment

1.2 Standards and Authorities

All systems shall be design in accordance with following current regulations and standards:

1. Building Code of Australia
2. Relevant Australian standards including but not limited to:

Air Handling:

- AS 1668.1 - 1991, The use of mechanical ventilation and air-conditioning in buildings - Fire and Smoke Control.
- AS 1668.2 - 1991, The use of mechanical ventilation and air-conditioning in buildings - Mechanical ventilation for acceptable indoor-air quality.
- AS 1688.2 Supplement 1 - 1991, The use of mechanical ventilation and air-conditioning in buildings - Mechanical ventilation for acceptable indoor-air quality - Commentary (Supplement to AS 1668.2 - 1991).
- AS/NZS 3666.1:1995, Air handling and water systems of buildings - Microbial control - Design, installation and commissioning.
- AS/NZS 3666.2:1995, Air handling and water systems of buildings - Microbial control - Operation and maintenance.
- AS 4254 - 1995, Ductwork for air handling systems in buildings.

Air-conditioning:

- AS 1277 - 1983 - Measurement procedures for ducted silencers.
- AS 1324.1 - 1996, Air filters for use in general ventilation and air-conditioning - Application, performance and construction.
- AS 1324.2 - 1996, Air filters for use in general ventilation and air-conditioning - Methods of test.
- AS 3823.1.1 - 1998, Performance of household electrical appliances - Room air conditioners. Part 1.1: Non ducted air conditioners and heat pumps - Testing and rating for performance.
- AS 1861.2 - 1991, Air-conditioning units - Methods of assessing and rating performance - Refrigerated package air conditioners.
- AS 2913 - 1987, Evaporative air-conditioning equipment.

Electrical:

- AS 3000 - SAA Wiring Rules.
- AS 3008 - Electrical Installation - Selection of Cables.
- AS 3080 + series - Telecommunications Installations.
- AS HB29 - Telecommunications Cabling Handbook
- Austel and in particular their Private Network Design Guide (PNDG).
- AS 1670 - Automatic Fire Detection and Alarm Systems - System Design, Installation and Commissioning
- AS 1735 - Lift Code.
- AS/NZS 2293 – Emergency Evacuation Lighting for Buildings.

BUILDING SERVICES**Hydraulic:**

- AS 3500
- Country Fire Authority
- AS 1851 (Series) - Maintenance of Fire Protection Equipment
- AS 5601 Gas Installations

Relevant Fire Codes and in particular where relevant:

- AS 2419 Fire Hydrant Installations
- AS 2441 Installation of Fire Hose Reels
- AS 2444 Portable Fire Extinguishers and Fire Blankets.
- AS 1841 Portable Fire Extinguishers
- AS 1851 Maintenance of Fire Protection Equipment
- AS 2118 Fire Sprinkler Installations

3. General Codes and regulations:

- Local Gas Supply Authority and AG 601 Gas Installation Code.
- Office of Gas Safety
- Environment Protection Authority.
- Local Electricity Supply Authority.
- Energy Safe Victoria
- Relevant Sewerage and Water Supply Authority
- Relevant Local, State and Commonwealth Health Departments
- All Local Authorities having jurisdiction over the work.

1.3 Energy Consumption

All systems shall be designed and operated to minimize the overall energy consumed within the building. As a minimum the system shall comply with Section J of the BCA. However where improved performance can be achieved by increasing the design greater than that required by Section J, these shall be put forward along with suitable financial analysis for consideration as part of the project.

1.4 Operation and Maintenance Manuals

The client must be provided with comprehensive and accurate operation and maintenance manual. The manuals shall not be left for the contractors to produce rather they shall be outsourced by professional companies skilled in the production of the manuals.

The manuals shall provide the client with all the necessary instruction to allow the venue to be run at optimum efficiency.

The manual shall include a description from the designers to explain the design philosophy and optimum running parameters.

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2 MECHANICAL SERVICES

Design mechanical services to minimise life cycle cost, maintain a comfortable and safe environment for occupants.

2.1 System Design

The design of the system shall be selected to meet the requirements of each space shall take into account the following minimum requirements:

- Be able to meet the heat loads within the space and maintain temperatures at varying population loads
- Be able to cope with the fresh air loads in high density spaces
- System shall include variable outside air based on occupancy
- Minimise drafts
- Minimal temperature differential in all spaces not matter what the height.
- Low energy consumption
- Variable zoning
- Meet the requirements of the Room data Sheets
- The system shall include economy cycle
- Heat recovery systems on exhaust air discharge
- Any outcomes from the ESD evaluation and design
- Fire rating of mechanical systems

The design shall include cost benefit analysis of various systems to provide data to the client to prove that the system selected is the most appropriate for the venue.

The system may include central heating and cooling plant for large spaces and VFV type systems for ancillary spaces.

Select plant, equipment and materials that will provide a minimum service life (defined as the expected life of a specific component) period of 15 years.

2.2 Plant rooms

The location and size of plant rooms for all plant and equipment shall be designed to meet the following requirements:

- Access by maintenance contractors shall be available without entering functional spaces
- All plant and equipment shall be able to be removed for repair without damage to the building or interference with the operations of the facility
- All plant and equipment shall be accessible without the need of a mobile ladder
- Allow 2.1m access in around all plant for maintenance contractors
- All equipment and pipe work shall be labelled and colour coded to industry standards
- Access shall be provided to all duct cleanouts, valves and controls
- No cleanouts or access hatches shall be provided in general public areas.

BUILDING SERVICES**2.3 Control System**

Design a building automation system (BAS) to minimise the life cycle cost of the mechanical and electrical services and promote the efficient operation of the centre.

The whole of the mechanical systems shall be controlled by a DDC system complete with the following:

- Automatic control and monitoring of the mechanical systems to maintain desired set points and minimise energy consumption.
- Automatic control of the illumination systems to minimise energy consumption.
- Monitoring of building security system.
- Interfaces with emergency control panels such as fire detection and alarm, EWIS and smoke management for annunciation of alarm signals.
- Monitoring and control of emergency evacuation lighting system.
- Digital metering of Gas, Water, Electricity.
- Speed controls on fans
- CO2 monitoring and control to minimise outside air
- Set up of trending of operation, occupancy, temperatures and conditions within the space
- 365 day time clock control;
- Set up of 'Theatrical Performance' time based schedule up to a year in advance with predicted occupancy and other set point adjustments

The BAS shall incorporate a central PC with operating software with real-time dynamic graphical displays of the various system operating variables and controlled entities, database functions, operational algorithms and alarm annunciation and archiving. The system shall be able to be remotely read via the internet.

- global control of temperatures

2.4 Smoke Control System

The building will need to comply with the smoke control sections of the BCA. The design of these systems shall take into account the operation of the theatres and shall include isolation and operation during performances to control theatrical smoke effects. Therefore they will need to be design to accommodate the acoustic requirements of the space and the operation requirements of the local fire brigade. The make up air paths will also require careful acoustic considerations.

The final air quantity shall be as per the BCA or any fire engineering solution carried out.

2.5 Special Factors

The mechanical systems shall include the following into the design:

- Control of systems from stage management positions
- Separate systems for stage and auditorium with separate control and operation
- Central and local control of all systems
- Air distribution shall not cause curtains to sway
- Kitchen exhaust and make up to Australian Standards
- Ventilation for all underground vehicle access to Australian Standards.

2.6 Noise Management

The mechanical systems shall be design to meet the noise criteria determined as a minimum by the acoustic engineer.

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2.7 Design Conditions

Provide mechanical systems to heat, cool and ventilate each space in accordance with statutory requirements, and the following design criteria:

Ambient Conditions	General Comfort Design	
Summer	33 Deg C Dry Bulb	21 Deg C Dry Bulb
Winter	2.4 Dec C Dry Bulb	
Facility/Space	System	Criteria
Auditoriums	Heating, cooling and ventilation	21.5°C ± 1.5 °C
Stage	Heating, cooling and ventilation, Local Exhaust	21-24°C 10 A.C/Hr
Orchestra Pits	Heating, cooling and ventilation	22.5°C ± 1.5 °C
Patrons Amenities	Tempered air via heat exchangers, ventilation and Exhaust	20-24°C
Meeting/Function Rooms	Heating, cooling and ventilation	21.5°C ± 1.5 °C
Management and Office Facilities	Heating, cooling and ventilation	22.5°C ± 1.5 °C
Foyer/Entry	Heating, cooling and ventilation	22.5°C ± 1.5 °C
Piano Store	Heating, cooling	21.0°C ± 1.0 °C 24/7
Bars	Heating, cooling and ventilation	21.5°C ± 1.5 °C
Kitchens	Evaporative Cooling & Ventilation, and Specialist Exhaust	
Stores	Ventilation	
Archive	Heating, cooling	21.0°C ± 1.0 °C 24/7
Communications Rooms	Cooling	21.0°C ± 1.0 °C 24/7

BUILDING SERVICES**3 ELECTRICAL SERVICES**

Design electrical services to minimise life cycle cost and maintain a comfortable and safe environment for occupants.

3.1 Power Loads

The design shall include a complete analysis of the existing power distribution system throughout the building and upgrade of the same to meet the requirements of the proposed redevelopment.

The design shall incorporate the upgrade and relocation of the existing sub-station.

3.2 Backup Power Facility

The design shall include an analysis of various backup power facilities for the site. The analysis shall include the comparison between the following:

- Full backup facility with permanent on-site generation
- 800A backup facility with permanent on-site generation
- Full backup facility via connections for hired generator
- 800A backup facility via connections for hired generator

The analysis shall include spatial requirements and investigation to the availability of backup generators in an emergency scenario.

The analysis shall include operation and maintenance costs and hiring costs

The analysis should also include a proposal for the minimum size of fixed on site generator that will provide backup power to the following:

- Lifts
- Communications rooms
- Emergency lighting

3.3 Power Distribution

The design shall incorporate new power distribution. The power distribution shall incorporate the following features:

- Each major space shall be fed by a separately metered feed from the main switchboard.
- Each performance space shall have its own "green" audio distribution switchboard designed to minimise noise in the audio equipment - described below.
- Each switchboard shall have min 35% space capacity both in number of spare poles in the switchboard and cable carrying capacity of sub-mins feeding the board
- The mechanical services for each performance space shall also be separately metered along with the light and power

3.4 Clean Audio Power Distribution

The design of the power reticulation shall also include clean 'green' audio power reticulation from separate audio switchboards. All audio outlets shall have green faceplates and shall be star wired from their respective boards.

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3.5 General Purpose Power

General purpose power will be provided throughout the building and should consist of 10 amp, double power outlet, wall mounted on standard white polycarbonate wall plates.

Generally wherever computers are required, two double GPO's will be provided. All general purpose outlets shall be protected with Residual Current Devices (Earth Leakage).

Special purpose power outlets and direct connections with isolators for equipment will be provided for

- theatre power requirements,
- dimmers
- winches
- kitchen equipment
- storage hot water units,
- bar equipment,
- hand dryers
- security control equipment
- data equipment
- A/V equipment
- Lift

Outlets for cleaning shall be located at maximum 20m spacing throughout the facility.

3.6 Clocks

Design a complete central computer controlled clock system throughout the venue. Clock shall be located in accordance with the room data sheets. Time and date shall be set and adjusted automatically by the computerized system.

3.7 Audio Visual Cabling

The design of the audio/visual cabling has been outlined in the brief prepared by the theatrical consultant. The scope of the building services is to coordinate with the theatre designer with respect to the layout and documentation of all cabling required for the audiovisual systems. The building will be designed to accommodate the installation of the cables and access of these cables for maintenance.

3.8 Lighting Design

Lighting to the redevelopment shall be designed to meet the functionality and regulations governing each space. These will be carefully selected in conjunction with the Lead Architect keeping in mind the following constraints.

- Lights must be appropriate for the usage of the space.
- Lights must be low maintenance with long lamp life.
- Reflect the ambience of the space
- Functional
- Location of lights carefully selected to enable accessible changing of lamps/globes
- Minimize energy consumption
- Integration with Theatrical Lighting Systems

Base the selection of the illumination system(s) on a comprehensive life cycle cost analysis of alternatives. Use the following factors and assumptions as the basis for the analysis:

- 24 hour per day 365 day per year operation
- Electricity tariff:
- Life cycle period: 20 years
- Cost escalation rate per annum:

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The design should incorporate the following systems:

- Automatic control systems for operation of illumination systems and adjustment of illumination levels in response to occupancy and daylight contribution.
- Dimming systems for House lighting and Function spaces
- Central monitoring and control system for the emergency evacuation lighting system.

In addition the design shall include:

- Working and Blue lights for theatrical spaces
- External Lighting for safety and amenity
- Gallery Exhibition lighting

3.9 Emergency and Exit Lighting Design

Emergency and exit lighting shall be designed in accordance with AS2293. All fittings will be stand alone fittings with their own batteries. Costs associated with a central computerized emergency and exit light system shall be considered and cost benefit analysis shall be presented to the client for review. A test switch shall be located in the switchboard adjacent to the office.

All exit lights in the stage, rehearsal and auditorium shall be green letters on black background. All other exits shall be the standard white letters on a green background.

3.10 Communications Data/Voice Cabling

Design the complete installation of computer/voice cabling throughout the venue wired back to centralized data racks in a dedicated room or rooms. The number and location of communications rooms shall be dependant on the final layout of the building keeping in mind maximum cable lengths of data cable and cost of cable runs.

A complete review of the existing Telephony systems shall be completed and a report on its state and possible re-use in the redevelopment shall be handed to the client for consideration. This cost shall include a cost benefit analysis between retaining the old system and installing a complete new system based around the criteria indicated below.

The system will be structured cabling enabling both voice and data to be reticulated through out the venue. All cabling shall be wired as a minimum in CAT 6 and will be tested and certified on completion. It is assumed that all switching hardware required shall be supplied, installed and commissioned by the client at the completion of the building works.

Undertake cost benefit analysis to upgrade the data network to CAT7 and present findings to the client.

The design shall include:

- PABX with capacity up to 20 Handsets
- VoIP with DECT phones
- UPS with minimum run time during power outage of 30min to allow for safe shutdown of all communications equipment and operation of PABX in emergency
- ATM's in public space
- Kiosk in public spaces for ticket and information technologies
- POS distribution
- Each workstation location to include 3 Data points along with power

The brief/scope of data points will need to be worked though with the client.

BUILDING SERVICES**3.11 Security**

Design a complete security installation throughout the venue.

The building shall include a zoned intruder passive detection system with an internal and external alarm to a remote monitoring facility.

The security system shall be linked to the Building Automated system to provide occupancy feed back to enable systems to be turn-off when armed.

The system shall also include the following:

- Duress system wired to security company (To be clarified during the design stage)
- Access control system throughout the facility
- Expand the existing CCTV surveillance system to accommodate new and refurbished areas

3.12 Fire Detection and EWIS System

The building will require an AS1670 fire detection system. The design shall take into account the installation of the fire sprinkler system, of required, and shall be designed in conjunction with the same.

The building will require an Early Warning and intercommunication System in the form of speakers activated by the smoke detectors and/or sprinkler heads, WIPS etc.

The fire system shall be designed to include a Sub FIP on stage at each performance space to enable smoke heads in the performance space and attached areas to be turned off by a fire warden when smoke is being used within the space for theatrical reasons.

The panel shall also control the operation of smoke exhaust systems.

The functionality of the system shall be worked through with the local fire brigade.

Refer fire services brief for further details.

BUILDING SERVICES**4 HYDRAULIC SERVICES****4.1 Scope**

The scope of the Hydraulic Services includes:

- Works required to build of authority sewer main
- Modification to Natural Gas
- Sewer plumbing and waste
- Hot and cold water reticulation
- Pumped circulation of hot water service
- Thermostatic mixing valves to all basins and showers
- Fire Extinguishers
- Greasy waste for kitchen.

All hot and cold water and sewer reticulation shall be in accordance with AS3500.

4.2 Cold Water Reticulation

The system shall be design to ensure areas can be isolated without shutting down the whole system.

The system design shall insure that adequate pressure and flow is maintained for all uses within the building.

4.3 Sewer

The sewer reticulation shall be design to include:

- Modification to Sewer pipe work
- Installation of a 3000l grease trap to the sewer pipes from the kitchen
- Greasy Wastes from Bars etc

4.4 Hot Water Reticulation

The system shall be design to ensure areas can be isolated without shutting down the whole system.

The selection of hot water service equipment should following a cost benefit analysis of the various systems available.

An analysis of solar hot water generation shall be undertaken and included in the design if financially viable.

4.5 Tepid Water

Tepid water mixing valves will be installed to all ablution areas to provide low temperature hot water (45°C) in accordance with relevant standards and to safe guard the occupants within the building. The cleaners and other amenity areas that have staff supervision will however have water at 65°C for cleaning purposes.

A complete review of the various options for thermostatic mixing to provide the lowest overall maintenance cost to the client. A report shall include items such as frequency of testing, replacement costs and reliability.

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4.6 Fire Systems.

The following fire systems will be designed in accordance with the relevant Australian Standards.

- Hose reels
- Fire extinguishers
- Smoke and fire separation
- Fire sprinkler system
- Fire detection system

Pressure and flow data shall be obtained and reviewed early in the design phase to confirm or otherwise the availability of water to services the fire suppression needs of the building.

Should water storage and/or pumps be required these shall be designed into the system.

4.7 Acoustic Treatment

The hydraulic design shall take into account the acoustic requirements for each space and shall include isolation from the structure as required. The systems shall be designed to ensure that water hammer is not transmitted through the venue.

5 LIFT SERVICES (If Required)

Design the complete lift services required to services the building. The following shall be incorporated into the design.

- The lifts will be required to operate in emergency situations and therefore will require backup power generation. This will be part of a fire engineered solution
- The lifts shall all be stretcher and DDA compliant
- Lifts serving backstage areas shall include stainless steel finishes and hooks and be capable of lift an upright piano.

6 FIRE ENGINEERING

All building services design work shall be coordinated with any fire engineering solution required for the venue.

7 ESD

7.1 ESD Objectives

The principal objective in the redevelopment of the facility isto develop engineering and construction methods the achieve the requirements of Councils Energy and Sustainability requiremnets.

The analysis of ESD initiatives shall be from a community wide viewpoint and not simply considered for use by this venue alone. For example the venue has relatively low water consumption with a high ability to collect a relatively large amount of water. The water collected could be used for adjacent community uses.

All analysis should compare possible design solutions on an 8 year payback period. Anything under 8 years should be considered a given and included in the design.

BUILDING SERVICES**7.2 ESD Analysis**

The following shall be included in the ESD analysis for the redevelopment:

- Passive Design
- High efficiency equipment
- Optimised indoor air quality
- Fit for Purpose - response to theatrical needs of each space
- Renewable Energy sources. Review and analysis of the following:
 1. Solar power and hot water
 2. Wind technologies
 3. Cogeneration
 4. Trigenation
- Water Efficiency
- Sub-metering
- Sustainable Materials
- Sustainable transport solutions
- Environmental Management plans

7.3 Operation

A critical factor in increasing the overall efficiency of the building is the feedback on how the system operates and how the client interacts with the facility. An important part of the design will be the process's put tin place to enable the client to monitor outcomes of the ESD initiatives.

Therefore the following will be critical to enable these outcomes to occur:

- Accurate and comprehensive operation manuals
- Clear understanding of the design philosophy and implementation of the same
- Feedback mechanism to measure and report on outcomes
- Clear and concise training of the operation and maintenance of all systems

7.4 Non Negotiable

The following shall be included in the design and shall be not negotiable:

- Lighting Control System for daylight and dimming control
- Sub-metering of water, gas electricity etc, in sub-groups that provide feedback to the overall operations of the venue
- No low voltage incandescent light sources