102-108 Humffray Street, Ballarat East

ENGINEERING SERVICES

Return Brief & Existing Conditions Report

JOB NO.: 11587
STATUS: Client Issue
DATE: 14.09.2022
REVISION: 00
FILE NAME: 11587-Humffray Street Ballarat East-Return Brief.docx

CITY OF BALLARAT

BRT Consulting Pty Ltd
159 Victoria Parade
Collingwood VIC 3066
T 03 9417 2971
E melb@brt.com.au

consulting engineers
BRT

BRT Consulting Pty Ltd
159 Victoria Parade
Collingwood VIC 3066
T 03 9417 2971
E melb@brt.com.au

consulting engineers
BRT

1.0 TABLE OF CONTENTS

BRT Consulting Pty Ltd
159 Victoria Parade
Collingwood VIC 3066
T 03 9417 2971
E melb@brt.com.au

BRT Consulting Pty Ltd
159 Victoria Parade
Collingwood VIC 3066
T 03 9417 2971
E melb@brt.com.au

2.0 REPORT SCOPE & INTRODUCTION

This report considers the engineering services for the new development located at 102-108 Humffray Street North, Ballarat East with consideration of the proposed designs provided.

This report is provided to help inform the design team to explain the following:

- Suitability or coordination issues with existing authority services
- Additional elements required for the proposed project
- Explanation and introduction to relevant building services components

In addition, commentary and details are provided on several of the key or requested design items involved in this type of project.

Once signed off, the drawings and specifications will be designed to meet the requirements of this brief.

This report covers power, communications, water, fire, sewer, and gas.

Areas in the brief which are highlighted have not been resolved. These areas may require a site investigation to confirm or further information from the client and/or relevant Authority. Generally, the blue highlight is client requested information and the yellow is to be resolved following further engineering services review and design issues to be worked through.

This report should be read in conjunction with the following documents:

1. Current architectural plans
2. BRT preliminary markups
3. BRT – Design Memos 01 & 02

This report is intended as a guide for the design process rather than any commitment or mandated building requirement.

2.1 Executive Summary

The report identifies the following:

- Gas will not be utilised in any building on the site, and a connection will not be provided to the site
- New NBN reticulation to the site will be provided, in accordance with authority requirements and guidelines
- It appears likely that the existing water and sewer reticulation around the site should be suitable to serve the site
- Issues with the electrical reticulation around the site have been identified (particularly to Porter Street and Humffray Street) and augmentation of assets to suit this project will almost certainly be required. Partially to provide the suitable power connections and partially to allow for the project as documented to take place. Further design work by the power authority will be required for this
- The provision of services connections (particularly electrical and fire) is impacted by whether or not the buildings in the development are ‘standalone’

and some economies of scale can be achieved if they are conducted simultaneously
- To this stage, the spatials in the design work have been caculated and provided on the basis that each building may need to be a standalone project
- The commercial building is proposed to be designed in line with the Property Council of Australia A-Grade requirements and also to be NABERS accredited. This does have significant impacts on some of the services designs throughout. Spatials and designs provided to this point have allowed for the general requirements of this guideline. Further information with regards to the implied Green Star requirements will be required during detailed design
- The building services design has and will be in conjunction with the ESD report for the project

In this early stage of the project, coordination with other consultants (for example acoustic), has not yet occurred, but is expected to be worked through during the design process.

Figure 1 Site image of 102-108 Humffray Street, Ballarat East

BRT Consulting Pty Ltd
159 Victoria Parade
Collingwood VIC 3066
T 03 9417 2971
E melb@brt.com.au

consulting engineers
BRT

3.0 SITE SERVICES

3.1 Electrical

The incoming electrical supplies to the existing site buildings are generally overhead supplies from assets located on Humffray Street. See figure 2 below for Dial Before You Dig information.

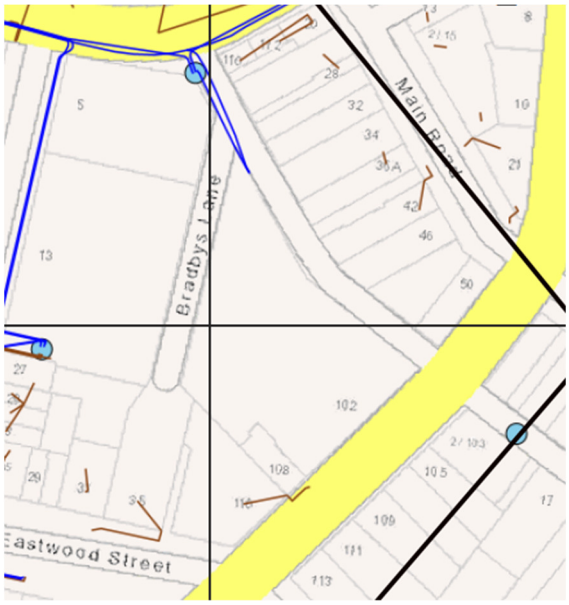

Figure 2 Dial Before You Dig excerpt (c) from Powercor

Figure 3 Detailed view of existing authority assets

In addition to these existing supplies; there is also a number of authority assets located down Porter Street, including connection to adjacent properties and also an authority substation located on common property (outside the proposed works area).

Figure 4 Existing authority electrical infrastructure in Porter Street

The local power authority, Powercor, have been contacted in relation to this project to determine some preliminary information. They have verbally confirmed the following:

- Any new project of this size or similar will require a new onsite substation (regardless of whether one building or several are constructed). No existing supplies could be reused or repurposed to suit
- The new substation can be internal or external, but due to existing assets around the area, there are complications with either option
- Powercor will need to do considerable design work to provide this new supply, and augmentation of their assets to suit the development will be required
- The easement size for a new substation differs, depending on location and type of substation. It can range from 4800 x 7200 to 7200 x 7200

Figure 5 Pole on corner of Bradbys Ln/Porter St and substation in background

The new incoming supply and substation will serve both buildings on the site and the authority are likely to require an authority pillar of some description as well. In addition, depending on the final substation location and size, easement clearances will need to be observed as well.

It is anticipated and proposed that any new substation would be built to serve this site only, and that regardless of staging of buildings, would be able to serve any combination of the buildings as they come online.

Figure 6 Existing overhead services connections on Humffray Street

Figure 7 Authority substation close up

3.2 Telecommunications

There is existing Telstra and NBN infrastructure around most of the proposed development site.

New fibre connections are proposed to be made to the buildings via connections from the existing authority infrastructure – either from Humffray or Bradby's Lane, pending further authority advice and consent.

It is expected that the existing street infrastructure would more than likely support this expansion - subject to authority approval.

There are existing comms pits and suspected NBN assets near to the proposed site that need to be considered and investigated further. The project team will commence their investigation to determine the extent of these authority assets. Occasionally infrastructure similar to this on the surface can indicate something substantial underground in the area. At this point, however, their significance is yet to be determined.

All existing internal comms infrastructure will be made redundant.

Figure 8 Existing communications infrastructure in Humffray St footpath

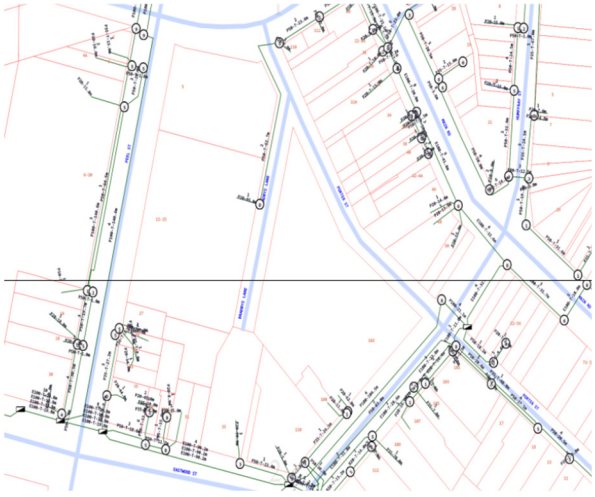

Figure 9 Existing NBN Infrastructure DBYD©

Figure 10 Existing Telstra Infrastructure DBYD©

3.3 Gas

Gas will not be used or provided in this development. It is available in Humffray St if it were required (subject to authority approval).

All existing gas connections would be made redundant and infrastructure removed from the site.

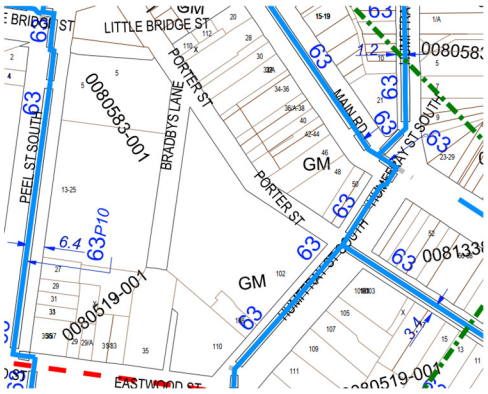

Figure 11 Dial Before You Dig information from Ausnet©

BRT Consulting Pty Ltd
159 Victoria Parade
Collingwood VIC 3066
T 03 9417 2971
E melb@brt.com.au

3.4 Cold-Water & Sewer

The proposed site has cold-water and sewer mains running along several site boundaries. Refer figure 13 for Dial Before You Dig information.

Figure 12 Existing water authority assets in Porter Street

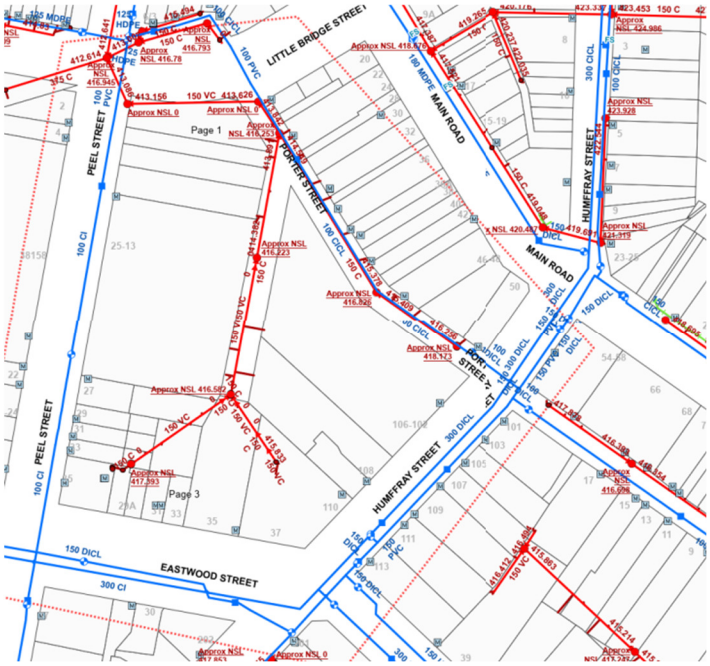

Figure 13 Dial Before You Dig information from Central Highlands Water©
Blue = water
Red = sewer

Pressure and flow information for the area has not yet been obtained, however, given the type of the proposed development, it is almost certain that fire pumps and tanks will be required - refer to the markups for details and sizing of this infrastructure.

In addition to the authority data, which is likely obtained from a simulated model, it is recommended a physical pressure and flow test be performed by a qualified independent party to ensure the data provided by the authority is accurate. The physical test will allow to ensure the fire services calculations are precise as well as confirm that cold water break tanks and booster pumps are not required.

Final detailed pressure and flow calculations will be completed as part of the design documentation phase of the project.

Further coordination and confirmation with Central Highlands Water is required to determine exactly which connection strategy and location will be permitted for both services and buildings. Application is to be made with Central Highlands Water for this.

Regarding the existing site, whilst no significant onsite investigations have taken place, it is proposed that all existing supplies are abolished and replaced with new. All supplies; sewer, fire services and cold water, will need to be made redundant and removed, with any meters returned to the Authority.

3.4.1 Cold-water

Cold-water reticulation on the site is proposed as follows:

Residential Building:

- Cold water break tank and pump would only be provided if required to achieve desired pressure and flows to all fittings and fixtures
- Significant space for the cold-water metering will be required given the number of apartments. Refer to the markups for details
- Individual authority cold-water meters to all apartments in line with authority requirements to be provided. Typically located in cupboards on each floor

Commercial Building:

- Cold water supply with break tank and pump set to be provided in line with PCA A-Grade requirements
- This system will provide backup cold-water supply in the event of disconnection from the mains

A new tapping and meter assembly/ies for the site will be required, refer to the markups for details. These tappings would supply both the fire service and domestic cold water to the site. It appears likely at this stage that multiple tappings will be required.

3.4.2 Sewer

Sewer reticulation on the site is proposed as follows:

Residential Building:

- Can connect to either Porter Street sewer main or via Bradby's Lane. To be determined during design stage in accordance with authority requirements
- Grease trap serving café tenancy to be provided

Commercial Building:

- Will connect to existing sewer main in Porter Street, subject to authority approval
- Grease trap to be provided

The condition of the existing site sewer on site is generally unknown, however none will be reused, with new reticulation throughout.

It does appear likely that given the survey levels and the proposed building levels that achieving sewer on grade will most likely be possible for all fittings and fixtures above ground level.

Confirmation of the approach on sewer will be made after the site investigations and authority responses are provided.

3.5 Fire Services

On site fire pumps and tanks are almost certain to be required for this project and have been factored in to the proposed designs for each building.

The new buildings will require hydrant and most likely hose reel coverage, and more than likely sprinkler coverage as well.

As noted above, pressure and flow information has not yet been obtained from Central Highlands Water. This will be obtained early in the design process.

Final detailed pressure and flow calculations have will be completed as part of the design documentation phase of the project.
It appears likely that non-DtS fire items will occur/be required in the project, and this must be catered for. If this does occur, a Regulation 129 Application will be required. A subsequent meeting with the FRV may be needed to review the FEB/FER and Regulation 129 issues. However, the meeting will not be required until later in the detailed design process.

4.0 GENERAL DESIGN PARAMETERS

The building services have and will be designed to meet the requirements of the Building Code of Australia (BCA) and the relevant Australian Standards called up by the BCA. Generally, the installation and commissioning shall take into account the functional requirements of the operators and those who need to maintain the services, systems and procedures to minimize energy consumption and wastage and ensure simplicity of use.

5.0 ELECTRICAL SERVICES

5.1 General Design Guidelines

The electrical services proposed for this project will be designed in accordance with the Building Code of Australia (NCC/BCA), relevant Australian Standard and local authority requirements.

All systems shall be designed to reduce energy consumption and minimise waste.

5.2 Design Criteria

All works will be documented in accordance with all the relevant standards and guidelines, including the following:

- Building Code of Australia.
- Local Electricity Supply Authority
- Current relevant Australian Standards
- AS 3000 - Wiring Rules
- AS 3008 - Electrical Installation - Selection of Cables

- AS 4836 - Safe Working on low-voltage electrical installations
- AS 2834 - Computer Accommodation
- 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 1851 - Maintenance of Fire Protection Equipment
- AS/NZS 2293 - Emergency Evacuation Lighting for Buildings
- PCA A-Grade Guidelines – Commercial Building only

5.3 Power Distribution

5.3.1 Electricity Supply

New incoming supplies are to be provided with authority metering throughout in line with authority requirements.

An embedded network will not be considered for either building due to recent regulatory changes and recommendations.

A new Main Switchboard (MSB) will be required to each building, as will metering to the site and all individual tenancies, as well as the common areas. Suggested MSB locations and spatials have been provided, however these are to be confirmed once the authority application process is further developed.

The reticulation within the building shall include separate switchboards and metering for the mechanical systems, hot water systems and general areas of the building.

Residential building:

- New sub-boards are to be provided to each apartment
- Common area sub-boards are to be provided on each floor for common area lighting and power

Commercial Building:

- New sub-boards are to be provided to each tenancy
- Common area sub-boards are to be provided on each floor for common area lighting and power

All switchboards which serve distinct and common areas are likely to be digitally metered to enable feedback on where energy is being used via either a BMS (building management system) or EMS (energy management system).

All circuits shall be protected with RCD breakers (earth leakage) in accordance with the latest version of AS3000 for electrical installations.

5.4 Metering

5.4.1 Authority Metering

As noted above, embedded metering will not be considered in this project due to recent regulatory changes. Instead, metering will be standard authority metering throughout both buildings.

The hot water system and AC system setups would affect this as the metering costs (if hard-wired) can differ significantly if single phase or three phase power is required to each apartment. Where possible, providing single phase supply only to each apartment is recommended.

Residential building:
- Each apartment to be authority metered
- No centralised mechanical equipment will be provided direct to the apartments, therefore AC will be dedicated to the apartment and metered via the standard switchboard to each apartment
- Common area electrical use to be authority metered

Commercial Building:
- New sub-boards are to be provided to each tenancy
- Common area electrical use to be authority metered

5.4.2 Sub-Metering

Given the size of each building, from the NCC, the following must be metered (not authority metered, just check metered) separately:

Each Sub-board	Light and Power
Mechanical plant	Power
Centralised hot water supply	Power (Only if centralised)
Lifts	Power
Other ancillary plant	Power

This would need to be confirmed with the building surveyor.

The configuration and setup of the hot water plant to the apartments will impact the above and therefore needs to be clarified during the detailed design process.

A BMS or EMS will be required to meet these requirements. It appears likely that one will be required per building and be entirely independent of one another.

5.5 Emergency and Exit Lighting

Emergency and exit lighting will be designed in accordance with AS2293 and the FEB/FER requirements. All fittings will be standalone fittings with their own batteries, connected to an emergency lighting test kit at each switchboard. A test switch shall be located in the relevant switchboard.

5.6 Electric Car Charging

Electric car charging will be provided in each of the basement carparks, with the exact scope and extent to be worked through during the design process.

As a minimum however, the infrastructure for electric car charging (conduits and spacing for digital metering in the corresponding switchboard) is planned to be provided to the development. This will ensure the basement carpark is future-proofed for the installation of car charging points.

The use of trickle chargers vs higher capacity units will be evaluated during design. It is likely that the following charging setups would be recommended:
Residential building:

- To be confirmed, but trickle charger to specific carparks most likely

Commercial Building:

- Also to be confirmed, but trickle chargers in conjunction with some smaller number of higher capacity chargers would be considered

5.7 Fire Detection System

In similar developments, an AS1670.1 smoke detection system and building occupant warning system is typically required throughout all common areas. Standalone smoke alarms would typically be required in each apartment throughout the residential building. All of these details would be confirmed via the Fire Engineering Brief/Report and Building Surveyor's report. Coverage to any carpark areas would again require input as above.

A Fire Indicator Panel (FIP) will most likely be required for the proposed development, with one in each building. The location of each panel has been proposed to be in the relevant entry foyer (refer updated architectural drawings), which will need to be accessible 24 hours a day.

Some of the building specific items that would likely be required are:

Residential building:

- Each apartment to have a smoke alarm. Where more than one was installed, these would be interlinked
- AS1670 system throughout common areas

Commercial Building:

- AS1670 system throughout whole building

All of this will need to be confirmed with the FER, NCC and the building surveyor and are provided here as an indication only.

5.8 Communications

Centralised incoming NBN will be designed into each building with an individual connection to each apartment in accordance with the fibre provider's guidelines.

Residential building:

- New dedicated NBN connection to each apartment
- Incoming NBN connections for major common services items (lifts, FIP, security etc)

Commercial Building:

- New dedicated connection to be provided to each tenancy
- Incoming NBN connections for major common services items (lifts, FIP, security etc)

5.9 Security

Security systems will be implemented to the new development, throughout both buildings, which are likely to include secure basement garage, swipe keys, etc. The extent of the security system will be confirmed during the detailed design process.
Security systems will consist of some combination of:

- Intruder detection (commercial building only)
- Access control
- CCTV system

5.10 Lighting

5.10.1 General Lighting

Generally, the light fittings throughout the project will be LED fittings, both internally and externally.

Residential building:

- Energy efficient, readily available fittings preferred
- Utilise similar fittings throughout the project where possible and practical

Commercial Building:

- Energy efficient, readily available fittings preferred
- Base-build lighting provided throughout tenancies – unless tenancy fit outs are required.
- In this case, low-brightness louvres for glare control would be suggested
- Suspended fittings to be considered be installed in the areas with the high light windows. The lights will have both upward and downward component lighting.
- Surface mounted LED fittings will be utilised in service, storage and amenities areas.

5.10.2 Lighting Control

Lighting controls generally will be provided to suit NCC requirements.

Residential building:

- Simple lighting controls throughout
- Motion sensors provided throughout corridors
- Entry points to be lit 24 hours a day

Commercial Building:

- Base build lighting to be controlled via automated system
- PCA A-Grade / Green Star requirements may require advanced controls and dimming

Full controls are to be worked through during the design development phase.

5.11 Photo Voltaic System

The client has expressed a desire to install a PV system on the roof of each new building. PV systems are proposed to the roof space of each building, with details as follows.

Residential building:

- One 26 kW array

Commercial Building:

- One 19kW array
- One 13kW array
- Total 32kW of PV proposed

The sizes of these systems are not yet confirmed, instead the sizes provided are only an indication of what it is believed could be achieved.

Further analysis of the options available will be conducted during design development.

Battery storage is generally not recommended for projects of this type.

5.12 Standby Generator

In accordance with the PCA A-Grade requirements, it is proposed that a standby generator be provided to serve the commercial building only. This would also require fuel storage for a to be determined number of hours operation.

No generator backup would be provided to the residential building.

6.0 MECHANICAL SERVICES

6.1 General Design Guidelines

The Mechanical services proposed for this development will be designed in accordance with the Building Code of Australia (NCC/BCA), relevant Australian Standard and local authority requirements.

6.2 Relevant Standards

All works will be documented in accordance with all the relevant standards and guidelines, including the following:

- AS NZS 1668.1 - The use of ventilation and air conditioning in buildings - Fire and smoke control in build
- AS 1668.2 - The use of ventilation and air conditioning in buildings
- AS 1668.4 - The use of natural ventilation in buildings
- AS/NZS 3666: Air handling and water systems of buildings
- AS 4254 - Ductwork for air handling systems in buildings.
- AS 1324.1 - Air filters for use in general ventilation and air conditioning - Application, performance and construction.
- AS 1324.2 - Air filters for use in general ventilation and air conditioning - Methods of test.
- AS 1677 - Refrigerating Systems - Parts 1 & 2
- AS1432 - Copper tubes for plumbers, gas fitting and drainage application.
- AS 4508 - Thermal resistance of insulation for ductwork used in building Air Conditioning.
- AS 4426 - Thermal insulation of pipework, ductwork and equipment - selection, installation and finish.
- PCA A-Grade Guidelines – Commercial Building only

BRT Consulting Pty Ltd
159 Victoria Parade
Collingwood VIC 3066
T 03 9417 2971
E melb@brt.com.au

6.3 Scope

The current scope proposed for the Mechanical Services shall comprise:

Residential building:

- Air-conditioning to each apartment is likely to be provided via a dedicated condenser, that is located in a centralized plant area located at roof level;
- Exhaust to the carpark (may be achieved via natural ventilation);
- Exhaust to the basement bin store;
- Local exhaust to each apartment kitchen via domestic rangehood (to be detailed);
- Local exhaust to each apartment bathroom and laundry via standalone exhaust fans;
- Ventilation to plant area (fire pumps);
- Ventilation to corridor areas (to be detailed);
- Automatic controls;
- BMS interfaces and controls;
- Utility sub-metering.

Commercial Building:

- Centralised heating hot water (HHW) and chilled water (CHW) plant serving fan coil units throughout;
- Outside air system/s providing mechanical ventilation throughout all floors, either with energy recovery and/or demand control via CO2 sensors;
- Consideration of natural ventilation to the office spaces;
- Exhaust to the basement carpark;
- Exhaust to the basement bin store;
- Kitchen exhaust system serving future commercial hoods in tenancies on ground floor;
- Combined centralised exhaust system serving amenities on each floor;
- Ventilation to plant area (fire pumps);
- Automatic controls;
- BMS interfaces and controls;
- Utility sub-metering.

6.4 Design Criteria

All systems will be designed to operate and maintain comfort levels to all occupied spaces

The design of the air-conditioning systems shall generally be design on the following criteria. The summer ambient DB temperature may be set lower if desired by the client. Further discussion is necessary for this.

Season	Ambient DB	Ambient WB	Cooling	Heating
Summer	33°	19°	24° ± 1°	
Winter	1.3°			21° ± 1°

Design conditions are determined empirically on the basis that these conditions are not exceeded on average more than 3% of the time, or about 10 times a year.

The philosophy behind this is that a unit capable of meeting the occasional extreme temperatures (such as 40-45°C) would require and addition 30% capacity and therefore cost considerably more. In addition, it would mostly operate on small partial loads where it would not be efficient or capable of providing stable conditions.

6.4.1 Humidity Control

Humidity control has not been proposed for any of the mechanical systems in this project.

6.5 Automatic Controls

All mechanical systems will be designed with ease of use and maintenance in mind. Controls will be located in mechanical services plant areas where required (excluding local AC controls to apartments).

Residential building:

- Local AC controller to each apartment
- Local exhaust systems controlled via in apartment systems (such as connection to local lighting)
- BMS provided throughout for monitoring and metering of centralised mechanical systems, to be confirmed as required

Commercial Building:

- Base build CHW and HHW plant to be controlled via BMS
- All HVAC plant generally to be controlled via BMS
- Each individual tenancy to have AC controls that would integrate with centralised plant as required
- PCA A-Grade / Green Star requirements may require further advanced controls

6.6 Ventilation

6.6.1 Building Code Fresh Air Requirements

Ventilation to all habitable spaces is required to be provided under NCC regulations and must be in accordance with the AS1668 series of Australian Standards in certain scenarios and applications.

Residential building:

- It is assumed that generally the architectural design will allow and account for all fresh air and natural ventilation to each apartment, bedroom and living areas throughout the residential building. Avoiding mechanical ventilation to these spaces is preferable
- Corridor ventilation has not yet been resolved or confirmed

Commercial Building:

- A preliminary discussion around the preferred method of meeting the NCC requirements has not yet been resolved. Spatials that will allow for full mechanical ventilation have been incorporated, but natural ventilation to certain areas may still be applicable
- The use of an air-to-air heat exchanger to provide outside air throughout the building has been considered. This is still a consideration for the project. Refer to figure 14 for further information

Where required, mechanical ventilation will be provided in accordance with the BCA and AS1668.

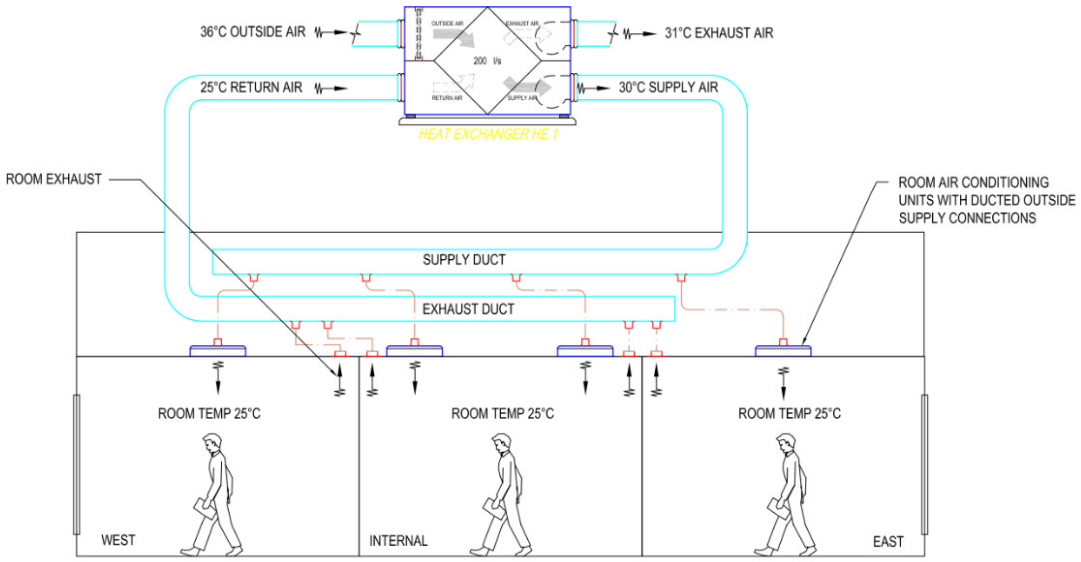

Figure 14 Air to air heat exchanger schematic detail

6.6.2 Exhaust

Various spaces will require exhaust systems designed in accordance with the requirements of the Building Code of Australia and relevant Australian Standards.

These include:

- Ducted exhaust to each apartment bathroom/laundry;
- Ducted exhaust to the fire pump rooms;
- Ducted exhaust to the bin stores;
- Ducted exhaust to the basement carparks, unless a natural ventilation solution can be achieved (which is the aim in the residential building);
- Domestic rangehood and ductwork to each apartment kitchen;
- Commercial rangehood and ductwork to each commercial cooktop/tenancy location
- Backup generator flue

6.6.2.1 Basement Carpark - Commercial Building

The basement carpark in the commercial building is proposed to be provided with mechanical ventilation. Typically, (unless natural ventilated), carparks need to be capable of mechanically exhausting large volumes of air. In this case, it is proposed to meet this requirement via a roof-mounted exhaust fan and an in-line fresh air fan. The preliminary configuration is shown in the latest services markups. The actual layout of the carpark ventilation is currently being developed, and it will be completed once the architectural floor plans have been finalised.

The use of jet fans could be considered if desired in the carpark. It would need to be carefully worked through as the carpark is likely to be sprinklered.

6.7 Heating and Air Conditioning System

6.7.1 Mechanical System

It is proposed that air conditioning is provided throughout the buildings as follows:

Residential building:

- AC to the living room in each apartment, with optional provision to bedrooms as required. Typically, one condenser (external unit) would be proposed per apartment – where multiple internal heads are required the system could still operate these as required
- Provision for AC to tenancy fit out on ground floor

Commercial building:

- AC provided to all tenancies via centralised CHW and HHW system with take-offs at each floor. These loops are then connected to fan coil units throughout the tenancies and zones
- Supplementary CHW and HHW loops for additional systems in line with PCA A-Grade requirements
- Possible tempering of outside air provided for mechanical ventilation
- Provision for AC to tenancy fit outs on ground floor

The commercial building will be provided with a number of air conditioning zones based on building orientation and functional area. The PCA A-Grade requirements nominate the minimum number of zones and the maximum area allowed per zone, and the proposed air handling/fan coil units to serve these areas will be in line with these guidelines. They will typically be ducted units throughout each tenancy space. Typically, each space will have its own units and therefore its own independent on/off and temperature control.

All units will be controlled by BMS in addition.

Integration with the lighting control system and security systems is proposed. It may be required subject to PCA A-Grade requirements.

6.8 Examples of Mechanical Systems

The proposed mechanical systems nominated for the commercial building are somewhat more complex than for the residential building. With this in mind, further explanation about the centralised systems versus standalone split system AC units is provided as follows. This has been provided as a guide and explanation only.

6.8.1 Central Heating Water (HHW) & Chilled Water Plant (CHW)

Below is a schematic layout of this type of system. Due to the nature of the building, its likely occupation profile, and the requirement to be PCA A-Grade as well as NABERS accredited, a centralised plant system similar to this will almost certainly be required.

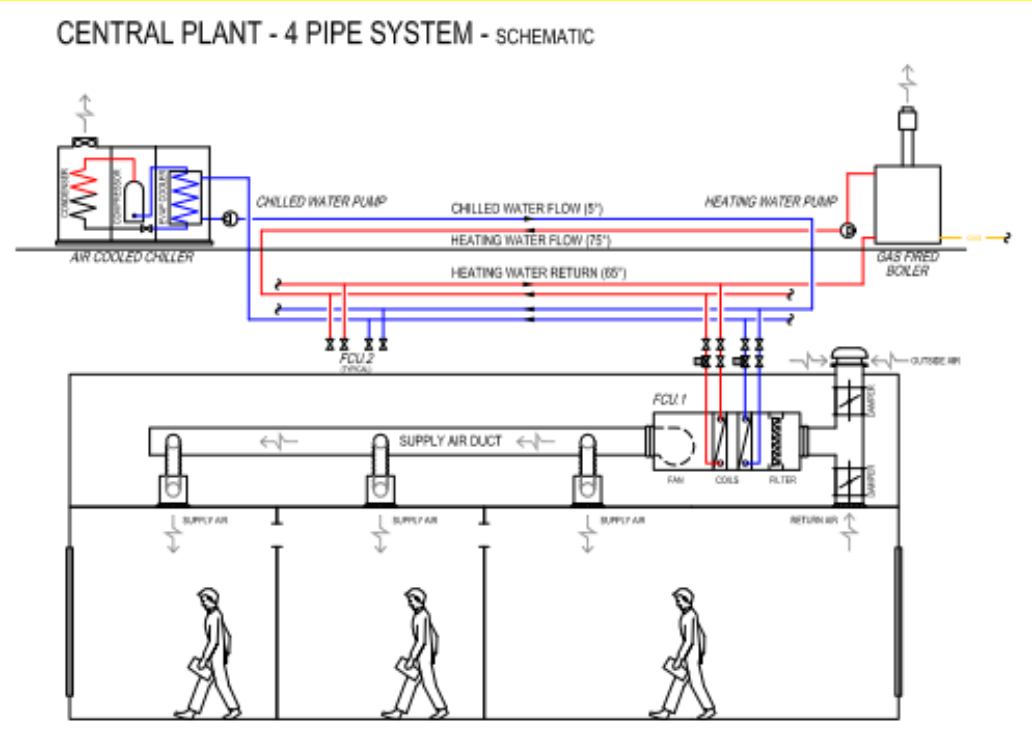

Figure 15 Typical CHW & HHW Schematic (please ignore gas fired boiler, as this will not be utilised, it is an example for the schematic only)

6.8.1.1 Chillers

These units produce chilled water which is pump circulated around the site to the fan coil units to provide the cooling function for each zone.

Traditionally chillers used cooling towers for heat rejection, though air cooled chillers can be utilised to exclude the risk of Legionella generation. Cooling towers are more thermodynamically efficient, though they are more expensive overall as the system needs to incorporate the condenser water system comprising, the cooling tower, pipework and pumps.

Chiller technology is improving and changing rapidly. New, low GWP refrigerants are now available and also the availability of heating loops from these units. All of these options will be further investigated during the design stage.

6.8.1.2 Boilers or Heat Pumps

Boilers or heat pumps produce the heating water which is also pump circulated to the same fan coil units.

Boilers are typically gas fired units, whereas heat pumps are electric powered. This development will not have gas so heat pumps will be utilised for the HHW loop plant. This heat pump system can also be utilised to provide the domestic hot water to the site.

6.8.1.3 Fan Coil Units

The system would be arranged so that each “zone” of the building has its own fan coil unit to provide independent control. The fan coil units would distribute the heated or

chilled air throughout the various rooms as required to maintain room conditions. The degree of heating/cooling is controlled by regulating the flow of heating/chilled water to the heat transfer coils in the fan coil unit, generally using modulating control valves.

6.8.1.4 Relative Benefits

Relative to other optional air-conditioning systems, the central heating/chilled water plant offers the following benefits:

i) Highest efficiency if efficient heat pumps are selected;
ii) Individual temperature control for each zone;
iii) Longest life expectancy (30 years);
iv) Least dependent on particular manufacturer. Major components are generic and can be sourced from any manufacturer;
v) Excellent temperature control as control function is fully modulating;
vi) Good operation in extreme temperature conditions.

The main disadvantages with these systems are;

i) They are an expensive option;
ii) The central equipment is often heavier and larger than smaller systems;
iii) The external plant is usually nosier than alternative systems;
iv) Should external plant fail the whole system will lose heating unless there is redundancy built into the design.

Most of the critical issues with the disadvantages listed above can be 'designed out' of the system – and would more than likely be done this way in this project.

For comparison purposes, details of split system AC are provided as follows:

6.8.2 Individual Split Reverse Cycle Units

Below is a schematic layout of these types of systems. This is type of system that is proposed for the IT/Comms rooms - noting that no location or details of a central ICT room have yet been confirmed. Similar systems to this would be utilised in each apartment.

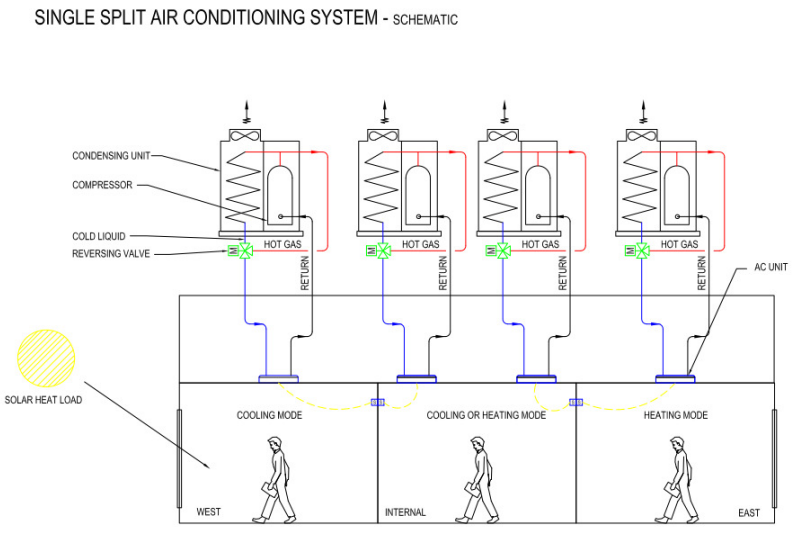

Figure 16 Typical AC Split System Schematic

Individual spilt reverse cycle AC systems are simply conventional split heat pump systems comprising an external condensing unit with a corresponding, one-to-one, indoor unit where either:

i) Refrigerant liquid is piped to the indoor unit to provide cooling and the heat rejected to the atmosphere by the condenser or;
ii) The cycle is reversed and hot gas is piped to the indoor units to provide heating. The energy is sourced from the atmosphere again by the condenser. Under low ambient temperature conditions, the condenser coils ice up and a defrosting cycle has to be initiated during which time heating is inhibited.

The indoor units come in a number of configurations such as a wall mounted unit, ceiling cassette, under ceiling unit or ducted unit.

6.8.2.1 Relative Benefits

Relative to other air-conditioning options, the split system offers the following benefits:

i) Each indoor unit has independent temperature control and operation;
ii) Indoor units can be on either on cooling or heating cycle independent of other indoor units (zones);
iii) Reasonable energy efficiency but not as high as VRF or central plant;
iv) Economical to install and operate;
v) Individual units can be turned off when space not occupied;
vi) Cheapest form of air conditioning available;
vii) Only one electrical connection, makes metering setup far easier;
viii) If a condenser fails only one zone is affected.

The main disadvantages are:

i) Control cycle is on-off so room temperatures are not as stable as central plant;
ii) Lower efficiency compared with VRF and centralised plant;
iii) Dependent upon the original manufacture for additional components and spare parts;
iv) One condenser required per indoor unit, typically within 20 or 30m maximum distance away. Typically results in large banks of condensers on facades

7.0 HYDRAULIC SERVICES

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

7.1 Cold Water Reticulation

Cold water reticulation will be provided to fittings and fixtures throughout as required.

Refer to the site services section for details on the use of break tanks and pump sets for cold water.

7.1.1 External hose bibs

Garden taps will be provided, these could be provided from the reticulated rain water noted below.

7.2 Domestic Hot Water System

Hot water will be provided throughout each of the buildings as described below.

Residential building:

- Not yet confirmed, but possibly via centralised heat pump hot water system reticulated throughout with individual metering to each apartment
- The alternative would be standalone electric hot water units to each apartment

Commercial building:

- TBC, however seems likely that it would be a system that was integrated with the centralised HHW mechanical system. That is a reticulated DHWS system providing DHW throughout via a loop with metering to each tenancy
- The alternative would be standalone hot water systems to each tenancy which it is believed would not fit with the project aims

Hot water plant would be proposed to be mounted on the roof plant area as much as possible.

Mixing valves will be installed to all bathroom areas to provide low temperature hot water (50°C) in accordance with relevant standards.

7.3 Sewer

Treatment pits to the authority requirements will be provided, such as grease traps to the commercial kitchen areas/tenancies.

7.4 Rain Water

Full details of the scope of rain water reuse have not yet been confirmed, however the current status of the proposal is as follows.

Residential building:

- Capture & reuse systems have not yet been located or proposed; however, two tanks could be utilised, one 20,000L and one 9,000L and would need to be located at ground or basement level. These sizes would suit the roof capture areas
- They will be provided where required to suit ESD/project specific council requirements, but no commitment to this has yet been made

Commercial building:

- Rain water capture and reuse systems are required in line with the PCA A-Grade requirements. At this stage a 20kL tank is proposed
- This system will have cold water backup and will be used to serve the water closets throughout as well as irrigation connections

Any rain water tanks are proposed to be located in the basement areas. The capacity of these can be added to other civil detention tanks if and where required. Eg A 40,000 litre detention tank could then have an additional 20,000 litres added for reuse purposes.

7.5 Natural Gas

No gas will be connected to the site.

BRT Consulting Pty Ltd
159 Victoria Parade
Collingwood VIC 3066
T 03 9417 2971
E melb@brt.com.au

8.0 FIRE PROTECTION

8.1 Introduction

The fire protection services proposed for this development will be designed in accordance with the Building Code of Australia (BCA), the FER, relevant Australian Standard and local authority requirements.

Current relevant Australian Standards and in particular AS 3500

- Fire Rescue Victoria
- AS 1851 Maintenance of Fire Protection Equipment
- 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

All notes and requirements listed below are based on typical requirements and need to be confirmed with the FER, fire engineer and the building surveyor for the project during the design phase.

8.2 Fire Storage/Fire Pump

New fire storage tanks and pumps to suit the site will need to be provided for each building. This design would then allow for maximum felxibility through the design stages, until a comprehensive and consolidated plan for the development contrsuction can take place.

8.3 Fire Hydrants

A fire hydrant system (fed by pumps and tanks in the relevant basement of each building) will be designed to feed hydrants and hose reels in and around the building to provide coverage in accordance with the BCA, Australian Standards and FER.

It is proposed that each building will be covered by a combination of external & internal hydrants. This is to be confirmed during the design process.

8.4 Fire Hose Reels

Fire hose reels will likely be required throughout both buildings in this project. Spatials have been provided as if this is a requirement.

8.5 Sprinkler Protection

It is likely that sprinkler protection will be required throughout both buildings in this project. Spatials have been provided as if it is a requirement.

As a minimum, the carpark sprinklers will be designed to meet AS2118.1 OH2 – Ordinary Hazard 2 for the carpark (pending the FEB/FER and Reg 129 process) and AS2118.4 - Residential for the remainder of the residential building. All details are still to be worked through as part of the detailed design process.

Specifics about the sprinkler system to the commercial building have not yet been worked through but will form part of the design development phase works.

BRT Consulting Pty Ltd
159 Victoria Parade
Collingwood VIC 3066
T 03 9417 2971
E melb@brt.com.au

consulting engineers
BRT

9.0 ESD

An ESD report has been drafted by the ESD consultant, Shared Space Architecture. ESD will be a key design consideration for the development.

Refer to the PV clause for details about the photo voltaic systems proposed.

All services designs will be in coordination with the ESD consultant reports.

10.0 VERTICAL TRANSPORTATION

10.1 Scope

A study on demand and waiting times for vertical transportation of the proposed development has been conducted for each building. The following is a summary and the proposed solutions:

Residential Building:

- Population assumption: 2 people/1 bedroom apt, 3 people/2 bedroom apt & 4 people/3 bedroom apt;
- Two lifts proposed. This provides backup to the whole building in the event of one being out of service;
- Double lift specifications from modelling:
    - Average waiting time: 13s < 30s (threshold from ISO);
    - Average time to destination: 39s (five-star rating on Kone scale)

Commercial building:

- PCA A-Grade requirements must be met – the key design consideration for this building was meeting these requirements:
    - Car capacity >= 16
    - Waiting time, up-peak <= 30s, lunch peak <= 40s
    - Goods lift required with capacity >= 1400kg
- Three passenger lifts are proposed, plus one goods lift. This provides significant backup to the whole building in the event of one being out of service;
- Specifications from the modelling of the three passenger lift arrangement:
    - Up-peak traffic:
        - Average waiting time 17s
        - Average time to destination 60s
    - Two-way traffic:
        - Average waiting time 21s
        - Average time to destination 52s