WOOD & GRIEVE ENGINEERS

Cardinal Freeman Village
137 Victoria Street, Ashfield
Mechanical and Lift Services Brief

John Taylor, Calum Ross, June Lo – Stockland
Andrew Graham, Kathryn Cuno – epm Projects
Peter Ireland, Richard Terry – Allen Jack + Cottier

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Prepared by Joshua Hii Project Number: 22262-SYD-M-1
Level 3, 454- 456 Pacific Highway, St Leonards, NSW 2065
Phone +61 2 8484 7000 Fax +61 2 8484 7100 Email sydney@wge.com.au Web www.wge.com.au

Revision

REVISION	DATE	COMMENT	APPROVED BY
2	17/10/2012	Revised with PM. comments	JLH
1	15/10/2012	Revised with arch. comments	JLH
0	13/09/2012	Preliminary Issue	JLH

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1. Critical Issues

The following list itemises what we believe to be critical issues for the project's building services.

- Layout of mechanical services within the RACF building and ILUs. We need to ensure sufficient ceiling and/or bulkhead space is allowed to accommodate for mechanical plant and ductwork (as well as other services, including hydraulic services and light fittings).

- Finalisation for riser allocation for ductwork and pipework.

2. Introduction

This document has been prepared for the client (Aevum Limited (Stockland Development Pty Ltd)), project manager (epm Projects) and the project architect (Allen Jack + Cottier) to:

- Identify the proposed Mechanical and Vertical Transportation Services for the project.
- Carry out preliminary design of services sufficient to size plant areas.
- Establish major routing of Mechanical Services.
- Outline systems for consideration of the project team.

The information contained in this report has been based on:

- Meetings held at Allen Jack + Cottier offices.
- Preliminary architectural drawings produced by Allen Jack + Cottier.

Where further feedback or clarification is required from the Client, these items are noted in italics.

It is expected that the Client and the project team will sign off on the contents of this report to allow the Engineering work to continue to the design development stage.

3. Description of Development & Objectives

The development consists of the construction of a new residential aged care facility (RACF) containing approximately 133 beds, basement carparking and associated facilities, as well as around 240 independent living units (ILUs) on the site at 137 Victoria Street, Ashfield, under three stages.

The objectives of the development is to create a high quality standard of residential aged care housing that is robust and has longevity and optimises the development potential of its land holdings.

We understand that the project objectives are:

- High Quality development
- Durable low maintenance materials and services.

This report has been based on the building having multiple classifications with regards to the Building Code of Australia:

- Residential Aged Care: Class 9c.
- Residential Independent Living Units: Class 2.
- Carpark: Class 7a

4. Codes and Authorities

4.1 General

System designs shall comply with the Building Code of Australia and all Australian Standards embodied therein. Where no standards are applicable the design shall be in accordance with current good engineering practice.

4.2 Particular Authorities Compliance

Building Code of Australia	(BCA).
New South Wales Fire Brigade	(NSWFB).
Department of Occupational Health and Safety	(OH&S).
New South Wales Health Department	
Sydney Water	

4.3 Applicable Standards and Codes

4.3.1 Mechanical Services

The mechanical services shall be designed to comply with the following Standards and Codes.

AS 1668	The use of mechanical ventilation and air conditioning in buildings.
AS 1677	Refrigerating Systems
AS 2107	Acoustics
AS 3000	SAA wiring rules
AS 3013	Electrical installations, wiring systems for specific applications.
AS 4254	Ductwork for Air Handling Systems
AS 1324-1996	Air Filters for use in Air Conditioning and General Ventilation.

4.3.2 Vertical Transportation Services

The vertical transportation Services shall be designed to comply with current Australian Standards where applicable and particularly the following:

AS 1735.1	Lifts, escalators and moving walks – General requirements.
AS 1735.12	Lifts, escalators and moving walks - Facilities for persons with disabilities.

4.4 BCA 2010 Requirements

We acknowledge that the buildings under Stages 1 and 2 are to be certified under to the Building Code of Australia 2010.

The following represents our understanding of the energy efficiency requirements, with respect to the mechanical services, stipulated under Section J of the BCA 2010.

- All new mechanical services within the building shall comply with Section J requirements. This includes any new plant and equipment including any new supplementary air conditioning systems or new ventilation systems.

5. Mechanical Services

5.1 Design Criteria

The design criteria for the Mechanical Services are as follows:

5.1.1 External Conditions

The design temperatures under which plant will maintain internal conditions are:

Summer : 34.6ºC Dry Bulb
: 23.9ºC Wet Bulb
: Full Solar Load

Winter : 5.8ºC Dry Bulb
: 80% Relative Humidity
: No Solar Load

5.1.2 Internal Conditions

Air Conditioned Areas Only

Cooling : Nominal 24°C Dry Bulb
: 40 - 60% relative humidity anticipated by virtue of cooling coil performance

Heating : 21°C Dry Bulb

Control Tolerance : Plus or minus 1.5°C at the point of control for heating and cooling.

5.1.3 Population

RACF bedrooms : As per bed layouts
RACF general areas : As per seating layouts
ILUs : As per bed layouts

5.1.4 Ventilation

Carparks : Ventilated to AS1668.2 requirements.

RACF Outside Air : Mechanically supplied to AS 1668.2 requirements.

ILUs Outside Air : Typically via openable windows.

RACF/ILU Bathrooms : 35 L/s/room (exceed minimum to AS 1668.2-1991)

ILU Laundries : 60 L/s/room (exceed minimum to AS 1668.2 - 1991)

ILU Kitchens : Via rangehoods ducted to the external facade.

Garbage Room : To **exceed** AS1668.2 – 1991 requirements

RACF Commercial Kitchen : As per AS1668.2 requirements.

RACF Laundry : As per AS1668.2 requirements.

5.1.5 Lighting & Power

RACF Common Areas Lighting & Power : 30 W/m^2

RACF Bedrooms, and ILUs Lighting & Power : 20 W/m^2

5.1.6 Glazing

RACF and ILUs will use performance glass as per ESD report by Cundalls (glass selection to be finalised).

5.1.7 Wall Construction

To minimum Section J requirements. Construction detail to be finalised.

5.2 Air Conditioning

5.2.1 RACF

VRV Systems

This involves the use of centralised VRV systems to serve the bedrooms, offices and shared spaces, with centralised condensing units to be located on the roof of the building. From this condensing unit, refrigerant pipework is runs through the corridor, then branches off to each fan coil unit in each room. Bedrooms will have a wall mounted unit, with larger ducted systems serving the shared areas.

Previous aged care projects completed by Wood & Grieve ENGINEERS have used VRV systems with good results.

We propose the use of a 3 pipe VRV system for the aged care bedrooms. In a 3 pipe system, all of the indoor units connected to the single VRV condensing unit can either be in cooling or heating mode (ie in the morning when rooms on the east side require cooling, the rooms and the west side can be provided with heating). This "heat recovery" mode also offers energy savings.

We propose that each of the following areas be air conditioned as follows:

- RACF Bedrooms. There are several options available for the type of fan coil unit used (wall mounted, ducted, cassette). We understand that the client's preference is for a ducted fan coil unit for each bedroom, situated above the bathroom ceiling.
- RACF Lounge Rooms / Dining & Living Areas - Ducted
- RACF Foyer/Entry - Ducted
- RACF Staff Areas / Offices / Meeting Rooms - Ducted
- RACF Therapy / Clinical Care Rooms – Ducted
- RACF Function Room/Library – Ducted
- Comms Room – Wall mounted.
- Kitchen - Ceiling mounted cassette unit/s to provide local cooling. Heat generated from the cooking appliances will be extracted via exhaust system with makeup air provided mechanically.
- Laundry - Ceiling mounted cassette unit/s to provide local cooling. A key factor is to ensure correct pressurisation of the dirty and clean areas.

The following areas will not be air conditioned:

- Toilets and ensuites (ventilation only)
- Garbage areas (ventilation only)
- Storage areas

The condensing units for these VRV systems will have to be located externally. These can either be roof mounted, or located in plantrooms (with sufficient louvred ventilation), or ground mounted. These can be located in one central location, or separated if need be. At this stage it is proposed to locate the units on a roof platform.

Further liaison with the acoustic engineer regarding the location of condensers and any required acoustic treatment will be necessary.

Provision of Fresh/Outside Air

Bedrooms, communal rooms and areas within the RACF building will require mechanically induced fresh air via a ducted fan system linked to the air conditioning systems serving these areas.

5.2.2 Independent Living Units (ILUs)

A number of options for the setup of the air conditioning in each ILU are outlined below:

Option 1 – Ducted Air Conditioning with Individual Condensing Units

A single, ducted type fan coil unit would be utilised to supply conditioned air to the living area and bedrooms within each ILU. The fan coil unit would be located over kitchen or bathroom areas above dropped ceilings.

Note: Fan coil units will require a minimum of 300mm clear ceiling space to accommodate units and drainage. Access panels will be required in any plasterboard ceilings for maintenance access. There will also be ductwork running through the ILU ceiling which will need 250mm clear height and access panels for the dampers.

Option 2 – Multi-split Bulkhead/Ducted Air Conditioning with Multi-split Condensing Units

Several fan coil units would be utilised to supply conditioned air to the Living area and bedrooms within each ILU (one unit per room). Each of the fan coil units would be a bulkhead/duct mounted type unit. The advantage of this scenario is that there is little to no air conditioning ductwork required, meaning that the areas of lowered ceiling could be reduced, and less access panels would be required, particularly if bedroom units were hidden above or within wardrobes. This option is more costly (20-30% more).

Interior Architect/Client to advise on preference.

For either option, a separate condensing unit would be required for each ILU, located on either the balconies, the roof or in the screened area outside the fire stairs. Refrigerant pipework would need to run from the fan coil units to the condensing unit outside, concealed in the ceiling space/bulkhead.

5.3 Mechanical Ventilation

5.3.1 Stair Pressurisation and Relief

We understand that since the RACF has a rise in storeys of more than two, stair pressurisation is required for each fire-isolated stairway. Currently there are 3 stairwells shown on the drawings, we have assumed that each stairwell is fire-isolated. No stairwell pressurisation is proposed for the ILUs, as these buildings are under 25m.

Each fire-isolated stairwell will require a stairwell pressurisation riser. This consists of a separate fire-rated shaft within or adjacent to the stairwell dedicated for pressurisation, with a fan at roof level.

There will also need to be a path for the relief air to exit the building, through the lobbies. This can be achieved via a lobby relief air shaft through the tower lobbies, with relief air fans at roof level. Alternatively, fixed/operable louvres in the lobbies can be provided on opposite sides of the building, sized so that all the relief airflow can be adequately discharged through either opening.

5.3.2 Carpark

The preference for the carparks is natural ventilation, via louvres/openings to the façade. Mechanical ventilation of the carpark will be required if natural ventilation is not feasible. This system will require exhaust mechanical ventilation (and potentially mechanical supply ventilation as well, if sufficient makeup air louvres to the façade cannot be provided. Nominal opening requirements are detailed at the end of this section. Please note: Areas given are free area, not louvre overall size. Generally allow for louvres with 55% free area, such that if 5.5m^2 of louvre is required, the actual louvre size required is 10m^2.

The carpark exhaust riser will need to run to the roof, with either a roof mounted fan or inline ducted fan. The makeup riser will need to run to the external (roof or façade) with roof or inline ducted fan. The carpark exhaust systems shall be controlled via carbon monoxide (CO) sensors to minimise running time and speeds.

We understand that carparks under buildings 2 and 3 have 1.5 facades open to the external and may not require specific natural or mechanical ventilation considerations. The other carparks have one façade open with louvres/openings and may not require mechanical ventilation.

Architect to determine if louvre/opening sizes are feasible during detailed design. If not mechanical ventilation riser locations will need to be determined.

5.3.3 RACF Commercial Kitchen

A mechanical exhaust system will required for the main kitchen, and this will need an external exhaust discharge point at roof level. This is to be a commercial grade kitchen, which will require an exhaust hood for grease laden waste.

Make up air for these kitchen exhaust hoods will be provided a separate outside air fan system. Air conditioning will be provided.

Nominally we have allowed for a 3,000 l/s main hood exhaust system, and a 500 l/s dishwasher exhaust hood, with 3,000 l/s make up air.

Requirements for kitchen exhaust to be finalised by the client/architect/kitchen consultant.

5.3.4 RACF Laundry

A mechanical exhaust system will be required for the laundry. Make up air for the kitchen exhaust hood can be provided with an evaporative cooling unit, which has the benefit of providing cooling to the kitchen. The laundry exhaust system will presumably need to include for gas flues from the dryers if these are to be installed.

Nominally we have allowed for a 2,000 l/s exhaust system, with 1,600 l/s make up air.

Requirements for the laundry exhaust to be advised by the client/architect/laundry consultant.

5.3.5 Servery/Dining

We have not allowed to provide any dedicated exhaust ventilation to the dining/servery rooms in the RACF. *Client to confirm if this is required.*

5.3.6 RACF Bathroom/Toilet Exhaust

It is proposed to provide centralised exhaust system/s serving the bedrooms (each bedroom ensuite is connected to a shared riser which would discharge at roof level), which would eliminate the need to have louvres in external walls.

On previous aged care projects (particularly high care facilities) it has been suggested that these fans should run 24 hours a day, in order to limit odours, etc.

With the RACF building effectively separate into 4 quadrants, we would propose 4 separate exhaust risers.

5.3.7 RACF Lobby Supply

It is proposed to provide centralised supply air systems to provide makeup for the bathroom exhaust systems. These systems will consist of a riser with supply air fan at roof level. These systems could potentially be connected to the common area air conditioning systems to provide required outside air.

5.3.8 RACF Garbage Room

An exhaust system is proposed for the garbage room, consisting of a roof mounted fan connected to the room via the dedicated shaft.

5.3.9 ILUs - Bathrooms

Ducted exhaust systems are proposed for the bathroom and laundry areas for each ILU. Exhaust fans would be located above dropped ceilings in bathroom areas.

Note: Exhaust fans will require a minimum of 250mm clear ceiling space and exhaust ductwork a minimum of 70mm ceiling space. Bulkheads may be required to conceal the exhaust ductwork.

Client to advise on availability of bulkhead/ceiling space.

Ceiling mounted egg crate type grilles are proposed to pick up the exhaust from each bathroom and laundry space.

Exhaust systems are proposed to discharge horizontally, via wall mounted external louvres, to the balcony areas for each ILU.

Undercut doors will be required to the ILU bathrooms and laundry rooms.

This option would be the least expensive in both capital cost and operational/maintenance cost.

With regards to the operation of each bathroom exhaust system, the exhaust fan will operate when the lights in either the bathroom/toilet are switched on. A separate push-button located adjacent to the laundry shall also turn on the exhaust system, with a run-on period of 1 hour.

5.3.10 ILUs - Kitchens

Ducted kitchen exhaust systems are proposed for the ILUs, rangehoods are to be provided by the builder. The exhaust ductwork would run out to the balcony, presumably in the same bulkhead as the toilet exhaust ductwork.

Note: Booster exhaust fans (if required) will require a minimum of 250mm clear ceiling space and exhaust ductwork a minimum of 100mm ceiling space. Bulkheads may be required to conceal the exhaust ductwork.

Client to advise on availability of bulkhead/ceiling space.

5.3.11 ILUs - Garbage Rooms

An exhaust system is proposed for each garbage room in each block of ILUs, consisting of a roof mounted fan connected to the room via the dedicated shaft.

5.3.12 Switchroom Exhaust

A mechanical ventilation system is proposed for the switchroom, consisting of a ducted exhaust fan (complete with fire damper) and a separate fire damper in the wall (ducted to the external) for makeup air.

5.3.13 Substation Exhaust

We have assumed that the substation/s (if required) will be a kiosk type and not require any riser space dedicated for ventilation.

Electrical consultant to confirm.

5.3.14 Pool Ventilation / Heating

A mechanical exhaust system will be required for the indoor pool, to prevent the build up of harmful chloromines. The indoor pool space is to be heated as well, therefore we believe it will be beneficial to heat the air using a heat recovery ventilator (which reclaims the heating energy which would otherwise be lost with a standard 100% outside air system.

We would recommend the use of an AirChange Poolpac system. The indoor pool unit would require a dedicated plant space.

Ventilation/heating preferences for the pool room to be finalised.

5.4 Building Management System

A central building management system (BMS) can be provided if required by the client, to control and monitor common plant, particularly for the RACF and any house services.

Client to advise of any specific BMS requirements.

5.5 Preliminary Spatial Requirements

The following table details our proposed spatial requirements for mechanical services.

Risers/Louvres	Width	Depth	No off	Terminates	Specific comments
RACF					
RACF Carpark Exhaust Main	700	700	1	roof	Mechanical ventilation shafts required unless natural ventilation louvres can be provided. Makeup shaft could be deleted if sufficient makeup can be provided through perforated roller shutter at carpark entry.
RACF Carpark Makeup Main	700	700	1	facade	
or Carpark Ventilation Permanent Openings or Louvres			~52m² on longest façade, or ~13 m² on each of 2 opposite sides	façade	Assuming ~26 car spaces, ~52 m² on one façade if shortest depth of carpark is <18m, or 13 m² equally distributed on two opposite sides (26 m² total). Areas given are free area, not louvre overall size.
Stairwell Pressurisation Shaft	1200	700	1 per fire stair (3 off)	roof	BCA consultant to confirm if all stairs are fir-isolated exits.
Relief Air Shaft or Relief Air Louvres	1200 4000	1400 1500	1 2 per level on opposite facades	roof façade	Final size of relief riser or louvres will be based on which stairwells are to be fire-isolated.
Kitchen Exhaust	1000	800	1	roof	Subject to kitchen consultant's requirements
Kitchen Makeup	1000	600	1	roof/façade	
Laundry Exhaust	1200	500	1	roof	Subject to laundry consultant's requirements. Number of dryer flues to be confirmed.
Laundry Makeup	1000	500	1	roof/façade	
Bathroom/toilet exhausts	600	600	4	roof	~1500 l/s per riser
Lobby supply air	600	600	4	roof	~1500 l/s per riser
Garbage Room	300	300	1?	roof	Final number to be determined

ILUs					
Carpark 2 Exhaust Riser	1100	1100	1	roof	Mechanical ventilation shafts required unless natural ventilation louvres can be provided. Makeup shaft could be deleted if sufficient makeup can be provided through perforated roller shutter at carpark entry.
Carpark 2 Makeup Riser	1100	1100	1	roof/facade	
or Carpark 2 Ventilation Permanent Openings or Louvres			~38 m^2 on each of 2 opposite sides	façade	Assuming 76 car spaces, 38 m^2 equally distributed on two opposite sides (76 m^2 total). Areas given are free area, not louvre overall size.
Carpark 3 Exhaust Riser	1000	1000	1	roof	Mechanical ventilation shafts required unless natural ventilation louvres can be provided. Makeup shaft could be deleted if sufficient makeup can be provided through perforated roller shutter at carpark entry.
Carpark 3 Makeup Riser	1000	1000	1	roof/facade	
or Carpark 3 Ventilation Permanent Openings or Louvres			~26 m^2 on each of 2 opposite sides	façade	Assuming 52 car spaces, 26 m^2 equally distributed on two opposite sides (52 m^2 total). Areas given are free area, not louvre overall size.
Garbage Room	400	400	TBC in detailed design	roof	1 per garbage room, number to be determined.
Individual bathroom/laundry/kitchen exhaust systems					Refer to Section 5.3.
Plant Spaces Required	**width**	**length**	**height**	**location**	
Pool Plant	3500	4000	2500	Enclosed plantroom with separate louvres for intake/discharge	
RACF Condensing Units Platform	6000	5000	2000	RACF Roof (with screening)	
Note: Generally roof fans to be located on top of allocated riser location					

6. Vertical Transportation Services

6.1 Design Criteria

- Vertical Transportation Services to comply with the Building Code of Australia.
- Vertical Transportation Services to comply with current Australian Standards where applicable and particularly the following:
  - AS 1735.1 Lifts, escalators and moving walks – General requirements.
  - AS 1735.12 Lifts, escalators and moving walks - Facilities for persons with disabilities.

6.2 Scope of Work

All lifts are proposed to be electric, machine roomless type.

RACF Lifts

- Provide two (2) passenger lifts in the RACF building. Both lifts serve 5 levels with single sided entry, from Level 1 through to Level 5 (inclusive).
- We understand both the lifts should be stretcher capable to meet the BCA and operational requirements of the client. *Client / BCA or access consultant to confirm this is not required.*
- Compliant with: BCA, AS1428.1, AS 1428.2, DDA and AS 1735.12. *Client / BCA or access consultant to confirm AS1428.2 compliance is required.*
- The passenger lift car will need internal floor dimensions of approximately 2280mm (depth) x 1600mm (width), compliant with AS 1428.2 and BCA stretcher requirements. ***This lift size has been nominated by the architect based on previous experience.***
- Lift car components (handrail, control buttons, lighting) to comply with AS1735.12.

RACF Passenger Lift Car Single Entry Sizes

SUPPLIER	INTERNAL CAR SIZE (width mm x depth mm x height mm)	DOOR SIZE (width mm x height mm)	INTERNAL SHAFT SIZE (width mm x depth mm)	LOAD	PIT DEPTH (mm)	LIFT OVERRUN (mm)
Eastern	1600 x 2280 x 2300	1000 x 2100	3000 x 2750	1700kg, 25 person	1700 (1.0 m/s)	4100
Preliminary Allowance						

The lifts will include:

- Standard lift finishes.
- Controls to comply with AS 1735.1, Lifts, escalators and moving walks - Facilities for persons with disabilities.

ILU Lifts

- Provide passenger lifts in the ILUs buildings as follows:
  - Block 1: 2 off passenger lifts. Both lifts shall be single sided entry serving 6 levels, from Level 2 through to Level 7 (inclusive).
  - Block 2: 2 off passenger lifts. Both lifts shall be single sided entry serving 5 levels, from Level 1 through to Level 5 (inclusive).
  - Block 3: 2 off passenger lifts. Both lifts shall be single sided entry serving 6 levels, from Level 2 through to Level 7 (inclusive).
  - Block 4: 3 off passenger lifts. Two lifts shall be single sided entry serving 5 levels, from Level 3 through to Level 7 (inclusive). The other lift shall be a through car dual entry type serving 2 levels, from Level 3 to Level 4.
  - Block 5: 2 off passenger lifts. Both lift shall be single sided entry serving 6 levels, from Level 2 through to level 7 (inclusive).
  - Block 6: 2 off passenger lifts. Both lift shall be single sided entry serving 5 levels, from Level 2 through to level 6 (inclusive).
  - Block 7: 2 off passenger lifts. Both lift shall be single sided entry serving 4 levels, from Level 3 through to level 6 (inclusive).
- We understand the lifts should be stretcher capable to meet the operational requirements of the client. *Client / BCA or access consultant to confirm this is required.*
- Compliant with: BCA, AS1428.1, AS 1428.2, DDA and AS 1735.12. *Client / BCA or access consultant to confirm AS1428.2 compliance is required.*

- The passenger lift car will need internal floor dimensions of approximately 2280mm (depth) x 1600mm (width), compliant with AS 1428.2 and BCA stretcher requirements. ***This lift size has been nominated by the architect based on previous experience.***
- Lift car components (handrail, control buttons, lighting) to comply with AS1735.12.

ILU Passenger Lift Car Single Entry Sizes

SUPPLIER	INTERNAL CAR SIZE (width mm x depth mm x height mm)	DOOR SIZE (width mm x height mm)	INTERNAL SHAFT SIZE (width mm x depth mm)	LOAD	PIT DEPTH (mm)	LIFT OVERRUN (mm)
Eastern	1600 x 2280 x 2300	1000 x 2100	3000 x 2750	1700kg, 25 person	1700 (1.0 m/s)	4100
Preliminary Allowance						

ILU Passenger Lifts Dual (Through) Entry Car Sizes (Block 4 lift only at this stage)

SUPPLIER	INTERNAL CAR SIZE (width mm x depth mm x height mm)	DOOR SIZE (width mm x height mm)	INTERNAL SHAFT SIZE (width mm x depth mm)	LOAD	PIT DEPTH (mm)	LIFT OVERRUN (mm)
Eastern	1600 x 2280 x 2300	1000 x 2100	3000 x 3000	1700kg, 25 person	1700 (1.0 m/s)	4100
Preliminary Allowance						

The lifts will include:

- Standard lift finishes.
- Controls to comply with AS 1735.1, Lifts, escalators and moving walks - Facilities for persons with disabilities.