WOOD & GRIEVE ENGINEERS

Leichhardt Park Child Care Centre, Leichhardt NSW

JV3 Energy Modelling - Compliance Report
NCC Section J – Energy Efficiency

Prepared for: Leichhardt Municipal Council
Attention: Mr. Julian Oon
November 2014
Revision No. 0

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Revision

REVISION	DATE	COMMENT	APPROVED BY
0	27/11/2014	CC	NCJ

Disclaimer

This energy model provides an estimate of the base building's energy performance. This estimate is based on a necessarily simplified and idealised version of the building that does not and cannot fully represent all of the intricacies of the building and its operation. As a result, the energy model results only represent an interpretation of the potential performance of the building. No guarantee or warranty of building performance in practice can be based on energy modelling results alone.

The results generated from this analysis are based on specific criteria outlined in the NCC and are not considered to be a true representation of the actual operation of the building. The intent of these criteria is to permit the comparison of the estimated annual energy consumption of a proposed building against that of a reference building and therefore determine if a specific building has the ability to be energy efficient.

For records the simulation files used in this report are as follows:

- IES Thermal Model:
  - Reference: 26687_reference_00.mit
  - Proposed Building with Reference Services: 26687_proposed_00.mit
  - Proposed Building with Proposed Services: N/A
- Apache Vista File:
  - Reference: 26687_reference_00.aps
  - Proposed Building with Reference Services: 26687_proposed_00.aps
  - Proposed Building with Proposed Services: N/A
- Apache HVAC File:
  - Not Applicable Apache Sim used for compliance calculation
- Energy Assessment Spreadsheet: 26687_JV3_141126.xlsm

Contents

1. Executive Summary

This modelling report has been prepared at the instruction of Leichhardt Municipal Council C/- Dillon & Savage Architects for the proposed child care centre development, located at Leichhardt Park, Leichhardt, NSW. This report applies specifically to the proposed building design and is intended to:

- Confirm the compliance of the works with the NCC 2014 Section J – Energy Efficiency provisions.

This analysis has been carried out in order to confirm that the estimated energy consumption for the development (calculated in accordance with Specification JV) is compliant with the NCC 2014 Section J - Energy Efficiency provisions via the alternative verification method ***JV3 – Verification using a reference building.***

The information contained in this report has been based on the following information:

- Architectural Drawing Issue dated 12 November 2014, prepared by Dillon & Savage Architects.

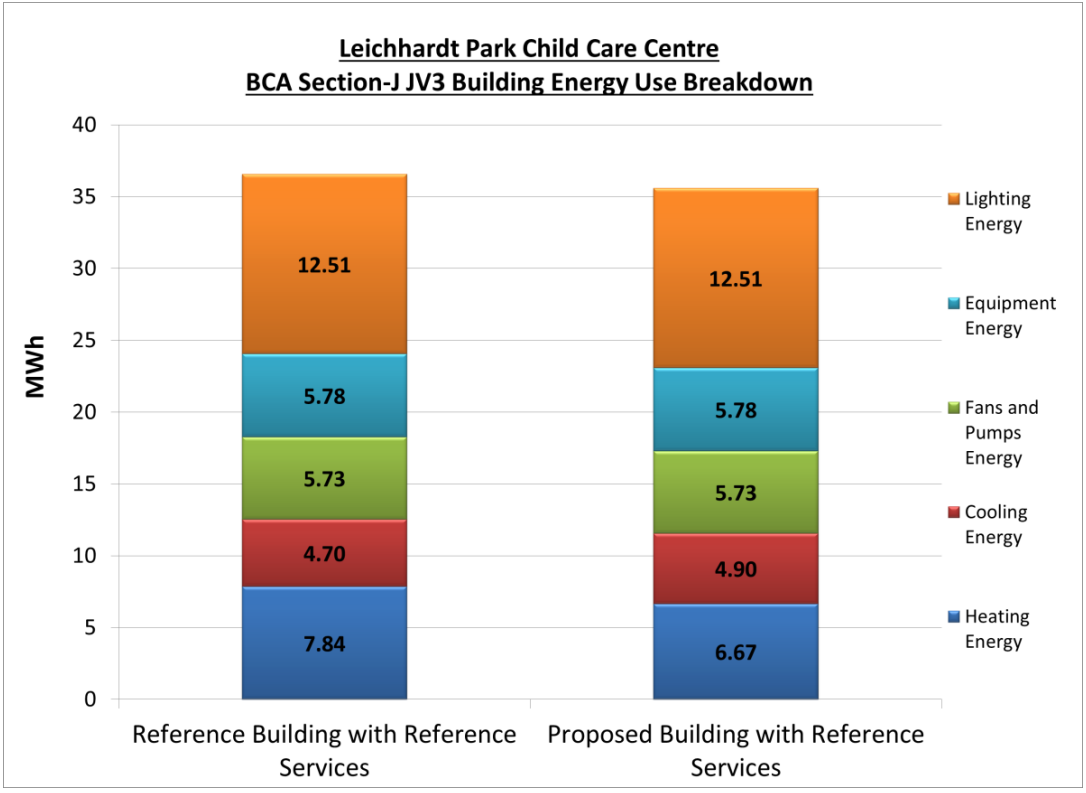
The relevant data and information contained within each of the energy estimation models has been further outlined within this report.

Compliance with the provision of Section J – Energy Efficiency is verified when it is determined that the estimated annual energy consumption of the 'Proposed Building' is not more than the estimated annual energy consumption of a (deemed-to-satisfy compliant) 'Reference Building' when:

- the proposed building is modelled with the proposed services; and
- the proposed building is modelled with the same services as the reference building.

The following graph and table summarises the results of the analysis:-

	Estimated Annual Energy Consumption (MWh) Reference Building (with reference services)	Estimated Annual Energy Consumption (MWh) Proposed Building (with reference services)
Total Energy Use	**36.55**	**35.58**



Based on the results outlined above, it can be stated that the proposed building design is compliant with the provisions of Section J - Energy Efficiency, having confirmed compliance via the alternative solution ***JV3 – Verification using a reference building*** (NCC 2014).

To achieve compliance as stated above the following thermal performance of the building fabric is required

Building Thermal Element	**Thermal Performance**
External Wall	**R2.8 total**
Roof	**R3.2 total**
Internal Wall (between adjacent conditioned and non-conditioned zones)	**R1.8 total**
Suspended Slab Floor	**No insulation required**

External Glazing	**Thermal Performance**
Glazing system (Glass & Frame) *Note: Glazing to comply with Acoustic Report criteria.	
Playroom 4 & Staff Program Room	**12.38mm Laminate** **U-value: 6.28 / SHGC 0.78**
Playrooms 1, 2 & 3	**10.38 Laminate** **U-value: 6.33 / SHGC 0.78**
Cot Rooms	**10.38 Laminate** **U-value: 6.33 / SHGC 0.78**
Dining / Craft Area	**10.38 Laminate** **U-value: 6.33 / SHGC 0.78**
Staff Lunchroom, Administration, Director, Meeting	**10.38 Laminate** **U-value: 6.33 / SHGC 0.78**
Wash Rooms	**6.38mm Laminate** **U-value: 6.40 / SHGC 0.74**

Notes:
1. The above results have been achieved based upon the drawings completed by Dillion & Savage (dated & revision as nominated).

2. The review of glazing types has considered the thermal rating to the glazing and frame configurations only. The design team should also coordinate these recommendations with any specific acoustic, wind, structural, safety (during design and installation) or Architectural Design requirements for the project.

As a further guide to the building thermal performance requirements, the architect is required to incorporate NCC 2014 Section J prescriptive requirements (where applicable) as noted in Appendix A.

2. Introduction

This modelling report has been prepared for the proposed child care centre development, located at Leichhardt Park, Leichhardt, NSW and sets out the proposed design parameters by which the building will be demonstrate design compliance with the NCC Section J – Energy Efficiency provisions.

We understand that the project aims to meet the following goal:-

- Confirm compliance with the Section J of the NCC 2014 via the alternative verification method: ***JV3 – Verification using a reference building***.

This report/energy analysis should be read in conjunction with all relevant plans and specifications and any supplementary regulatory information as nominated further within the body of this report. For example, where specific architectural drawings or specification are nominated, these documents are to be consulted in accordance with this design compliance report.

2.1 Section J of the NCC

Section J of the NCC was introduced to set minimum energy efficiency measures for the various classifications of building types while still maintaining acceptable internal environmental conditions for occupants.

The measures were designed to reduce the use of artificial heating and cooling, improve the energy performance of lighting, conditioning and ventilation, and reduce energy loss through air leakage.

These reductions are achieved by setting specific descriptive design criteria by which the building must be designed and built. When these criteria cannot be met the building must prove that the predicted annual energy demand is equal or better than the set design criteria, in accordance with a specific alternative verification method known as *JV3 – verification using a reference building*.

2.2 JV3 Modelling Process

Alternative Verification Method JV3 (*Verification using a reference building*) is an alternative method of design compliance when proposed building designs prevent compliance with the descriptive deemed-to-satisfy provisions. In accordance with alternative verification method JV3 – a design is deemed to be compliant with the provisions of Section J when it is determined that the estimated annual energy consumption of a proposed building with its services is not more than that of the estimated annual energy consumption of a reference building when:-

- the proposed building is modelled with the proposed services, and
- the proposed building is modelled with the same services as the reference building

In accordance with the alternative verification methodology, the following energy modelling simulations are required to be created in order to demonstrate code compliance.

2.2.1 Case 1:- Reference Building with Reference Services

The ‘Reference Building’ represents the proposed building layout, with NCC (minimum) compliant building fabric. The Reference building model includes deemed-to-satisfy HVAC and building services design in accordance with NCC 2014 Specification JV requirements.

The extent and location of glazing for the reference building model is the same as that of the proposed building with specific building geometry including roof, shading elements and glazing thermal properties all being compliant to Deemed-to-Satisfy requirements.

2.2.2 Case 2:- Proposed Building with Reference Services

The next energy model is a thermally accurate representation of the proposed building. However, this energy model has the Reference building's services applied to it.

The intent of this model is to determine if the proposed thermal fabric of the building achieves the same thermal energy performance results as that of a Reference building, i.e. by applying the same services the only area that differs from the Section J Deemed-to-Satisfy requirements is the thermal envelope.

2.2.3 Case 3: -Proposed Building with Proposed Services

The intent of this energy model is to ensure the proposed services comply with the energy efficiency performance requirements of Section J of the NCC. In this case, compliance with Case 3 shall be confirmed by the relevant Services Consultant under separate cover. Please refer to the relevant Services Consultants for confirmation of compliance.

Note: Models constructed under Case 1 and 2 are sufficient in order to demonstrate compliance with the relevant provisions associated with the thermal performance of the building. Separate compliance certificates for building services shall be issued by the relevant design consultants.

2.2.4 Test Reference Year

All of the above scenarios are modelled against the same set of climatic data, known as a test reference year.

A test reference year (TRY) is a set of measured hourly values for dry temperature, for global, diffuse and direct normal solar radiation, and for wind velocity. The figures nominated are selected from multiple year data sets of observations for a given location and are in sequence, such that the resulting TRY is "typical" for that specific location.

2.3 General Project Information

Property Title	Leichhardt Park Child Care Centre
Address	Leichhardt, NSW
Building Class and Use	Class 9b
Verification Method	JV3 – Verification using a Reference Building
NCC Climate Zone	5

Name and Version of the Software used in the Analysis

The design of the buildings has been assessed utilising the IES Virtual Environment energy modelling software. This software included the ModelIT, SunCast, Apache, Vista and ApacheHVAC range of tools. The version of the tool used within this modelling report was Virtual Environment 2014.

2.3.1 NCC Climate Zone Map – NSW

The following climate zone map identifies the relevant test-reference year and climate zone data applicable to the JV3 Energy Model used to demonstrate NCC Section J – Energy Efficiency compliance.

Leichhardt, NSW:

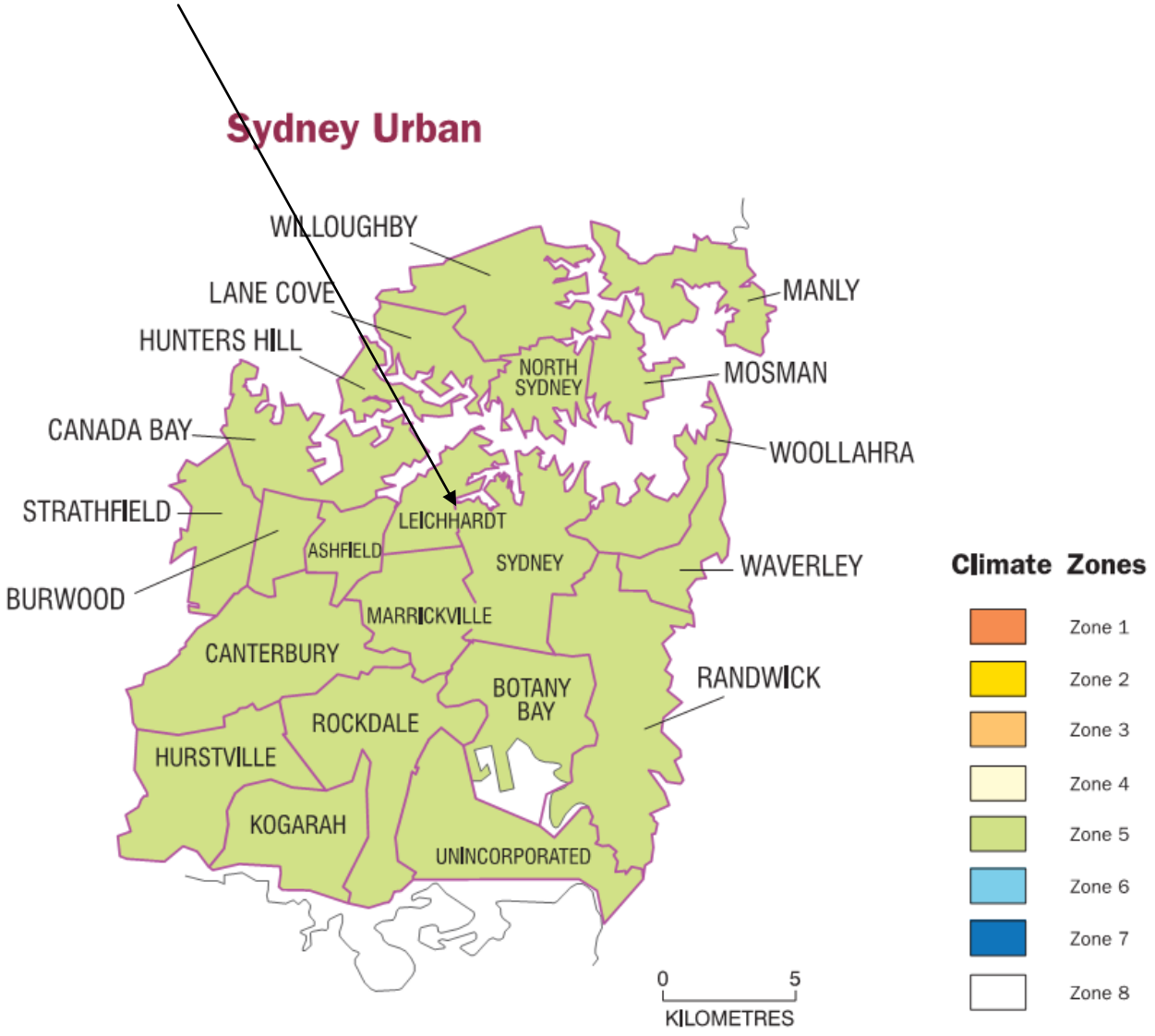


Image 1: NCC Climate Zones – Sydney Surrounds. Source www.abcb.gov.au

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3. General Information

3.1 Project Overview

Typical associated spaces included in the development model are as follows.

Ground Floor:

- Child Care Centre - Refer Architectural Drawing

3.2 Documentation and Drawings

The energy model is based on the following architectural drawings and documentation:

- Architectural Drawing Issue – dated 12 November 2014, with additional drawings noted as follows:
    - CC03 Elevations Model.pdf – Rev B (10/11/14)
    - CC04 Sections Model.pdf – Rev A (04/09/14)
    - CC06 Roof Plan.pdf – Rev A (12/11/14)
    - CC07 Openings Schedule.pdf – Rev C (20/11/14)
    - CC09 Reference Floor Plan.pdf – Rev A (11/06/14)

4. Standard Modeling Inputs

The following modelling inputs are kept constant throughout all three energy models based on NCC Specification JV simulation requirements.

4.1 Building Form

To ensure uniformity in the assessment the building form must remain the same for all three building models; including roof geometry, floor plan, number of storeys, ground to lowest floor arrangements and size and location of glazing.

The following areas of glazing were used on the facades encompassing the conditioned zone of the building.

4.1.1 Glazing Spatial Area

Ground Level

Orientation	Area
North	51.5 m^2
North East	45.7 m^2
East	2.95 m^2
South East	28.3 m^2
South	11.9 m^2
South West	21.2 m^2
West	16.5 m^2
North West	1.85 m^2

4.2 Zonal Layout

Air conditioned zones were defined for the facility (based on the mechanical services layout) and included in each of the energy models.

4.3 Internal Loads

4.3.1 Daily Occupancy and Operating Profile

Occupancy, lighting, equipment and HVAC plant throughout the site were estimated to operate in accordance with the NCC 2014 JV Specification in accordance with the following extract from the NCC:

Time Period (Local Standard Time)	Occupancy (daily)	Artificial Lighting (daily)	Equipment (daily)	HVAC (daily)
12:00am to 1:00am	0%	5%	5%	Off
1:00am to 2:00am	0%	5%	5%	Off
2:00am to 3:00am	0%	5%	5%	Off
3:00am to 4:00am	0%	5%	5%	Off
4:00am to 5:00am	0%	5%	5%	Off
5:00am to 6:00am	0%	5%	5%	Off
6:00am to 7:00am	0%	5%	5%	Off
7:00am to 8:00am	5%	30%	30%	On
8:00am to 9:00am	75%	85%	85%	On
9:00am to 10:00am	90%	95%	95%	On
10:00am to 11:00am	90%	95%	95%	On

11:00am to 12:00pm	90%	95%	95%	On
12:00pm to 1:00pm	50%	80%	70%	On
1:00pm to 2:00pm	50%	80%	70%	On
2:00pm to 3:00pm	90%	95%	95%	On
3:00pm to 4:00pm	70%	90%	80%	On
4:00pm to 5:00pm	50%	70%	60%	On
5:00pm to 6:00pm	20%	20%	20%	Off
6:00pm to 7:00pm	20%	20%	20%	Off
7:00pm to 8:00pm	20%	20%	20%	Off
8:00pm to 9:00pm	10%	10%	10%	Off
9:00pm to 10:00pm	5%	5%	5%	Off
10:00pm to 11:00pm	5%	5%	5%	Off
11:00pm to 12:00am	5%	5%	5%	Off

Extract from Table 2g, Occupancy and Operational profiles of a Class 9b School

Internal Sensible Heat Gains for appliances and equipment in a Class-9b building are generally 5W/m^2 during daily operation hours, 7 days per week.

4.3.2 Lighting Controls

Lights throughout the site were estimated to operate in accordance with the NCC 2014 JV Specification. Therefore lights were modelled to operate in accordance with Table 2a Artificial Lighting profiles of a Class 9b Retail Building of the NCC.

4.4 Sensible and Latent Internal Heat Gain per Occupant

In accordance with the NCC 2014 Specification JV, we have made the following allowances for sensible and latent heat gain per person:

Extract from NCC 2014 Specification JV Clause 2 (a) (iii) (A) and (B):-

> "From the occupants, at an average rate of 75W per person sensible heat gain and 55W per person latent heat gain, with the number of people calculated in accordance with D1.13" of the NCC (shown below).
>
> "From hot meals in a dining room, restaurant or café, at a rate of 5W per person sensible heat gain and 25W per person latent heat gain with the number of people calculated in accordance with D1.13" of the NCC (shown below).

4.4.1 Occupant Density

The following occupant density figures were utilised throughout the model. These densities were extracted from NCC 2014 Table D1.13.

Zone	Occupant Density
Play area	2 m^2 per person
Staff area	10 m^2 per person

4.5 Internal Heat Gains from Appliances and Equipment

In accordance with the NCC 2014 Specification JV, we have made the following allowances for sensible heat gain from equipment to all heating and cooling zones throughout the site:

Extract from NCC 2014 Specification JV Table 2h Internal Heat Gains for Appliances and Equipment

Application	Internal Sensible Heat Gain Rate (W/m^2)
Class 9b	5 W/m^2 maximum.

4.6 Building Services Simulations

4.6.1 Space Temperature Range

In accordance with Specification JV Clause 2 (a) (i) the space temperature being within the range of 18°C DB to 26°C DB for 98% of the plant operation time.

- Cooling Load Set-points were designed to operate at 24°CDB
- Heating Load Set-points were designed to operate at 20°CDB

4.6.2 Availability of Plant

Plant was scheduled to operate in accordance with the Daily Occupancy and Operating Profile outlined above in Section 3.3.1 of this report. All mechanical services plant was assumed to be available for operation during these times.

4.6.3 Mechanical Ventilation Rate – Outside Air

Outside air was introduced to the conditioned spaces via the air conditioning within the energy model at a rate of 7.5 l/s/person as per NCC and AS1668.2.

4.6.4 Exhaust Ventilation System Operation

Exhaust ventilation was modelled in accordance with AS1668.2 and the proposed mechanical services design.

4.6.5 Infiltration Air Change Rate

In accordance with the NCC 2014 Specification JV, we have made the following allowances for sensible heat gain from equipment to all heating and cooling zones throughout the site:

Extract from NCC 2014 Section J Energy Efficiency JV3 (d) (i) (F)

> "Infiltration values, for a perimeter zone of depth equal to the floor-to-ceiling height:
> - when pressurising plant is operating, 1.0 air changes per hour; and
> - when pressurising plant is not operating, 1.5 air changes per hour."

4.6.6 Heat Migration

The model generated for the site allowed for all associated internal wall construction types as per the DA issue documentation. This included internal stud walls, internal doors and windows where appropriate.

The heat load simulation then calculated the heat flow across all interconnecting zones during the simulation, which in turn was then incorporated into the energy simulation calculations.

4.7 Hot Water Supply

Domestic hot water energy consumption has been excluded from the calculation in accordance with the NCC 2014 Specification JV3, which states;

> "Where the annual energy consumption of the hot water supply or lifts and escalators are the same in the proposed building and the reference building, they may be omitted from the calculation of both the proposed building and the reference building."

5. Reference Building with Reference Services (Case 1)

5.1 Building Fabric

The "Deemed-to-Satisfy" requirements for NCC Section J1 compliance were used to calculate the total thermal performance levels required for the opaque building elements. The project is assumed to be Class 9b in Climate Zone 5. Therefore, the following building fabrics were used to model the reference building.

Element	R-value
External Wall	Rt2.8
Roof (including conditioned zones exposed to terraces above)	Rt3.2
Suspended Floor Slab (between conditioned and non-conditioned zones or where exposed to external climatic conditions)	N/A
Internal Partition Wall (between conditioned and non-conditioned zones)	Rt1.8

5.2 Glazing and Shading

5.2.1 Glazing Area Distribution

The glazed areas used for the reference building were calculated using the NCC Section J2 Glazing Calculator (Method 2). A maximum allowance for glazing was reached using the calculator (Appendix B) based on an assessment of conditioned zones only.

5.2.2 External Shading

Part J2 of the NCC provides the ability to account for permanent horizontal external shading projections which reduce the solar load on a window. These shading elements must be solid in construction and provided a direct reduction to the solar absorbance calculations within the heat load calculations. These results in turn are applied to the energy model to ensure the reference case reflects the thermal performance allowance applied in the Part J2 Glazing Calculator as accurately as possible.

5.3 Lighting Levels

Lighting levels according to NCC J6.2 allowances were incorporated into the energy modelling (see below):

Zone	Lighting Load
Play room	8W/m^2
Corridor (Foyer)	8W/m^2
Toilet	6W/m^2
Staff room	8W/m^2

5.4 Heating and Air Conditioning – Reference System

The following attributes were applicable to the deemed to satisfy HVAC system (to conditioned areas):-

- EER (Cooling): 2.8
- COP (Heating): 2.7
- Fuel: Electricity
- Air Supply System: Zoned supply system with remote fan
- Auxiliary Energy Value: 4.1W/m^2K

6. Proposed Building with Reference Services (Case 2)

6.1 Building Fabric

All currently documented thermal performance levels are either equal to or better than the NCC Section J1 "Deemed-to-Satisfy" levels required for a Class 6 facility in Climate Zone 5.

Wall and roof constructions, along with their overall thermal performance, are shown below. External wall makeups were taken from the architectural documentation.

To meet compliance with the JV3 analysis the following thermal performance for building constructions, along with their overall thermal performance, are shown below.

Thermal Building Element	Thermal Performance
External Wall	**R2.8 total**
Roof	**R3.2 total**
Internal Wall (between adjacent conditioned and non-conditioned zones)	**R1.8 total**
Slab-On-Ground	**No Specification**

6.2 External Walls

For external walls, a thermal performance of **Rt2.8** is required. For internal walls to unconditioned zones i.e. the toilets, plant and services zones a thermal performance of **Rt1.8** is required.

6.3 Roof

No change proposed to the reference building or deemed-to-satisfy services.

6.4 Exposed Suspended Floors

No insulation is required.

6.5 Glazing and Shading

6.5.1 Glazing Area Distribution

All external glazing and/or roof lights where applied to the model for the site in accordance with the architectural drawings received.

The following glass type has been proposed for the window system:-

- Single glazed system with standard aluminium frames.
- Thermal properties of the window system including frame have been documented in accordance with the project specific acoustic report prepared by Acoustic Logic (07/03/2014)

External Glazing	Thermal Performance
Glazing system (Glass & Frame) *Note: Glazing to comply with Acoustic Report criteria.	
Playroom 4 & Staff Program Room	**12.38mm Laminate U-value: 6.28 / SHGC 0.78**
Playrooms 1, 2 & 3	**10.38 Laminate U-value: 6.33 / SHGC 0.78**
Cot Rooms	**10.38 Laminate U-value: 6.33 / SHGC 0.78**
Dining / Craft Area	**10.38 Laminate U-value: 6.33 / SHGC 0.78**
Staff Lunchroom, Administration, Director, Meeting	**10.38 Laminate U-value: 6.33 / SHGC 0.78**
Wash Rooms	**6.38mm Laminate U-value: 6.40 / SHGC 0.74**

Note: This review of glazing types has considered the thermal rating to the glazing and frame configurations only. The design team should also coordinate these recommendations with any specific, wind, structural, safety (during design and installation) or Architectural Design requirements for the project.

All glass was assumed to be fixed in an aluminium type frame and location as per architectural drawings received.

6.5.2 External Shading

External shading was applied to the model for the site in accordance with the detail as show on the DA Issue architectural drawings received.

Where applicable, these shading elements were assumed to be solid in construction and provided a direct reduction to the solar absorbance calculations within the heat load calculations. These results in turn were reflected in the energy estimation calculations.

6.6 Lighting Levels

Lighting levels according to NCC allowances were incorporated into the energy model (see below):

Zone	Lighting Load
Play room	8W/m^2
Corridor (Foyer)	8W/m^2
Toilet	6W/m^2
Staff room	8W/m^2

6.7 Heating and Air Conditioning Design Parameters

The following attributes were applicable to the deemed to satisfy HVAC system (to conditioned areas):-

- EER (Cooling): 2.8 in accordance to NCC Part J5 requirements
- COP (Heating): 2.7 in accordance to NCC Part J5 requirements
- Fuel: Electricity
- Air Supply System: Zonal supply system with remote fan
- Auxiliary Energy Value: 4.1W/m^2K

7. Model Verification

7.1 Temperature Control

In accordance with Specification JV Clause 2 (a) (i) the space temperature of the Reference Building must be within the range of 18°C DB to 26°C DB for 98% of the plant operation time.

In order to verify this requirement, IES Virtual Environment's Vista analysis software module was utilised to assess the results for each of the nominated heating and cooling zones. As the plant is expected to operate between the hours of 4pm – 9am Monday to Friday and 4pm – 10am for all other times (Table 2a, noted in Section 1.3 above), a check was carried out to identify the percentage of total hours per annum (between this range) that the space temperature was outside this specified temperature band. The results of which are noted below.

Location	**Air temperature (°C) % hours in range**	**Air temperature (°C) % hours in range**	**Air temperature (°C) % hours in range**
	< 18.00	**18.00 to 26.00**	**> 26.00**
Ground conditioned zones	0	100	0

Percentage Outside of 18-26 Temperature range = 0%

8. Energy Consumption Results

The following annual energy consumption has been taken from the IES Virtual Environment Vista results file for the site:-

8.1 Case Results

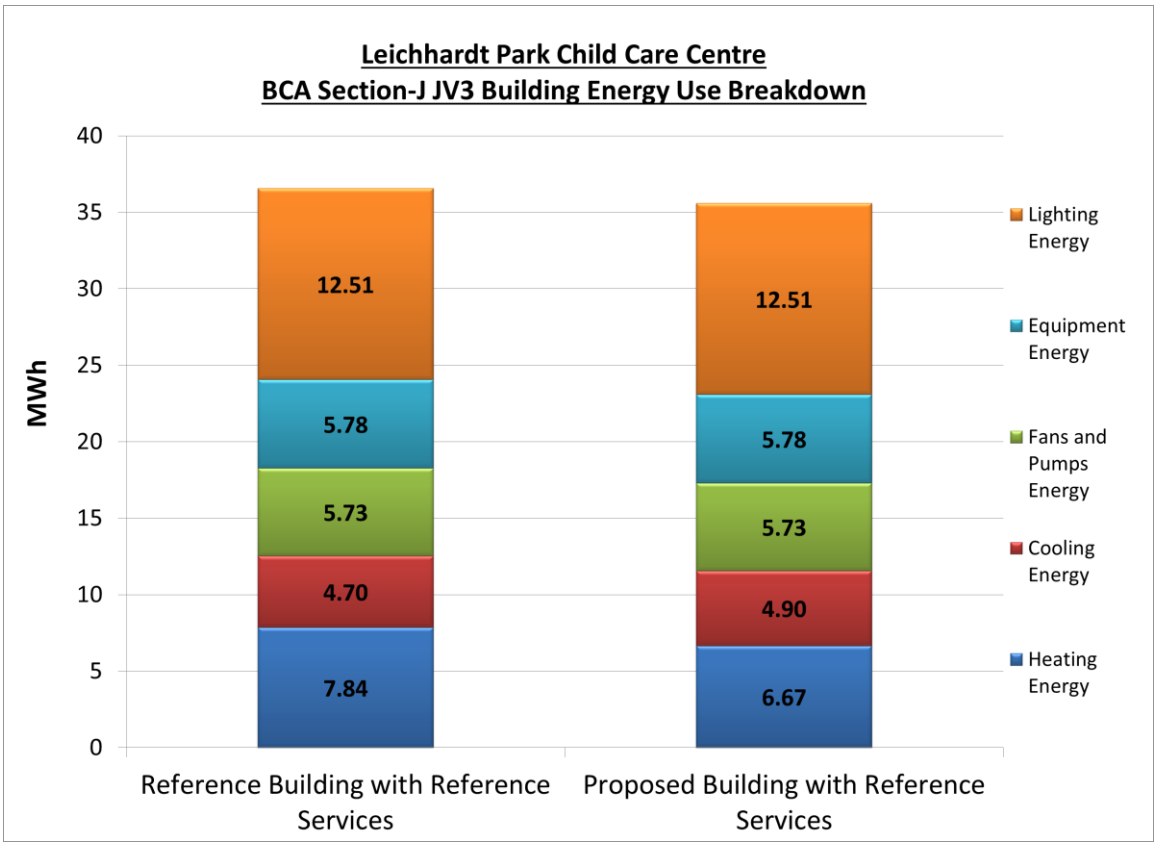
Case 1 – Reference Building with Reference Services

Heating Energy (MWh)	7.84
Cooling Energy (MWh)	4.70
Fans & Pumps Energy (MWh)	5.73
Equipment Energy (MWh)	5.78
Lighting Energy (MWh)	12.51
Total Energy Use (MWh)	**36.55**

Case 2 – Proposed Building with Reference Services

Heating Energy (MWh)	6.67
Cooling Energy (MWh)	4.90
Fans & Pumps Energy (MWh)	5.73
Equipment Energy (MWh)	5.78
Lighting Energy (MWh)	12.51
Total Energy Use (MWh)	**35.58**

The following graph outlines the Energy Use for the two cases modelled.



9. Conclusion

9.1 Results Summary

In accordance with the preferred design outcome (documented by the consultant design team) the energy model in Case 2 showed the building's total energy use to be 35.58 MWh/year. This total is equal to or less than the energy consumption of the project reference building 36.55 MWh/year.

It is therefore confirmed that the estimated annual energy consumption from the energy analysis is deemed to be compliant with the provisions the NCC 2014 Section J Energy Efficiency JV3 – Verification using a reference building.

Appendix A – NCC Prescriptive Requirements

FOR COMPLIANCE WITH SECTION J OF THE NCC 2014, WE RECOMMEND THE FOLLOWING GENERAL CONSTRUCTION NOTES TO BE INCLUDED IN THE ARCHITECTURAL SPECIFICATION OR ARCHITECTURAL DRAWINGS.

Thermal Construction General

For compliance with Section J1.2 of the NCC 2014.

Where required, insulation must comply with AS/NZS 4859.1 and be installed so that it –

(i) Abuts or overlaps adjoining insulation other than at supporting members such as studs, noggings, joists, furring channels and the like where the insulation must butt against the member; and
(ii) Forms a continuous barrier with ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier; and
(iii) Does not affect the safe or effective operation of a service or fitting.

Where required, reflective insulation must be installed with –

(iv) The necessary airspace to achieve the required R-value between a reflective side of the reflective insulation and a building lining or cladding; and
(v) The reflective insulation closely fitted against any penetration, door or window opening; and
(vi) The reflective insulation adequately supported by framing members; and
(vii) Each adjoining sheet of roll membrane being –
    (A) Overlapped not less than 50mm; or
    (B) Taped together

Where required, bulk insulation must be installed so that –

(i) It maintains its position and thickness, other than where it crosses roof battens, water pipes, electrical cabling or the like; and
(ii) In a ceiling, where there is no bulk insulation or reflective insulation in the wall beneath, it overlaps the wall by not less than 50mm

Roof, ceiling, wall and floor materials, and associated surfaces are deemed to have the thermal properties listed in **Specification J1.2 of the NCC.**

Roof and Ceiling Construction

For compliance with Section J1.3 of the NCC 2014.

Where, for operational or safety reasons associated with exhaust fans, flues or recessed downlights, the area of required ceiling insulation is reduced, the loss of insulation must be compensated for by increasing the R-Value of the insulation in the remainder of the ceiling in accordance with Table J1.3b.

Table J1.3b Adjustment of Minimum R-Value for loss of Ceiling Insulation

Percentage of ceiling area uninsulated	Minimum *R-Value* of ceiling insulation *required* to satisfy J1.3(a)							
	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
	Adjusted minimum *R-Value* of ceiling insulation *required* to compensate for loss of ceiling area insulation							
0.5% to less than 1.0%	2.8	3.4	4.0	4.7	5.4	6.2	6.9	
1.0% to less than 1.5%	2.9	3.6	4.4	5.2	6.1	7.0		
1.5% to less than 2.0%	3.1	3.9	4.8	5.8	6.8			
2.0% to less than 2.5%	3.3	4.2	5.3	6.5				
2.5% to less than 3.0%	3.6	4.6	5.9					
3.0% to less than 4.0%	4.2	5.7	Not Permitted					
4.0% to less than 5.0%	5.0							
5.0% or more								

Note:
Where the minimum *R-Value* of ceiling insulation *required* to satisfy J1.3() is between the values stated, interpolation may be used to determine the adjusted minimum *R-Vale*.

A roof that –

(i) Is required to achieve a minimum Total R-Value; and
(ii) (has metal sheet roofing fixed to metal purlins, metal rafters or metal battens; and
(iii) Does not have a ceiling lining or has a ceiling lining fixed directly to those metal purlins, metal rafters or metal battens (see Specification J1.3 Figure 2(c) and (f)),

Must have a thermal break, consisting of a material with an R-Value of not less than R0.2, installed between the metal sheet roofing and its supporting metal purlins, metal rafters or metal battens.

Chimneys and Flues

For compliance with Section J3.2 of the NCC 2014.

The chimney of flue of an open solid-fuel burning appliance must be provided with a damper or flap that can be closed to seal the chimney or flue.

Roof Lights

For compliance with Section J3.3 of the NCC 2014.

Roof lights need to be sealed, or capable of being sealed and must be constructed with—

(i) an imperforate ceiling diffuser or the like installed at the ceiling or internal lining level; or
(ii) a weatherproof seal; or
(iii) a shutter system readily operated either manually, mechanically or electronically by the occupant

External Windows and Doors

For compliance with Section J3.4 of the NCC 2014.

A seal to restrict air infiltration must be fitted to each edge of all external doors, openable external windows or the like. A seal maybe a foam or rubber compressible strip, fibrous seal or the like.

These requirements do not apply to –

(i) A window complying with AS 2047; or
(ii) An external louvre door, louvre *window*, or other such opening; or
(iii) A fire door; or
(iv) A roller shutter door, roller shutter grille or other security door or device installed only for out-of-hours security

A seal for the bottom edge of an external swing door, must –

(i) be a draft protection device; and
(ii) for the other edges of an external door or the edges of an openable window or other such opening, may be a foam or rubber compression strip, fibrous seal or the like

All doors to the conditioned zone must have a self-closing device.

Exhaust Fans

For compliance with Section J3.5 of the NCC 2014.

A miscellaneous exhaust fan, such as a bathroom or domestic kitchen exhaust fan, must be fitted with a sealing device such as a self-closing damper or the like when serving a conditioned space, or habitable room in climate zones 4, 5, 6, 7 and 8.

Construction of roofs, walls and floors

For compliance with Section J3.6 of the NCC 2014.

Roofs, external walls, external floors and any opening such as a window, door or the like must be constructed to minimise air leakage. All Constructions must be –

(i) Enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions; or
(ii) Sealed by caulking, skirting, architraves, cornices or the like.

These requirements do not apply to openings, grilles and the like required for smoke hazard management.

Appendix B – Deemed to Satisfy NCC Glazing Calculator

NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description: **Leichhardt park - Proposed Child Care Centre**

Application: **other**

Climate zone: **5**

Storey: **Ground**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	94.2m²	65.9m²	16.3m²	79.8m²	28.3m²	61.9m²	49.9m²	5.1m²	
Option B									n/a
Glazing area (A)	*51.5m²*	*45.7m²*	*2.95m²*	*28.3m²*	*11.9m²*	*21.2m²*	*16.5m²*	*1.85m²*	

Number of rows preferred in table below: **36** *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	WNE-1	NE		0.80		6.70	8.0	0.38	2.800	2.500	1.12	1.70	0.93	0.75	6.70	19% of 100%
2	WNE-3	NE		1.66	2.20		8.0	0.38	2.100	1.600	1.31	-0.06	0.00	0.27	3.65	3% of 100%
3	WNE-4	NE		2.10		7.00	8.0	0.38	2.800	2.500	1.12	0.40	0.52	0.43	7.00	10% of 100%
4	WNE-6	NE		2.10		8.70	8.0	0.38	2.100	2.500	0.84	0.40	0.75	0.56	8.70	17% of 100%
5	WNE-7	NE		1.30	2.10		8.0	0.38				0.00	1.00	1.00	2.73	11% of 100%
6	WNE-8	NE		2.10		5.59	8.0	0.38	2.800	2.500	1.12	0.40	0.52	0.43	5.59	8% of 100%
7	WNE_U	NE		0.61	18.50		8.0	0.38	0.200	0.630	0.32	0.02	0.88	0.75	11.29	33% of 100%
8	WN-1	N		0.94	4.35		8.0	0.55	0.600	2.660	0.23	1.72	1.00	0.97	4.09	15% of 98%
9	WN-2	N		2.10	2.50		8.0	0.55	2.100	2.500	0.84	0.40	0.75	0.46	5.25	6% of 98%
10	WN-3	N		1.50	1.20		8.0	0.55				0.00	1.00	1.00	1.80	7% of 98%
11	WN-4a	N		1.66	3.60		8.0	0.55	2.800	2.500	1.12	0.84	0.86	0.51	5.98	8% of 98%
12	WN-4b	N		2.10	1.80		8.0	0.55	2.800	2.500	1.12	0.40	0.40	0.34	3.78	2% of 98%
13	WN-6	N		2.10	10.20		8.0	0.55	1.500	2.500	0.60	0.40	0.91	0.62	21.42	41% of 98%
14	WN_U	N		0.61	15.00		8.0	0.55	0.200	0.630	0.32	0.02	0.90	0.69	9.15	21% of 98%
15	WSE-1	SE		0.94	2.90		6.0	0.66	0.600	1.200	0.50	0.26	0.85	0.80	2.73	9% of 100%
16	WSE-2	SE		1.60	3.80		6.0	0.66	0.600	1.900	0.32	0.30	0.92	0.89	6.08	22% of 100%
17	WSE-3	SE		0.90	4.50		6.0	0.66	0.600	1.900	0.32	1.00	0.98	0.96	4.05	15% of 100%
18	WSE-4	SE		1.54	3.30		6.0	0.66	0.600	1.900	0.32	0.36	0.92	0.89	5.08	18% of 100%
19	WSE_U	SE		0.65	16.00		6.0	0.66	0.400	1.100	0.36	0.45	0.90	0.87	10.40	36% of 100%
20											ROW SKIPPED (OK if intentional)					
21	WNW-3	NW		1.54	1.20		8.0	0.80	2.100	1.600	1.31	0.06	0.00	0.27	1.85	100% of 46%
22											ROW SKIPPED (OK if intentional)					
23	WW-1	W		1.60	1.30		8.0	0.49	0.600	1.900	0.32	0.30	0.95	0.89	2.08	13% of 99%
24	WW-2	W		1.60	1.30		8.0	0.49	0.600	1.900	0.32	0.30	0.95	0.89	2.08	13% of 99%
25	WW-3	W		0.77	1.50		8.0	0.49	0.600	1.900	0.32	1.13	0.98	0.96	1.16	7% of 99%
26	WW-4	W		1.54	2.42		8.0	0.49	0.600	1.900	0.32	0.36	0.95	0.89	3.73	23% of 99%
27	WW_U	W		0.65	11.50		8.0	0.49	0.400	1.100	0.36	0.45	0.93	0.87	7.48	45% of 99%
28	WE-1	E		1.30	0.90		8.0	0.80	2.100	1.600	1.31	0.30	0.41	0.45	1.17	31% of 56%
29	WE-2	E		0.77	1.20		8.0	0.80	4.000	1.600	2.50	0.83	0.42	0.45	0.92	24% of 56%
30	WS-1	S		1.60	1.80		6.7	0.80	*0.600*	3.800	*0.00*	*2.20*	*1.00*	*1.00*	2.88	25% of 99%
31	WS-2	S		2.10		9	6.7	0.80	0.600	1.900	0.32	-0.20	0.90	0.85	9.00	75% of 99%
32	WSW-1	SW		1.60	1.80		8.0	0.67	0.600	1.600	0.38	0.00	0.84	0.77	2.88	14% of 100%
33	WSW-2	SW		1.20	1.80		8.0	0.67	0.600	1.500	0.40	0.30	0.91	0.86	2.16	11% of 100%
34	WSW-3	SW		2.10		6.18	8.0	0.67	2.700	2.500	1.08	0.40	0.71	0.59	6.18	27% of 100%
35	WSW_U	SW		0.61	16.30		8.0	0.67	0.400	1.100	0.36	0.49	0.92	0.88	9.94	49% of 100%
36	WE_U	E		0.35		0.86	8.0	0.80	0.600	1.200	0.50	0.85	0.96	0.91	0.86	45% of 56%

if inputs are valid

Appendix C – Insulation Layout

EXISTING CAR PARK AREA

existing bollards

retaining wall

paving

FFL 20.90

outdoor store 12.5 sq.m

PLAYROOM 1 3-5 62.9 sq.m

wash room 9.7 sq.m

walkway

FFL 21.25

PLAYROOM 2 2-3 61.9 sq.m

store 12.1 sq.m

tree to be protected

laundry cleaner 8.1 sq.m

WC 3 sq.m

drying yard

veranda 54.2 sq.m

wash room 9.6 sq.m

outdoor store 10 sq.m

store 11.2 sq.m

staff lunchroom 15.1 sq.m

DINING/ CRAFT AREA 35 sq.m

cool room 5 sq.m

kitchen 17.5 sq.m

store/ photo copy 5.9 sq.m

foyer

FFL 21.25

38 sq.m

admin 9.3 sq.m

staff program room 12.8 sq.m

pantry 5 sq.m

director 9.7 sq.m

acc. WC 6.4 sq.m

parent area

meeting 11.3 sq.m

STEEP SLOPE

outline of underground rainwater/OSD tank

OUTDOOR PLAY AREA 3-5 184 sq.m

grass

sand pit

dry creek bed

sensory garden

shade sail

sand pit

OUTDOOR PLAY AREA 2-3 156 sq.m

mound

grass

dry creek bed

paving

upper roof column

paved entry court

entry arch

porch 8.5 sq.m

pram store

timber deck

veranda 42.8 sq.m

wash room 13.7 sq.m

PLAYROOM 3 0-2 42.9 sq.m

art sink bottle prep 9.7 sq.m

cot room 10.4 sq.m

cot room 8.1 sq.m

store 9.5 sq.m

PLAYROOM 4 0-2 42.1 sq.m FFL 21.25

cot room 9.3 sq.m

cot room 9.3 sq.m

outdoor store 10 sq.m

NEW PATH

kerb/ retaining wall

bicycle parking

NEW PATH

retaining wall

paved path

OUTDOOR PLAY AREA 0-2 162 sq.m grass/soft fall

sand pit

paved path

retaining wall

shade sail

bin store

EXISTING NEIGHBOURHOOD PLAYGROUND

heritage listed fig tree

heritage listed fig tree

heritage listed fig tree

MARY STREET

EXISTING CARETAKER'S COTTAGE

RIDGE RL27.50

GUTTER RL25.23

GUTTER RL26.02

GUTTER RL25.38

KEY

19.67	existing level
+21.20	proposed level
	1800mm palisade security fence
	2100mm palisade security fence
	1800mm timber lapped and capped fence
	2100mm timber open slat fence
	1000mm timber picket fence
	filled area
	cut area

N

SITE AREA	1330 sq.m
GROSS FLOOR AREA	605 sq.m
VERANDAS	120.5 sq.m

Rt1.8 - internal wall insulation

Rt2.8 - external wall insulation

Rt3.2 - roof insulation

Project Name Leichhardt Park

Project No 26687

Sketch Title Insulation markup

Sketch No SK-1

Date 28/11/2014 By greg.zheng

WOOD & GRIEVE ENGINEERS
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SCALE 1:100 @ A1

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Client: LEICHHARDT COUNCIL

Project: Proposed Child Care Centre Leichhardt Park

Drawing: SITE PLAN FLOOR PLAN

	Date	Amendment
D	10/11/14	Kitchen wall amended
C	13/10/14	Main Electrical Distribution and meter board moved plumbing fittings amended
B	12/09/14	Sections D,E and F cross referenced. Staff veranda column set out amended
A	4/09/14	Renumbered as CC series

Drawing No. 103 131 CC 002

Issue D

Date June 2014

Scale 1:100 @A1

Drawn

Checked