

EMKC CUBED PTY LTD

J9D5 PERFORMANCE SOLUTION REPORT

Apollo Place, Lane Cove West - Data Centre

Project Number: 118537
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Document Control

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118537- Performance Solution-r1	19 June 2024	Performance Solution A2G2(2) Expert Judgement (Supported by Evidence)	Pari Elete	Robert Romanous
	19 June 2024	Robert Romanous ESD Manager	DocuSigned by: <i>Robert Romanous</i> 90DD09FAE98A469...	
		Pari Elete Sustainability Engineer	DocuSigned by: <i>Pariksheth Elete</i> 6D9DF3473E294EE...	

Jensen Hughes Australia

Providing building regulations, fire engineering, accessibility, and energy consulting services to NSW for over 25 years

Our story begins in 1997 with the founding of BCA Logic to fulfill the demand of a consultancy company whose expertise expanded across the entire life cycle of a building, from consulting on the initial planning through to construction and occupation.

BCA Logic, SGA Fire and BCA Energy joined Jensen Hughes in 2021, a leading global, multi-disciplinary engineering, consulting and technology firm focused on safety, security and resiliency. We continue to be at the forefront of our industry and work thoroughly to preserve our position by ensuring the successful delivery of projects.

Jensen Hughes was launched in 2014 through the historic merger of Hughes Associates and Rolf Jensen & Associates (RJA), two of the most experienced and respected fire protection engineering companies at the time. Since then, we have gained market leadership in nuclear risk consulting and established commanding positions in areas like forensic engineering, security risk consulting and emergency management. Over the past 22 years, our integration of more than 30 privately held engineering and consulting firms has dramatically expanded our global footprint, giving us a powerful market presence ten times larger than our nearest competitor in some of our markets and extending our historical lineage back to 1939.

With more than 90 offices and 1500 employees worldwide supporting clients globally across all markets, we utilise our geographic reach to help better serve the needs of our local, regional, and multinational clients. In every market, our teams are deeply entrenched in local communities, which is important to establishing trust and delivering on our promises.

Table of Contents

1.0	INTRODUCTION.....	4
1.1	The Project	4
1.2	Building Code of Australia	5
1.3	Report Scope.....	5
2.0	BUILDING DESCRIPTION.....	6
2.1	Rise in Storeys (Clause C2D1).....	6
2.2	Classification (Clause A6G1).....	6
3.0	COMPLIANCE WITH THE BCA.....	7
3.1	Performance Methodology	7
4.0	STAKEHOLDERS	8
5.0	PERFORMANCE SOLUTION.....	9
5.1	Introduction	9
5.2	Bca deemed-to-satisfy provisions and Guide.....	11
5.3	BCA Performance Requirements	12
5.4	Proposed Performance Solution	12
5.5	Evidence Assessment	14
5.5.1	Building Services Consultant Comments	14
5.5.2	Cooling and Power Demand	16
5.5.3	Identifying the function and intent of the building.....	17
5.6	Conclusion.....	18
6.0	ASSUMPTIONS AND LIMITATIONS.....	21
6.1	Assumptions	21
6.2	Limitations.....	21
	APPENDIX – DESIGN & SUPPORTING DOCUMENTATION.....	22

1.0 Introduction

1.1 THE PROJECT

Jensen Hughes Pty Limited (Jensen Hughes) has been engaged by EMKC CUBED Pty Ltd to provide a Performance Solution Report for the proposed Apollo place Data centre project at 1 Sirius Road & 1 Apollo place, Lane cove west.

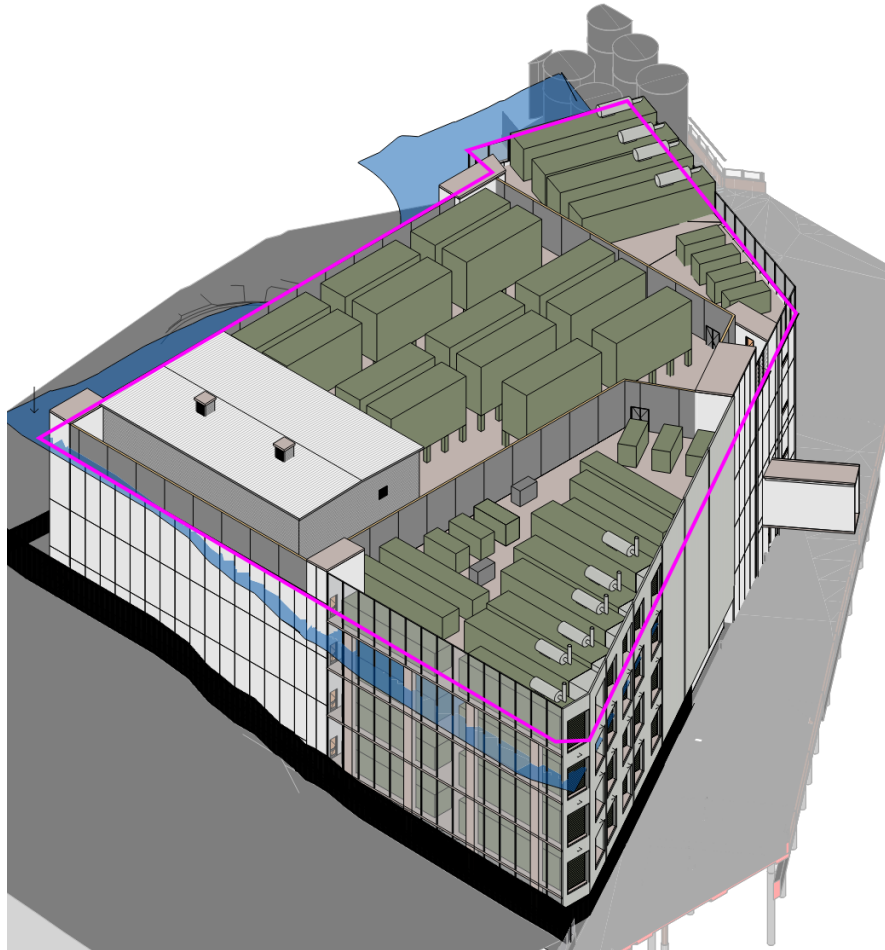


Figure 1 – Apollo Place Data Centre Project Roof (NE)

This Performance Solution Report demonstrates that the relevant Performance Requirements of the Building Code of Australia 2022 Volume One, pertaining to the proposed data centre project has been satisfied:

1.2 BUILDING CODE OF AUSTRALIA

The Building Code of Australia currently applicable to this project is the National Construction Code Series Volume 1 - Building Code of Australia 2022 herein referred to as the BCA2022.

1.3 REPORT SCOPE

Jensen Hughes Pty Limited has been engaged by EMKC Cubed Pty Ltd to carry out Performance Solutions for the proposed Data centre project at Apollo Place, Lane cove west.

Table 1 - Proposed Performance Solution and DtS Provision

No.	Performance Solution Reference	Relevant DtS Provision(s)
1.	A2G2(2)(c) – Expert Judgement (supported by evidence)	J9D5(2)

The report is limited to the Performance Solutions identified above and must not be used as an assessment for other buildings on-site against the BCA. In this Performance Report assessment, it has assumed that the remainder of the building satisfies the Deemed-to-Satisfy Provisions of the BCA.

2.0 Building Description

For the purposes of the Building Code of Australia (BCA) the development may be described as follows.

2.1 RISE IN STOREYS (CLAUSE C2D1)

The building has a rise in storeys of 4: Level 1 to Level 4.

2.2 CLASSIFICATION (CLAUSE A6G1)

The building has been classified as follows.

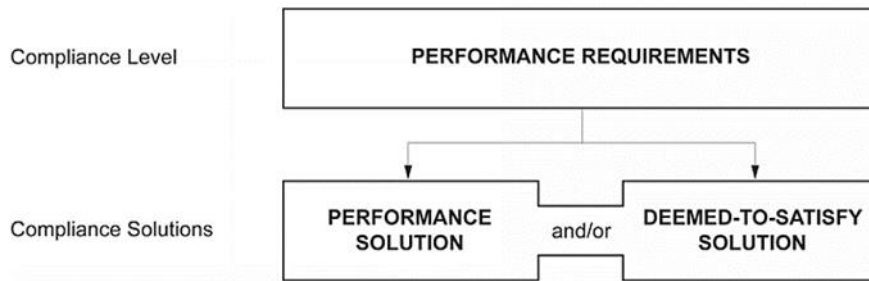
Table 2: Building Classification(s)

Class	Level	Description
Class 5, 7a, 7b/8	Level 1	Carp Office, Carpark, Data Centre Storage, Loading Dock, Waste Storage and minor storerooms ark
Class 7b/8	Level 2-3	Office, Data Centre Storage and Plant Space
Class 7b/8	Level 4	Data/Plant Storage
Class 7b/8	Level 5	Plant Equipment

3.0 Compliance with the BCA

3.1 PERFORMANCE METHODOLOGY

Clause A2G1 of the BCA2022 requires compliance with the Governing Requirements and Performance Requirements (PR) of the BCA. Clause A2G1 states that the PR may be satisfied by a Deemed-to-Satisfy (DtS) Solution, a Performance Solution (PS), or a combination of both. The compliance option structure of the BCA is identified below in excerpt of Figure A2G1 to reflect this.



Clause A2G2 of the BCA2022 prescribes that a Performance Solution must comply with all relevant Performance Requirements, or at least demonstrate equivalence to the DtS Provisions which are 'deemed to satisfy' the relevant Performance Requirements of the BCA.

A Performance Solution must demonstrate compliance through one or a combination of the Assessment Methods prescribed by Clause A2G2 sub-clause (2) of the BCA and must identify all relevant Performance Requirements from all Sections or Parts of the BCA. To satisfy this prerequisite, all relevant Assessment Methods and Performance Requirements have been identified within the Performance Solution assessments in the following sections of this report.

Additionally, Clause A2G2 sub-clause (4) requires:

- 4) Where a Performance Requirement is proposed to be satisfied by a Performance Solution, the following steps must be undertaken:
 - a) Prepare a performance-based design brief in consultation with relevant stakeholders;
 - b) Carry out analysis, as proposed by the performance-based design brief;
 - c) Evaluate results from 4(b) against the acceptance criteria in the performance-based design brief.
 - d) Prepare a final report that includes:
 - i) all Performance Requirements and/or Deemed-To-Satisfy Provisions identified through A2G2(3) or A2G4(3) as applicable; and
 - ii) identification of all Assessment Methods used; and
 - iii) details of the steps 4(a) to 4(c) above; and
 - iv) confirmation that the Performance Requirement has been met; and
 - v) details of conditions or limitations, if any exist, regarding the Performance Solution.

This Report has been prepared in accordance with the requirements of Clause A2G2 sub-clause (4) of the BCA.

4.0 Stakeholders

The key stakeholders in the Performance Solution process for this project are identified below.

Role	Company	Contact(s)
Project Manager	EMKC3	Cristian Patino / Pawan Lala
Building Services Consultant	ARUP	Kamolwatchara Wongpanyathaworn
Building Services Consultant	ARUP	Javod Noori
Sustainability (Section J) Consultant	Jensen Hughes Pty Limited	Robert Romanous
Principle Certifying Authority (PCA)	McKenzie Group	Kingsley Lunt

5.0 Performance Solution

5.1 INTRODUCTION

Table 3: Performance Solution Summary

Performance Solution for J9D5	
BCA DtS Clause:	<p>Facilities for Solar Photovoltaic Systems.</p> <p>J9D5(2), focusing on J9D5(2)(d) below.</p> <p>2) <i>At least 20% of the roof area of a building must be left clear for the installation of solar photovoltaic panels, except for buildings—</i></p> <p>d. <i>Where more than 50% of the roof area is used as a terrace, carpark, roof garden, roof light or the like”</i></p>
BCA Guide to J9D5(2)	<p>Further clarification</p> <p>J9D5(2) addresses roof area conditions with at least 20% of the roof area should be kept free for installing solar photovoltaic panels.</p> <p>Buildings with already installed solar panels covering at least 20% of the roof, or those with 100% shading for more than 70% of daylight hours, or <i>special use cases</i> like terraces and roof gardens, are exempt. These exemptions are intended to cover buildings where the use of rooftop solar panels will be ineffective or <i>impractical</i>.</p>

<p>Description of the DtS Non-conformance:</p>	<p>DtS requires that at least 20% of the roof area of a building must be left clear for the installation of solar photovoltaic panels except for buildings where more than 50% of the roof area is used as a terrace, carpark, roof garden, roof light or the like.</p> <p>However, due to the functional use of the building, Data Centre, a significant amount of roof space is required for services which are necessary and appropriate to the functional use of the building, such as vital HVAC equipment and facilities / space for the maintenance of the equipment.</p> <div style="background-color: #003366; color: white; padding: 5px; text-align: center;">Statement from ARUP building services consultants below:</div> <ul style="list-style-type: none"> + <i>High efficiency cooling system is proposed for the facilities. The system utilises hybrid cooling towers (HCTs) with water-cooled chillers (WCCs) and can run in “free-cooling” mode when ambient condition is suitable. Significant portion of the roof space will be occupied by this cooling equipment, in order for the system to meet the following requirements:</i> <ul style="list-style-type: none"> ● <i>Meeting high heat rejection, typical for data centre facilities and specially so for multi-storeys development</i> ● <i>Maximising free-cooling operation</i> ● <i>Increased system efficiency</i> + <i>The roof North and West gantry is reserved for critical plants including standby generators and PTU (Power Train Unit) supporting the critical Data Hall IT load</i> <p>As per the above statement from ARUP, the roof is occupied by vital mechanical services and trafficable maintenance space which cover over 50% of the roof space, therefore roughly 10% of roof area will be left clear for the future installation of solar photovoltaic panels, not the required 20%.</p>
<p>Assessment Method:</p>	<p>A2G2(2)(c) Expert Judgement (supported by evidence).</p>
<p>Acceptance Criteria – The Performance Solution will be considered acceptable if:</p>	<p>It will be demonstrated that 20% of the roof area of this building cannot be left clear and is impractical for the future installation of solar photovoltaic panels without infringing on the roof area which is necessary for essential mechanical building services and equipment which are required to support the function and use of the building as a data centre.</p> <p>When the above is demonstrated from the evidence collected, it will be concluded that under clause J9D5(2)(d) and of BCA guide, the mechanical building services and equipment required to support the function and use of the building as a data centre are of special use case.</p>

5.2 BCA DEEMED-TO-SATISFY PROVISIONS AND GUIDE

BCA NCC2022 DTS

J9D5 Facilities for solar photovoltaic and battery systems

[New for 2022]

- (1) The main electrical switchboard of a building must—
- (a) contain at least two empty three-phase circuit breaker slots and four DIN rail spaces labelled to indicate the use of each space for—
 - (i) a solar photovoltaic system; and
 - (ii) a *battery system*; and
 - (b) be sized to accommodate the installation of solar photovoltaic panels producing their maximum electrical output on at least 20% of the building roof area.
- (2) At least 20% of the roof area of a building must be left clear for the installation of solar photovoltaic panels, except for buildings—
- (a) with installed solar photovoltaic panels on—
 - (i) at least 20% of the roof area; or
 - (ii) an equivalent generation capacity elsewhere on-site; or
 - (b) where 100% of the roof area is shaded for more than 70% of daylight hours; or
 - (c) with a roof area of not more than 55 m²; or
 - (d) where more than 50% of the roof area is used as a terrace, *carpark*, roof garden, *roof light* or the like.

BCA Guide

Roof Area Requirements

[J9D5\(2\)](#) addresses roof area conditions with at least 20% of the roof area should be kept free for installing solar photovoltaic panels.

Buildings with already installed solar panels covering at least 20% of the roof, or those with 100% shading for more than 70% of daylight hours, or special use cases like terraces and roof gardens, are exempt. These exemptions are intended to cover building where the use of rooftop solar panels will be ineffective or impractical.

5.3 BCA PERFORMANCE REQUIREMENTS

The relevant Performance Requirement applicable to this Performance Solution are stated in the table below.

Table 4 - Performance requirements

Clause	Requirements
J1P1 – Energy Use	A building, including its services, must have features that facilitate the efficient use of energy appropriate to— a) The function and use of the building (Data Centre in this case)
J1P4 - Renewable energy and electric vehicle charging	A building must have features that facilitate the future installation of on-site renewable energy generation and storage and electric vehicle charging equipment.

5.4 PROPOSED PERFORMANCE SOLUTION

DtS Clause J9D5(2) currently allows exemptions to the clause when achieving 20% of the roof area for future solar panels in impractical cases. These exemptions include situations where more than 50% of the roof area is used for a terrace, car park, roof garden, roof light, or the like.

The BCA guide further clarifies the above by exempting '**special use cases**' that make the use rooftop solar '**impactable**'.

The proposed performance solution will include an assessment of expert evidence from relevant stakeholders to determine that under clause J9D5(2)(d) if the essential HVAC equipment is as important, or more important than features such as a terrace, carpark, roof garden, or roof light due to the function and use of the building as a Data Centre.

Therefore, a supporting statement of

Evidence Assessment from ARUP deems the essential HVAC equipment to qualify as **Special use case** for this project under clause J9D5(2)(d) exemptions mentioned above.

5.5 EVIDENCE ASSESSMENT

In accordance with local council DCP commitments and in supporting Australia's transition to Net-zero emissions, the project proposes an all-electric approach, except for backup generators under a diesel supply with storage capacity of 345.5kL to ensure no interruption to the function and reliability to the operations as a data centre.

5.5.1 Building Services Consultant Comments

Electrical Consultant	The roof North and West gantry is reserved for critical plants including standby generators and PTU (Power Train Unit) supporting the critical Data Hall IT load
Mechanical Consultant	<p>Essentially a multi-storey datacentre will require a large extent of the roof to locate cooling plant as the cooling load requirements is more than an order of magnitude greater than other buildings (such as commercial building) of similar size.</p> <p>High efficiency cooling system is proposed for the facilities. The system utilises hybrid cooling towers (HCTs) with water-cooled chillers (WCCs) and can run in "free-cooling" mode when ambient condition is suitable. Significant portion of the roof space will be occupied by this cooling equipment, in order for the system to meet the following requirements:</p> <ul style="list-style-type: none"> • Meeting high heat rejection, typical for data centre facilities and especially so for multi-storeys development • Maximising free-cooling operation • Increased system efficiency

5.5.2 Cooling and Power Demand

Data centres have a much higher cooling load than similar-sized residential or commercial buildings. This is because they house a large amount of high-powered equipment that constantly generates heat. To ensure this equipment keeps operating within safe temperatures, data centres require extensive cooling systems.

For a data centre, rooftop space is dedicated to housing these cooling systems. The high heat output necessitates a powerful cooling solution, which typically takes up a significant amount of roof space. Refer to 5.5.1 Building Services Consultant Comments

Furthermore, data centres operate continuously, so reliable cooling is critical. To guarantee uninterrupted operation, even in case of power outages, data centres often incorporate redundant systems, such as the backup generators. Therefore, on-site renewable energy sources, such as solar panels, aren't ideal for data centres.

Evident to the above, to guarantee reliable operation for the building's mechanical systems, all available northern exterior space on Levels 1-4 has been dedicated to housing building service equipment. Refer to figure below:

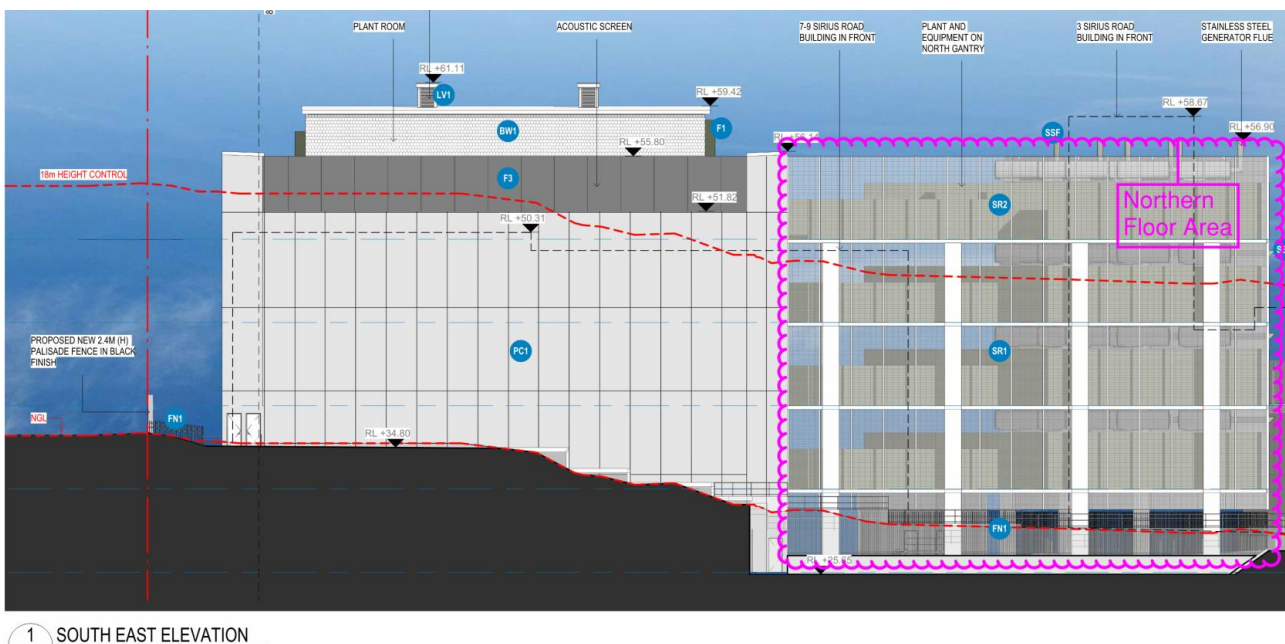


Figure 2 - Northern Floor Mechanical Equipment

5.5.3 Identifying the function and intent of the building

The classification of the data centre provides the intent of use across all spaces within the building and external to; namely roof space. This is supported under the governing requirements of determining a building classification, with BCA2022 clauses referenced below:

BCA SPTC	Clause
A6G1(1)	The classification of a building or part of a building is determined by the purpose for which it is designed, constructed, or adapted to be used.
A6G1(4)	Unless another classification is more suitable, an <u>occupiable outdoor area</u> must have the same classification as the part of the building to which it is associated.
<u>Occupiable outdoor area:</u> A space on a roof, balcony or similar part of a building— <ol style="list-style-type: none"> that is open to the sky; and to which access is provided, other than access only for maintenance; and that is not open space or directly connected with open space. 	

A building classification typically dictates the intended use of the rooftop space. For example, in a Class 2-6 and 9 building, occupiable rooftops like terraces or gardens serve as amenities for occupant comfort. While other similar daytime-use buildings might utilise roof lights to provide natural light to improve amenity.

As discussed in 5.5.2 Cooling and Power Demand, Data centres (Class 7b) have a unique rooftop requirement. Unlike buildings focused on occupant well-being or amenity, a data centre's roof space core function is to maintain 24/7 operation to cool vital data storage equipment. Therefore, the essential HVAC equipment becomes as important, or more important than features that already allow for exemptions under J9D5(2) such as a terrace, carpark, roof garden, or roof light due to the function and use of the building as a Data Centre, making it a special use case.

The mechanical and supporting equipment is illustrated in the figure below, showing greater than 50% coverage of the roof area.

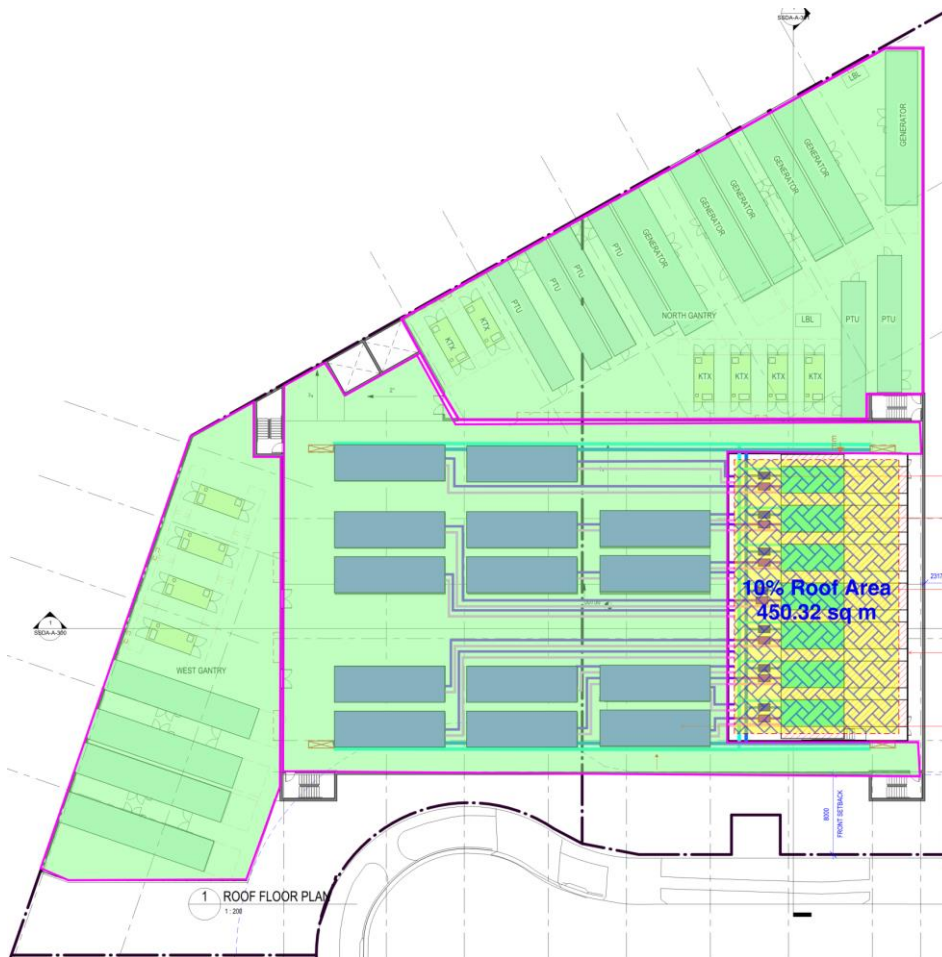


Figure 3 - Roof plan, showing mechanical systems (in green) covering more than 50% roof area

5.6 CONCLUSION

The evidence collected and demonstrated in 0

Evidence Assessment has supported the below acceptance criteria of this performance solution.

- + It will be demonstrated that 20% of the roof area of this building cannot be left clear and is **impractical** for the future installation of solar photovoltaic panels without infringing on the roof area which is necessary for essential mechanical building services and equipment which are required to support the function and use of the building as a data centre.
- + When the above is demonstrated from the evidence collected, it will be concluded that under clause J9D5(2)(d) and of BCA guide, the mechanical building services and equipment required to support the function and use of the building as a data centre are of **special use case**.

Therefore, the essential HVAC equipment and generators are qualified under **special use case** as detailed in BCA Guide of clause J9D5(2)(d). This is appropriate due to the intent of the equipment servicing the function of the building and covers more than 50% of the roof area.

J1P1(a) and J1P4 Performance requirements are met and satisfied with the supporting evidence for an expert judgement made in this report, and as demonstrated below:

Clause	Requirements	Project Demonstration
J1P1 – Energy Use	<p>A building, including its services, must have features that facilitate the efficient use of energy appropriate to—</p> <p>a) The function and use of the building (Data Centre in this case)</p>	<ul style="list-style-type: none"> + The building services are appropriate to 'The function and use of the building' (Data centre in this case). + The building services have features that facilitate the efficient use of energy, including <ul style="list-style-type: none"> o High efficiency cooling systems for the facilities. o The system utilises hybrid cooling towers (HCTs) with water-cooled chillers (WCCs) and can run in "free-cooling" mode when ambient condition is suitable. o Significant portion of the roof space will be occupied by this cooling equipment, in order for the system to meet the following requirements: <ul style="list-style-type: none"> o High heat rejection, typical for data centre facilities and especially so for multi-storeys development. o Maximising free-cooling operation to increased system efficiency.

J1P4 - Renewable energy and electric vehicle charging	A building must have features that facilitate the future installation of on-site renewable energy generation and storage and electric vehicle charging equipment.	<ul style="list-style-type: none"><li data-bbox="810 277 1428 450">+ The essential HVAC equipment and generators are qualified under special use case as detailed in BCA Guide of clause J9D5(2)(d), and therefore J9D5(2) is exempt due to being impractical.<li data-bbox="810 461 1337 524">+ On-site EV charging on L1 in addition to provisions as per NCC22 Section J9.
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6.0 Assumptions and Limitations

6.1 ASSUMPTIONS

For the purpose of this report, the following are assumed:

- + Other than the proposed Performance Solution(s), and those third-party Performance Solution(s) identified in Part 1.3 of this Report, the building satisfies the DtS provisions of the BCA.

6.2 LIMITATIONS

This report does not include nor imply any design or assessment of compliance or upgrading for:

- + the structural adequacy or design of the building;
- + the inherent derived fire-resistance ratings of any proposed structural elements of the building (unless specifically referred to);
- + the design basis and/or operating capabilities of any proposed electrical, mechanical or hydraulic fire protection services (other than any specifically referred to);
- + compliance with BASIX or Section J of the BCA;
- + balustrade construction outside the ambit of the proposed Performance Solution(s);
- + inspections of the completed building, nor general BCA compliance of the building, outside the ambit of the proposed Performance Solution(s);

This report also does not include, nor imply compliance with:

- + the National Construction Code – Plumbing Code of Australia Volume 3;
- + the Disability Discrimination Act 1992, including the Disability (Access to Premises – Buildings) Standards 2010 – unless specifically referred to;
- + Demolition Standards not referred to by the BCA;
- + Work Health and Safety Act 2011;
- + Construction Safety Act
- + Requirements of other Regulatory Authorities including, but not limited to, Telstra, Telecommunications Supply Authority, Water Supply Authority, Electrical Supply Authority, Work Cover, Roads and Maritime Services (RMS), Local Council, Department of Planning and the like; and
- + Conditions of any Development Consent issued by the Local Consent Authority;
- + Any other Performance Solutions prepared by other parties.

Note: This report is not a Specification Document to be used for tendering purposes.

Appendix – Design & Supporting Documentation

This report has been prepared based on the following Design Plans and Specifications:

- + GreenBox Architecture Pty Ltd, 15th March 2023 DA Issue Rev N/A (Drawn/Checked/Approved: IL/DW/AO)
- + ARUP | Kamolwatchara.W – Associate & Javad Noori - Senior Electrical Engineer

High efficiency cooling system is proposed for the facilities. The system utilises hybrid cooling towers (HCTs) with water-cooled chillers (WCCs) and can run in “free-cooling” mode when ambient condition is suitable. Significant portion of the roof space will be occupied by these cooling equipment, in order for the system to meet the following requirements:

- Meeting high heat rejection, typical for data centre facilities and especially so for multi-storeys development
- Maximising free-cooling operation
- Increased system efficiency

Regards,

Kamolwatchara Wongpanyathaworn
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“The roof the North and West gantry is reserved for critical plants including standby generators and PTU (Power Train Unit) supporting the critical Data Hall IT load”

The signed document will be sent by Mac shortly.

Thanking you in advance,

Javad Noori (he/him/his)
Senior Electrical Engineer
CEng, MIET

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