1

ESD PERFORMANCE SPECIFICATION

ISSUE

BRINDABELLA 06

JUNE 2021

atelier ten

PROJECT INFORMATION

JOB TITLE: BRINDABELLA 06
JOB NUMBER: 1275
DOCUMENT TITLE: ESD SPECIFICATION
VERSION: 0
FILE NAME: BRINDABELLA 06

PREPARED

PREPARED BY: DANIELA MENDEZ

SIGNED: DM

DATED: 9TH JUNE 2021

CHECKED

CHECKED BY: PAUL STOLLER

SIGNED:

DATED: 21ST JUNE 2021

APPROVED

APPROVED BY: PAUL STOLLER

SIGNED:

DATED: 21ST JUNE 2021

REVISIONS

NO:	DATE	CHECKED	APPROVED
0	09.06.2021	21.06.2021	21.06.2021

ATELIER TEN
Level 1
79 Myrtle Street
Chippendale, 2008
T +61 (0) 2 9262 4500

Contents

1. Introduction

Atelier Ten has been commissioned by Capital Airport Group (CAG) (the Principal) to provide environmentally sustainable design (ESD) services for the building it owns at Brindabella 06, Canberra (the Property).

1.1 REFERENCE DOCUMENTS

This document is to be read in conjunction with all Drawings, Specifications & Reports referred to in the Request for Tender and Principal's Project Requirements, including but not limited to:

- Architectural Specification and Drawings
- Mechanical Services Specification and Drawings
- Electrical Services Specification and Drawings
- Hydraulic Services Specification and Drawings
- Fire Services Specification and Drawings
- Lighting Specification and Drawings
- Contractor Commissioning Clauses
- The Contract
- Airport Management Plan
- CAG Building Guidelines

1. PROJECT ESD OVERVIEW

The Principal has set out environmental performance outcomes that the Property is required to achieve at completion and maintain throughout building operations. The entire development is to be delivered under the ESD specifications of this document. The Contractor will be required to certify both buildings as a single entity under Green Star, WELL, and NABERS systems. The buildings are to achieve a PCA A Grade rating and its environmental quality grade for new offices. The Principal requires the following ratings, meeting or exceeding PCA requirements. These include:

- Green Star Design & As-Built v1.2 - 5 Star.
  PCA A Grade rating requires Green Star Design & As-Built v1.2 - 5 Star. The principal requires the updated Green Star Design & As-Built v1.2-5 star. This rating is aligned with NCC2019.The Contractor will be required to document the entire development in line with Green Star Design & As Built submission requirements, and is required to submit and certify the South Building only with the GBCA. The extent of the contract, whether it includes a Warm Shell or a Cold Shell, will meet the above requirements.
- WELL Core Pilot v2 - Gold
  The Contractor will deliver a Core Building rating in accordance with the WELL Core Building Pathway set on this specification.
- NABERS Energy 5 Star
  The rating will assess whole of building energy use 12 months after issue of the Occupation Certificate, to demonstrate compliance with NABERS Energy 5 star. The Contractor will participate in building tuning exercises at the following times following issue of Certificate of Occupancy: 3-month review, 6-month review, 9-month review, 12-month review. At these times, the Contractor must demonstrate that building performance is meeting NABERS Energy 5 Star performance targets.
- NABERS Water 4 Star
  The Rating will assess whole of building water use 12 months after issue of the Occupation Certificate, to demonstrate compliance with NABERS Energy 4 star. The Contractor will participate in building tuning exercises at the following times following issue of Certificate of Occupancy: 3-month review, 6-month review, 9-month review, 12-month review. At these times, the Contractor must demonstrate that building performance is meeting NABERS Water 4 Star performance targets.

The Contractor's delivery of the Works in line with this specification will enable the Principal's required ratings to be achieved in future performance assessments.

It is a condition of the defects liability period that the Contractor can demonstrate compliance with the required environmental ratings.

Performance strategies for each NABERS rating have been agreed to by the Principal for this project and are included for reference at the end of this document. During the Contractor's Design & Construct process, there is an opportunity for the Contractor to suggest alternative pathways that contribute the equivalent value to these ratings (i.e. points in Green Star, WELL or resource use reduction for NABERS).

The Contractor must request agreement from the Principal prior to making any changes to these intended pathways allowing for equivalent total points.

1.2 DEFINITIONS & INTERPRETATIONS

Within this specification and the related drawings, the following words will have the meanings described:

- Principal: Canberra Airport Group
- Principal's Representative: Construction Control
- Contractor: Construction Control.
- Subcontractor: any subcontractor engaged in respect of the Works and any supplier of Work.
- Consultant: means all advisors and consultants engaged to provide advice and / or services in connection to the project.
- The Works: the whole of the Work to be carried out and completed in accordance with the Contract, which by the Contract is to be handed over to the Principal.

2. Responsibility of Parties in Contract

The Head Contractor will be aware of the environmental targets set by the contract and its appendices in agreement with the Principal and the project design intent.

From the point of Contract, the Contractor's role includes all elements of design, coordination, construction, commissioning and balancing, hand over and the operation of the building. It is the Contractor's responsibility to actively request relevant documentation from the Subcontractors during the different stages of this process.

The Contractor must collect and compile evidence of achievement of all items within these specifications. The general standard of evidence for any individual item is that required by the Green Star rating tools for documentation of relevant credit achievement. This documentation must be provided to the Principal at key stages of the project to demonstrate progress and pathways to ensuring the environmental performance objectives will be met.

For the duration of the project, should any of the specification requirements be unachievable or should the Contractor wish to change specific aspects of the design, the Contactor must:

- Seek permission from the Principal to make any design changes. Requests for Information should be directed initially to the Principal.
- Provide the Principal with evidence that the proposed design changes are such that the project is still capable of achieving the desired target rating.
- Maintain a current credit and points summary for the project and issue to the Principal every time a change is made in order to demonstrate that the minimum target rating is being maintained.
- In proposing the changes, demonstrate any commercial impact to the project, noting that the Principal is unlikely to accept any additional costs or project risk.

3. Scope of Works

The Works include:

The construction and surrounding landscape of the project located in 06 Brindabella Circuit, ACT.

Construction detail, leading the subcontractors to ensure the project achieves the required minimum performance requirements for the environmental ratings as outlined in this document and the supporting documentation.

Collation and review of subcontractor documentation with regards to the environmental objectives, including a Principal's review of return brief from subcontractors.

4. Minimum Performance Requirements

The Contractor must ensure the Works are carried out to achieve the following:

- A 5 Star Green Star rating under the Green Star Design & As-Built v1.2 tool.
- A WELL Core Gold rating under the WELL Building Standard Pilot v2 tool.
- A 5 Star NABERS Energy rating
- A 4 Star NABERS Water rating

5. Standards

The Contractor is responsible for complying with the guidelines outlined by the project brief.

The full pathways for any of the credit pathways are listed in the below documents:

- Green Star Design & As-Built v1.2 Pathway
- WELL Building Standard Pilot v2 Pathway

The construction work will be completed to assure that the building systems operate and are commissioned in accordance with the design and all relevant building codes and standards, including, but not limited to the Building Code of Australia 2019, CIBSE and ASHRAE.

- The Contractor is to ensure that the final selection and installation of equipment is conducted in a manner that enhances energy efficiency and the ability to achieve this target in operation. All relevant requested part load and operational performance data will be provided to the Principal's Representative for approval prior to final selection should alternative products be proposed.
- The Contractor is responsible for raising, as early as possible, any observed inefficiencies in equipment selection or final detailed design of systems which may adversely affect energy efficiency of the systems.
- The Contractor will conduct pre-commissioning tests prior to commencing commissioning including confirming that static tests are complete, inspecting the whole installation, completing pre-start-up checklists and rectifying outstanding items in accordance with the commissioning requirements within this document.
- The Contractor will co-operate and be involved with the commissioning process and the independent commissioning agent for a 12-month period post practical completion. This requires, at a minimum, quarterly reviews and a final re- commissioning by the Contractor after 12 months of operation, in addition to fulfilling the requirements of Green Star & NABERS for commissioning and building tuning.

- The Contractor is responsible for involvement in the study of operational performance of all systems controlled and monitored by the control systems and to converse with the facilities manager, building manager and ESD Consultant to identify any areas of inefficiency.

6. Sustainability

6.1 OVERVIEW

This section of the ESD specification provides:

- Requirements necessary to maintain the design intent of the building.
- A pathway to enable the project to target the desired future Green Star, WELL and NABERS ratings.
- The Contractor's responsibilities relating to documentation and reviews.
- The Contractor's responsibilities relating to specific specification requirements.

These requirements are based on the Principal's and design team's preferred solution to achieve the environmental outcomes in the most efficient manner. The Contractor may provide comment on alternatives to this pathway for discussion with the Principal, however these alternatives will be subject to the Principal's endorsement. Pricing for any alternative solutions should be provided concurrently to the Principal for review.

6.2 GREEN STAR DESIGN & AS BUILT PATHWAY

The pathway summarising the targeted credits and points total is summarised in Appendix A. To achieve this rating, the Contractor must achieve the equivalent of the number of points designated as the Contractor's responsibility from the appended scorecard, including credits targeted in excess of the required rating to ensure a suitable buffer is maintained.

The Contractor is responsible for the delivery of a 5 (five) star rating. This must be achieved no-more than 24 months following practical completion of the project. The Contractor will be responsible for the development and compilation of all documentation and delivery of that documentation for GBCA's Green Star Design And As-Built v1.2 benchmarking tool. It is the Contractors´ responsibility to draw to the attention of the principal and their representatives at the earliest possible time any reason that might preclude the project achieving the target rating of 5 star.

The Contractor must request agreement from the Principal prior to making any changes to this intended pathway allowing for equivalent total points.

6.3 WELL CORE PATHWAY

The pathway summarising the targeted credits and points total is summarised in Appendix B. To achieve this rating, the Contractor must achieve the equivalent of the number of points designated as the Contractor's responsibility from the appended scorecard, including credits targeted in excess of the required rating to ensure a suitable buffer is maintained.

The Contractor is responsible for the delivery of a Gold rating. This must be achieved no-more than 24 months following practical completion of the project. The Contractor will be responsible for the development and compilation of all documentation and delivery of that documentation for WELL Core Pilot v2 benchmarking tool. It is the Contractors´ responsibility to draw to the attention of the principal and their representatives at the earliest possible time any reason that might preclude the project achieving the target rating of WELL Core Gold.

The Contractor must request agreement from the Principal prior to making any changes to this intended pathway allowing for equivalent total points.

This pathway has some overlap with Green Star Design & As Built Pathway.

6.4 NABERS ENERGY PATHWAY

NABERS Energy is a performance rating and will be enabled through actions overlapping with Green Star pathway, and the Contract Documentation. Where Works documented exceed Green Star, WELL or Principal's requirements, they are detailed in this section.

6.5 NABERS WATER PATHWAY

NABERS Water is a performance rating and will be enabled through actions overlapping with Green Star pathway, and the Contract Documentation. Where Works documented exceed Green Star or WELL, they are detailed in this section.

6.6 KEY CONTRACTOR RESPONSIBILITIES

For the duration of the project, should any of the specification requirements be unachievable or should the Contractor wish to change specific aspects of the design, the Contactor must:

- Seek permission from the Principal to make any design changes. Requests for Information should be directed initially to the Principal.
- Provide the Principal with evidence that the proposed design changes are such that the project is still capable of achieving the desired target rating.
- Maintain a current credit and points summary for the project and issue to the Principal every time a change is made in order to demonstrate that the minimum target rating is being maintained.

- In proposing the changes, demonstrate any commercial impact to the project, noting that the Principal is unlikely to accept any additional costs or project risk.

The following section intends to highlight specific requirements that the Contractor must adhere to.

7. Green Star Design & As Built

7.1 MANAGEMENT

7.1.1 Commissioning and tuning

7.1.1.1 Services and Maintainability Review

The Contractor must demonstrate that a comprehensive services and maintainability review has been conducted, led by the Contractor (or owner's representative or ICA) during design stage and prior to construction.

The services and maintainability review is to facilitate input from the design team, the facilities manager and operations staff (if known) and any relevant suppliers and subcontractors (if engaged).

The review must address the following aspects for all nominated building systems:

- Commissionability
- Controllability
- Maintainability
- Operability, including Fitness for Purpose; and
- Safety

The services and maintainability review and its outcomes must be summarised in a 'Service and Maintainability Report', including agreement and sign off from all involved parties.

7.1.1.2 Commissioning

The Contractor must demonstrate that the pre-commissioning and commissioning activities have been performed, based on the approved standards and guidelines, and in accordance with the following requirements.

The contractual tender or construction documentation must list the commissioning requirements for each system. It is not sufficient to state that systems must be commissioned to the relevant standard. Instead, the documentation must:

- List the design parameters for each system;
- List the required commissioning activities;
- Define how each system is intended to operate; and
- List the acceptable tolerances during commissioning.

Contractual documentation must clearly indicate divisions of responsibilities, pre-commissioning procedures, commissioning requirements, witnessing requirements, phased completion requirements (if needed), post occupancy checks, and any training requirements for the operator.

A commissioning plan shall be developed and must include at least the following:

- The objectives, or basis, of the design;
- The scope of the commissioning plan;
- The commissioning team list, the individual responsibilities and interface matrix;
- The general sequence of commissioning;
- The proposed commissioning procedures;
- The witnessing requirements;
- The commissioning program; and
- The requirements for subcontractor commissioning manuals.

The commissioning must have taken place in accordance with the requirements laid out in the contractual documentation and the commissioning plan. A commissioning report must certify that this is the case, and be signed by the designer, the head or main Contractor, the commissioning manager (or ICA), and the project manager (or owner representative).

The person responsible for commissioning the nominated services must have specific and demonstrable knowledge of the types of systems to be commissioned. A general sub-Contractor is unlikely to be able to fill this role.

Air Permeability Testing

The Contractor must engage a suitably qualified practitioner to undertake air permeability testing over a sample area of the Works, in accordance with an approved standard.

A Suitably qualified practitioner will be a member of the Air Tightness Testing and Measurement Association (ATTMA) or a testing member of the Air Infiltration and Ventilation Association of Australia (AIVAA). All test results will be signed off by both the Contractor and the testing practitioner.

Air permeability testing will be undertaken in accordance with AS/NZS ISO 9972:2015 *Thermal performance of Buildings – Determination of air permeability of buildings – Fan pressurization method.*

Testing will be performed over a sample area, if not the whole building, that consists of an area of 2000m^2, or 20% of the building's total envelope area, whichever is greater. The sample areas tested must include the upper most occupied floor of the building, and be representative of the external envelope construction, including different façade types and building geometries, for the building as a whole. Levels can be tested separately as compartments.

The air permeability rate must not exceed 7m^3/(hr.m^2) at 25Pa.

This ESD specification does not nominate air-tightness innovation points in the Green Star Design & As-Built v1.3 matrix, though the Contractor is encouraged to pursue the following target air permeability rates and associated innovation points:

- $7m^3/(hr.m^2)$ at 50Pa for 1 innovation point
- $3m^3/(hr.m^2)$ at 50Pa for 2 innovation points

7.1.1.3 Systems Tuning

Following practical completion and prior to occupation, a tuning process will be undertaken for all nominated systems. The commitment must include quarterly adjustments and measurement for the first 12 months after occupation and a review of manufacturer and supplier warranties. The scope of the tuning works will determine the relevant tuning period.

The tuning process will require the analysis of data from the monitoring systems and assessment of feedback from occupants on internal conditions. During the tuning period, the owner/client must commit to take steps to adjust nominated systems to account for all identified deficiencies.

The Contractor must confirm that there is a requirement for a tuning process and responsibilities are assigned to have all nominated systems tuned after practical completion. This can be included in the Commissioning Plan or provided as a separate document from the building owner. This must include at least the following:

- Operating and Maintenance Manuals have been developed in accordance with approved standards and guidelines (refer to Guidance).
- A building tuning manual, or a building tuning plan, has been developed in accordance with the approved standards and guidelines.
- A building tuning team has been created including the facilities manager, the owner's representative and the ICA (if applicable). The Contractor and the services design professionals are available to address specific tuning issues where required.
- The owner has engaged parties to tune the nominated systems. This engagement includes requirements for:
- Verification that nominated systems are performing to their design potential at full and part load conditions;
- Reviews of environmental performance against the environmental targets;
- Collection of user feedback to match the system performance with the occupant's needs;
- Adjustment of all the systems to account for all deficiencies discovered; and
- Management communication, and assignment of responsibilities for the tuning process within the team.

7.1.1.4 Comprehensive Tuning Process

The Contractor must undertake a comprehensive building systems tuning process. This will involve the Principal's independent commissioning agent. The comprehensive tuning process must include:

- Periodic audits of the existing systems followed by reporting; and
- An action plan leading to continuous monitoring, system testing, corrective action response, ongoing measurement and appropriate documentation.

The periodic audits of the building systems shall include techniques used to evaluate and identify performance of monitored points and associated systems, including:

- Conflicts between systems;
- Out of sequence operation of system components;
- Energy and water usage profiles;
- Obsolete functional control;
- Errant time scheduling; and
- Opportunity for adaptive control

The action plan leading to continuous monitoring, system testing, corrective action response, ongoing measurement shall include:

- Timeline for correction of operational issues and deficiencies identified, including:
  - Identification of operational errors and recommended training to help ensure errors are not duplicated;
  - Repairs and maintenance needed to retain performance.
- Frequency of tuning, review, and analysis.

Appropriate documentation shall include:

- Update of procedures within 'Operations Manuals' or 'Logbook' to indicate the modifications performed, the revised settings as appropriate, and the reasoning for the modifications from the original system.
- Production of periodical report on the performance of nominated building systems.
- Commissioning procedures.

AIRAH Application Manual DA27 Building Commissioning and DA 28 Building Management Control Systems are specified as a minimum requirement to develop and implement the commissioning, recommissioning, retro-commissioning and comprehensive tuning plans and processes.

7.1.2 Adaptation and Resilience

7.1.2.1 Climate Adaptation Plan

The Contractor must allow for the future adaptation of the building in response to climate adaptation planning undertaken by the design team.

Key items resulting from the review that must be provided in the Contractor's design are:

- Smoke filtration on outdoor air supply. Spatial allowances for additional 'drop in' filtration capable of filtering out bushfire smoke from entering the building via ventilation systems.
- Appropriate inundation planning in accordance with CAG's flooding guidance.
- Waterless heat rejection through ASHP.

7.1.3 User information

7.1.3.1 Operation and Maintenance Information

The Contractor must provide an operations and maintenance (O&M) manual or equivalent operating information defining the requirements and procedures for the effective operation, maintenance and recommissioning of the building. A comprehensive set of operations and maintenance information includes details of the building's construction, commissioning information, maintenance instructions for the operations and maintenance team, and guarantees and warranties.

Based on the information required to effectively manage a building, best practice operations and maintenance manuals should include:

- A summary sheet of relevant building service contacts;
- System-level information for nominated building systems;
- Introduction and scope, including physical and functional descriptions;
- Operating parameters and procedures;
- Preventive maintenance requirements, including procedures and schedules;
- Corrective maintenance requirements, including repair requirements;
- Service contacts, and any warranties and certificates;
- Up-to-date drawings incorporating at least:
    - Mechanical, electrical and hydraulic drawings and schematics covering all associated nominated building systems;
    - Architectural, façade/building envelope drawings; and
    - Architectural layout of the building.

In addition, information aimed at assisting the facilities management team operate the building for optimal sustainability outcomes should be provided (for instance a Strategic Asset Management Guide). This information should include:

- Details on the metering and sub-metering strategy employed by the building, including any instructions for data collection and analysis; and

Triggers for updating operations and maintenance information should also be detailed. This guidance should be aimed at assisting the facilities management team to maintain relevant, up-to-date building information. Triggers for the update of operations and maintenance manuals and/or related operating information should include at least when the following events occur:

- Refurbishment of a building space;
- Recommissioning, retro commissioning, or replacement of nominated building systems;
- Building owner targets or benchmarks change;
- A new operational process is introduced or an existing

7.1.3.2 Log book

The Contractor must develop a building log book to present to the building owner before practical completion of the project.

The building log book must:

- Be developed in line with CIBSE TM31: Building Log Book Toolkit;
- Cover all nominated systems; and
- Include links or references to all relevant operations and maintenance information.

A building log book is an easily accessible central point of information provided for those who are managing a building. It is a living information source that provides a summary of all key building information. It should be a reference point and provide links to all other key information and documentation such as drawings, O&M manuals, BMCS functional information, and warranty documents.

The building log book is a key document for the training of staff involved in operating the building and should be used as a part of inductions for staff or Contractors. It is a dynamic information source that includes, and tracks updates to:

- Descriptions of building systems, including their use and performance;
- Activities for ongoing compliance;
- Recommissioning procedures, and
- Tuning protocols.

For further information refer to CIBSE TM31: Building Log Book Toolkit.

7.1.3.3 Occupant and User Information

The building user is understood to be tenants (a tenant representative or office manager of tenanted space) and occupants (day-to-day users of space), depending on the level of information that is relevant to that audience. The Contractor must provide the following typical information to be provided to building users.

- Description of initiatives designed to enhance energy efficiency and minimise greenhouse gas

emissions, and measures that must be taken by users during day-to-day operation to maximise their effectiveness;
- Description of initiatives intended to enhance and minimise water use and the measures that must be taken by users during day-to-day operation to maximise their effectiveness;
- Description of basic function and operation of any nominated building systems that building users may come in direct contact with including any occupant-activated controls;
- List of relevant contacts for maintenance information, operational issues, complaints or other feedback (e.g. relevant facilities management team contact details and/or online request/feedback form);
- Description of alternative transport initiatives promoted within premises (such as bicycle facilities, end-of-trip facilities, carpooling or car-share), location of a transport plan (if available); and
- Information on how to maximise the efficiency potential offered by building services and nominated building systems.

7.1.4 Responsible Construction Practices

7.1.4.1 Environmental Management Plan

The Contractor must develop and implement a best practice project-specific Environmental Management Plan in line with the *NSW Environmental Management System Guidelines*.

7.1.4.2 Environmental Management System

The Contractor must demonstrate that a formalised systematic and methodical approach to planning, implementing, and auditing is in place during construction, to ensure compliance with the EMP.

The Contractor's Environmental Management System must have been independently certified to a recognised standard, such as AS/NZS ISO 14001, BS 7750 or the European Community's EMAS. The EMS certification held by the Contractor must be currently valid and maintained continuously through throughout the duration of the Works. Evidence of this certification must be provided to the Principal.

Throughout the Works the Contractor is required to appoint and independent auditor to assess compliance against the EMS. The Contractor appointed auditor is required to record and report nonconformities with the EMS where they occur, and the corrective and preventive actions taken to maintain compliance with the EMS. This report must be provided to the Principal and for submission to the GBCA.

7.1.4.3 High Quality Support Staff

The Contractor is required to promote wellbeing onsite, targeting both physical and mental health outcomes.

These outcomes must be in addition to the legal requirements for occupational health and safety (OHS).

At least three distinct issues, with one of those specifically addressing mental health impacts must be addressed. These may include:

- Healthier eating and active living
- Reduced harmful alcohol and drug and tobacco-free living
- Increase social cohesion, community, and cultural participation
- Understanding depression
- Preventing violence and injury
- Suicide prevention
- Decrease psychological distress

The Contractor should carry our a needs analysis of its site workers and subcontactors to determine appropriate actions. The policies and programs must be relevant to all construction workers on site for the whole duration of construction. Established acceptable programs include:

- Beyond Blue
- Mates in Construction
- Lifeline
- Headspace
- White Ribbon
- Nutrition Organisation

The Contractor is required to provide training to site workers on project specific sustainable practices and initiatives. The training must include information on any sustainable building certifications sought; explain the value of the certification; and the role site workers play in delivering a sustainable certified building.

The training must be provided to all Contractors and subcontractors that were present for at least three days on site. Training can be provided through one, or a combination of:

- On-site training, such as inclusion in site-induction.
- Off-site training, such as by providing sustainability training via access to TAFE or similar courses within the last three years.
- Online training, such as by a third-party service providing training on sustainability topics and can track personnel who have taken the relevant materials in the last three years.

7.1.5 Metering and Monitoring

7.1.5.1 Metering

The Contractor must provide accessible metering to all energy and water common uses and major uses, and to energy and water sources provided by the project.

Metering must be provided to allow for monitoring of the relevant areas or functions of the project. In most cases floor-by-floor metering will suffice if the entire floor has a single use. If a floor has multiple uses, the different uses

must be metered. If a floor has multiple tenants or owners, each tenancy or property shall also be separately sub-metered.

Where an energy load for a single item exceeds 5% of the total energy use for the building, or 100kW, it must be independently metered. Smaller supplementary equipment may be grouped on the same meter as the major use item, as long as the combined load of smaller items is cumulatively less than 20kVA. Refer to Metering Schedule in Clause 9.1.1

Grouping of like items for energy metering (e.g. two chillers or two air handling units) is also acceptable, as long as the combined load of these items does not exceed 25% of the total energy use for the building.

Where a common water use consumes 10% of the building's water use, these must be independently metered. Refer to Metering Schedule in Clause 9.2.1

Utility meters must meet metering guidelines under the weights and measures legislation, as outlined under the current National Measurement Regulations. The Contractor must verify if existing meters meet these requirements as well as any other utility meters being installed.

Non-utility meters (including sub-meters) that meter a load greater than 100kVA must follow the same requirements to those described in the most current Validating Non-Utility Meters for NABERS ratings protocol, issued by the NSW Office of Environment and Heritage.

It is a requirement that all meters and metering systems:

- Be commissioned and validated in accordance with the most current 'Validating Non-Utility Meters for NABERS Ratings' protocol. Alternative protocols are acceptable provided they are of similar scope and nature.
- Be capable of producing alerts if any inaccuracies in the meter network are found. Inaccuracies are defined as in excess of meter tolerances. The Monitoring system is to be continual (15mins to 1hr interval readings) and meter accuracy reconciled to appropriate standards, including, but not limited to, NABERS Protocol or National Measurement Institute (NMI) standards.

Meters must be either:

- Connected to the Building Management System (BMS), a web-based interface, or other software interface accessible to the building's facilities managers and/or other relevant operations personnel; or
- Located in an area that allows regular monitoring and maintenance by facilities mangers and other relevant operations personnel.

In addition to Energy Meters installed under clause 9.1.1 and Water Meters installed under clause 9.2.1 the following meters shall be installed at the corresponding locations:

LOCATION / END USE	METER TYPE
INDOOR ENVIRONMENTAL QUALITY	
Occupied zone level	Dry Bulb Temperature (^{O}C)
Occupied zone level	Relative Humidity (%)
Occupied zone or return air grilles (not AHU)	Carbon Dioxide (CO_2 ppm)
Occupied zone or return air grilles	Carbon Monoxide (CO ppm)
Sample floorplate	Daylight (lux)

See section 8.1.5

7.1.5.2 Monitoring Systems

The monitoring information available to facilities management and other relevant operations staff must include:

- The end use that are sub-metered (lighting, HVAC, fans);
- The estimated energy consumption for the end use;
- Identification of which meter(s) provide the required information;
- The individual metered end use consumption; and
- The location and the type of meters.

The Contractor must provide automatic monitoring systems that record both consumption and demand of energy or water, and are capable of producing reports on hourly, daily, monthly, and annual energy use for all meters.

The installed meters must be capable of producing an output that can be transmitted to a central location (either onsite or offsite). This central location must provide data retrieval and reporting mechanisms.
As a minimum, the automatic monitoring system must be capable of:

- Collecting data from all meters;
- Alerting to missing data due to failures;
- Recording energy use and water consumption, and providing a reporting capability at user adjustable intervals;
- Raising an alarm when the energy or water use increase beyond certain parameters and automatically and instantly issue an alert the facilities manager;

- Providing a breakdown of the information by building system (mechanical, electrical, etc.), or by space (or by tenanted floor); and
- Providing the consumption rates of water or energy, the load versus time (load profile), and the power factor (in the case of energy).

7.1.6 Commissioning and tuning

7.1.6.1 Commissioning

The Contractor must demonstrate that the pre-commissioning and commissioning activities have been performed, based on the approved standards and guidelines, and in accordance with the following requirements.

The contractual tender or construction documentation must list the commissioning requirements for each system. It is not sufficient to state that systems must be commissioned to the relevant standard. Instead, the documentation must:

- List the design parameters for each system;
- List the required commissioning activities;
- Define how each system is intended to operate; and
- List the acceptable tolerances during commissioning.

Contractual documentation must clearly indicate divisions of responsibilities, pre-commissioning procedures, commissioning requirements, witnessing requirements, phased completion requirements (if needed), post occupancy checks, and any training requirements for the operator.

A commissioning plan shall be developed and must include at least the following:

- The objectives, or basis, of the design;
- The scope of the commissioning plan;
- The commissioning team list, the individual responsibilities and interface matrix;
- The general sequence of commissioning;
- The proposed commissioning procedures;
- The witnessing requirements;
- The commissioning program; and
- The requirements for subcontractor commissioning manuals.

The commissioning must have taken place in accordance with the requirements laid out in the contractual documentation and the commissioning plan. A commissioning report must certify that this is the case, and be signed by the designer, the head or main Contractor, the commissioning manager (or ICA), and the project manager (or owner representative).

The person responsible for commissioning the nominated services must have specific and demonstrable knowledge of the types of systems to be commissioned. A general sub-Contractor is unlikely to be able to fill this role.

7.1.6.2 Systems Tuning

Following practical completion and prior to occupation, a tuning process will be undertaken for all nominated systems. The commitment must include quarterly adjustments and measurement for the first 12 months after occupation and a review of manufacturer and supplier warranties. The scope of the tuning works will determine the relevant tuning period.

The tuning process will require the analysis of data from the monitoring systems and assessment of feedback from occupants on internal conditions. During the tuning period, the owner/client must commit to take steps to adjust nominated systems to account for all identified deficiencies.

The Contractor must confirm that there is a requirement for a tuning process and responsibilities are assigned to have all nominated systems tuned after practical completion. This can be included in the Commissioning Plan or provided as a separate document from the building owner. This must include at least the following:

- Operating and Maintenance Manuals have been developed in accordance with approved standards and guidelines (refer to Guidance).
- A fitout tuning manual, or a fitout tuning plan, has been developed in accordance with the approved standards and guidelines.
- A fitout tuning team has been created including the facilities manager, the owner's representative and the ICA (if applicable). The Contractor and the services design professionals are available to address specific tuning issues where required.
- The owner has engaged parties to tune the nominated systems. This engagement includes requirements for:
- Verification that nominated systems are performing to their design potential at full and part load conditions;
- Reviews of environmental performance against the environmental targets;
- Collection of user feedback to match the system performance with the occupant's needs;
- Adjustment of all the systems to account for all deficiencies discovered; and
- Management communication, and assignment of responsibilities for the tuning process within the team.

7.1.6.3 Comprehensive Tuning Process

The Contractor must undertake a comprehensive building systems tuning process. This will involve the Principal's independent commissioning agent. The comprehensive tuning process must include:

- Periodic audits of the existing systems followed by reporting; and

- An action plan leading to continuous monitoring, system testing, corrective action response, ongoing measurement and appropriate documentation.

The periodic audits of the building systems shall include techniques used to evaluate and identify performance of monitored points and associated systems, including:

- Conflicts between systems;
- Out of sequence operation of system components;
- Energy and water usage profiles;
- Obsolete functional control;
- Errant time scheduling; and
- Opportunity for adaptive control

The action plan leading to continuous monitoring, system testing, corrective action response, ongoing measurement shall include:

- Timeline for correction of operational issues and deficiencies identified, including:
  - Identification of operational errors and recommended training to help ensure errors are not duplicated;
  - Repairs and maintenance needed to retain performance.
- Frequency of tuning, review, and analysis.

Appropriate documentation shall include:

- Update of procedures within 'Operations Manuals' or 'Logbook' to indicate the modifications performed, the revised settings as appropriate, and the reasoning for the modifications from the original system.
- Production of periodical report on the performance of nominated building systems.
- Commissioning procedures.

AIRAH Application Manual DA27 Building Commissioning and DA 28 Building Management Control Systems are specified as a minimum requirement to develop and implement the commissioning, recommissioning, retro-commissioning and comprehensive tuning plans and processes.

7.1.7 User information

7.1.7.1 Operation and Maintenance Information

The Contractor must provide an operations and maintenance (O&M) manual or equivalent operating information defining the requirements and procedures for the effective operation, maintenance and recommissioning of the building. A comprehensive set of operations and maintenance information includes details of the building's construction, commissioning information, maintenance instructions for the operations and maintenance team, and guarantees and warranties.

Based on the information required to effectively manage a building, best practice operations and maintenance manuals should include:

- A summary sheet of relevant building service contacts;
- System-level information for nominated building systems;
- Introduction and scope, including physical and functional descriptions;
- Operating parameters and procedures;
- Preventive maintenance requirements, including procedures and schedules;
- Corrective maintenance requirements, including repair requirements;
- Service contacts, and any warranties and certificates;
- Up-to-date drawings incorporating at least:
  - Mechanical, electrical and hydraulic drawings and schematics covering all associated nominated building systems;
  - Architectural, façade/building envelope drawings; and
  - Architectural layout of the building.

In addition, information aimed at assisting the facilities management team operate the building for optimal sustainability outcomes should be provided (for instance a Strategic Asset Management Guide). This information should include:

- Details on the metering and sub-metering strategy employed by the building, including any instructions for data collection and analysis; and

Triggers for updating operations and maintenance information should also be detailed. This guidance should be aimed at assisting the facilities management team to maintain relevant, up-to-date building information. Triggers for the update of operations and maintenance manuals and/or related operating information should include at least when the following events occur:

- Refurbishment of a building space;
- Recommissioning, retro commissioning, or replacement of nominated building systems;
- Building owner targets or benchmarks change;
- A new operational process is introduced or an existing

7.1.7.2 Log book

The Contractor must develop a fitout log book to present to the fitout owner before practical completion of the project.

The fitout log book must:

- Be developed in line with CIBSE TM31: Building Log Book Toolkit;
- Cover all nominated systems; and

- Include links or references to all relevant operations and maintenance information.

A fitout log book is an easily accessible central point of information provided for those who are managing a fitout. It is a living information source that provides a summary of all key fitout information. It should be a reference point and provide links to all other key information and documentation such as drawings, O&M manuals, BMCS functional information, and warranty documents.

The fitout log book is a key document for the training of staff involved in operating a fitout and should be used as a part of inductions for staff or Contractors. It is a dynamic information source that includes, and tracks updates to:

- Descriptions of building systems, including their use and performance;
- Activities for ongoing compliance;
- Recommissioning procedures, and
- Tuning protocols.

For further information refer to CIBSE TM31: Building Log Book Toolkit.

7.1.7.3 Occupant and User Information

The building user is understood to be tenants (a tenant representative or office manager of tenanted space) and occupants (day-to-day users of space), depending on the level of information that is relevant to that audience. The Contractor must provide the following typical information to be provided to building users.

- Description of initiatives designed to enhance energy efficiency and minimise greenhouse gas emissions, and measures that must be taken by users during day-to-day operation to maximise their effectiveness;
- Description of initiatives intended to enhance and minimise water use and the measures that must be taken by users during day-to-day operation to maximise their effectiveness;
- Description of basic function and operation of any nominated building systems that building users may come in direct contact with including any occupant-activated controls;
- List of relevant contacts for maintenance information, operational issues, complaints or other feedback (e.g. relevant facilities management team contact details and/or online request/feedback form);
- Description of alternative transport initiatives promoted within premises (such as bicycle facilities, end-of-trip facilities, carpooling or car-share), location of a transport plan (if available); and
- Information on how to maximise the efficiency potential offered by building services and nominated building systems.

7.1.8 Operational Waste

The Contractor must demonstrate that a dedicated area for the storage and collection of applicable waste streams is provided. The storage area must be sized to accommodate all bins or containers, for all applicable waste streams, for at least one collection cycle. The calculations used to demonstrate that the area provided is adequately sized to handle the recyclable waste streams specified must be based on:

- Assumed waste generation by the building; and
- Collection frequency for each waste stream.

7.2 INDOOR ENVIRONMENT QUALITY

7.2.1 Indoor Air Quality

7.2.1.1 Ventilation System Attributes

Entry of Outdoor Pollutants

The entry of outdoor air pollutants to the space must be minimised. The fitout ventilation systems must be designed to comply with ASHRAE Standard 62.1:2013 in regard to minimum separation distances between pollution sources and outdoor air intakes. Windows, doors, openings, vents, grilles, and skylights are all considered outdoor air intakes for purposes of this credit and must be modelled taking into account their free area.

Compliance is to be demonstrated in accordance with the distances specified in Table 5.5.1 of the Standard, however projects must also ensure compliance with any other related requirement or guidance nominated within the Standard. Analytical solutions are also acceptable by following the guidance provided within Appendix F of ASHRAE Standard 62.1:2013.

Design for Ease of Maintenance and Cleaning

Any mechanical ventilation system within the fitout, whether existing or new, must be designed to provide adequate access for maintenance, to both sides of all moisture-producing and debris-catching components, within the air distribution system. Moisture-producing and debris-catching components include items such as cooling coils, heating coils, humidifiers and filters in the air handling system.

Cleaning Prior to Use and Occupation

All new and existing ductwork that serves the fitout must have been cleaned in accordance with recognised Standards, see the Guidance section. This includes all ductwork in the building that serves the fitout from the outdoor air intake, to the air handling unit, to the supply vents. If no ductwork exists, these requirements are deemed to be met.

Where construction management processes are in place to ensure that all new ductwork, or ductwork that has been recently cleaned, remains free of moisture and debris until occupation, this ductwork can be considered to be clean. All other ductwork (existing and new) including plenums, filters and fan chambers must be cleaned in accordance with a recognised Standard.

7.2.1.2 Provision of Outdoor air

Outdoor air is able to be provided at a rate of 100% greater than the minimum required by AS 1668.2:2012 as per 9.2A. Demand Control Ventilation systems will be controlled by a CO2 sensor that ensures a maximum CO2 concentration of 700ppm is not exceeded during operational hours.

7.2.1.3 Exhaust or elimination of pollutants

The Contractor must demonstrate that specified sources of pollutants, such as printing or photocopy equipment, kitchen stoves or vehicles, will be exhausted directly to the outside of the project in accordance with a recognised standard.

All print and photocopy equipment must be located in an enclosed print/photocopy area that is exhausted directly to the outside, or to a dedicated exhaust riser. Each print/photocopy room must achieve a minimum exhaust ventilation flow rate in accordance with AS 1668.2-2012 (Table B1). The exhaust facility must be a dedicated exhaust facility and exhausted air shall not be recycled to other enclosures, or to the return air duct of the ventilation system.

All kitchens must be ventilated in accordance with AS 1668.2:2012. A separate exhaust system must be provided for the kitchen exhaust. The kitchen must be physically separated from the adjacent spaces or have an opening no larger than an area of 2.5m2.

A 'kitchen' is defined as a space that includes cooking equipment such as stove tops or ovens, please see the Definitions section. Kitchenettes or tea points with basic tea/coffee making or simple reheat equipment are not included. Cooking equipment employed for the preparation of food which has a power input less than 0.5kW/m2 may be excluded.

All pollutants from vehicles in an enclosed space must be exhausted to a dedicated exhaust riser or directly to the outside, in accordance with section 4 of AS 1668.2-2012. This exhaust system must not recycle air to other enclosures.

This requirement is applicable where a combustion engine-based vehicle (of all types) is parked or otherwise operated in an enclosed area which is within the project area.

7.2.2 Acoustic Comfort

7.2.2.1 Internal Noise Levels

The Contractor must demonstrate that internal ambient noise levels in are no more than 5dB(A) above the lower figure in the range recommended in Table 1 of AS/NZS 2107:2016.

Noise measurement and documentation must be provided by a qualified acoustic consultant and in accordance with AS/NZS 2107:2016. Noise measurement must account for all internal and external noise including noise arising from building services equipment, noise emission from outdoor sources and noise from industrial processes. Occupancy noise is excluded.

Compliance must be demonstrated through measurement, and measurements shall be conducted in at least 10% of the building spaces, and these spaces shall be representative of spaces most exposed to internal and external noise sources.

7.2.2.2 Reverberation

The Contractor must demonstrate that the reverberation time in the nominated area is below the maximum stated in the 'Recommended Reverberation Time' provided in Table 1 of AS/NZ 2107:2016. Reverberation refers to the persistent prolonged reflections of sound in a space. A technical definition is provided in AS/NZS 2107:2016.

Where note 3 of Table 1 AS/NZ 2107:2016 applies and requires that reverberation times be minimised as far as practical, acoustic absorption should be installed in the noise sensitive space. Acoustic absorption should be applied in locations appropriate to the function of the space and located to maximise the acoustic performance of materials selected.

The resulting performance of the installed acoustic absorption, irrespective of quantity or location installed, must result in a reverberation time equivalent to or lower than the reverberation time predicted for treating at least 50% of the combined floor and ceiling area with a material having a noise reduction coefficient (NRC) of at least 0.5.

Alternatively, compliance may be demonstrated by treating 50% of the combined floor and ceiling area with a material having an NRC of at least 0.5.

Compliance shall be demonstrated through measurement, and the measurements shall be conducted in at least 10% of the spaces in the nominated area.

The range of measurement locations shall be representative of all spaces available within the nominated area. All relevant buildings systems must be in operation at the time of measurement.

7.2.3 Lighting Comfort

7.2.3.1 Lighting Fixture Performance

All lights

- Are flicker-free;
- Accurately address the perception of colour; and
- Eliminate glare from bare lamps.

All lighting must be flicker-free by being comprised of luminaires that have either:

- A minimum Class A2 ballast; or
- High frequency ballasts for all fluorescent lamps; or
- Electronic ballasts for all High Intensity Discharge (HID) lighting; or
- Electronic drivers that feature 12-bit or greater resolution for all Light-emitting Diode (LED) lighting.

All lamps must have a minimum Colour Rendering Index (CRI) of 80, unless it can be demonstrated that the activity is not impeded by a lower CRI. This can be demonstrated by ensuring selection complies with the guidance provided in Table 7.2 in AS 1680.1:2006.

Glare from lamps must be eliminated from designated work areas within the regularly occupied primary spaces. To achieve this all bare lamps directing light onto task areas must have been fitted with baffles, louvers, translucent diffusers, or other means that obscures the lamps from direct view, under typical operating conditions. Additional requirements on Clause 8.4.4

7.2.3.2 General Illuminance

The appropriate lighting levels for each task within each space is defined as lighting with an illuminance level meeting the recommended minimum illuminance of the AS/NZS 1680 standard listed in the table below. The illuminance levels will be tested after completion.

TYPE OF TASK/ACTIVITY	GUIDANCE
Industrial tasks and processes	Table E1 of AS/NZS 1680.2.4
Circulation and other general areas	Table D1 of AS/NZS 1680.2.1
Healthcare spaces	Table F1 of AS/NZS 1680.2.5
Office spaces	Table 3.1 of AS/NZS 1680.2
Other activities	Table 3.1 of AS/NZS 1680.1

7.2.3.3 Glare Reduction from electric lighting

The Contractor must demonstrate that the Unified Glare Rating (UGR) calculated for the lighting on a representative floor must not exceed the maximum values listed in Table 8.2 of AS/NZS 1680.1-2006. The UGR rating must be calculated in accordance with the procedure outlined in Clause 8.3.3 of AS/NZS 1680.1-2006.

7.2.3.4 Localised Lighting Control

The Contractor must demonstrate that for 95% of the nominated area, occupants have the ability to control the lighting in their immediate environment. This includes turning the lights on and off and adjusting their light levels.

One light can be controlled by one or more individuals.

It is essential for the Contractor to identify what the 'immediate environment' is. For example, in an open-plan office the immediate environment is the light shone on the workstation.

In the case of an integrated fitout incorporating an activity-based working environment, the occupant adjustment of light levels criterion may be achieved where it is demonstrated that a wide variety of working environments provide a variety of lighting conditions, including some with the ability to adjust lighting levels, which are suitable for the activity undertaken in the space. A system is still required throughout the nominated area to turn lights on/off.

7.2.4 Visual Comfort

7.2.4.1 Glare Reduction

The Contractor must demonstrate that glare from sunlight through all viewing façades and skylights in the nominated area is reduced through a combination of blinds, screens, fixed devices, or other means.

All blinds or screens in the nominated area must meet the following criteria:

- The blinds must provide glare reduction to at least 95% of the area of viewing façade and skylights;
- Blinds must be controlled by all affected occupants within each individual space; and
- Blinds must have a visual light transmittance (vlt) of ≤ 10%.

Manual or automated internal, in-glazing, or external blinds can be used.

Where automated blinds are used, they must be controlled either by a management system or by a manually-activated switch. If blinds and screens are

automatically controlled, they must also be equipped with a manual override function accessible by occupants in each of the adjacent spaces served.

7.2.5 Indoor Pollutants

7.2.5.1 Paints, Adhesives, Sealants and Carpets

The Contractor must demonstrate that either:

- No paints, adhesives, sealants or carpets are used in the nominated spaces;

OR

- At least 95% of all internally applied paints, adhesives, sealants (by volume) or carpets (by area) meet the total VOC limits specified in the tables below.

This requirement is applicable to all internal applications of all types of paints, adhesives or sealants applied on-site, including both exposed and concealed applications.

If exterior grade products are used in an internal application, then these must also meet the requirements.

The following items are excluded from this:

- Glazing film, tapes, and plumbing pipe cements;
- Products used in car parks;
- Paints, adhesives and sealants used off-site, for example applied to furniture items in a manufacturing site and later installed in the fitout; and
- Adhesives and mastics used for temporary formwork and other temporary installations.

Total VOC (TVOC) values must reflect the final ready to use product, inclusive of tints (in the case of paints) and made in grams of VOC per litre (g/L) of ready to use product.

The products can be certified under a recognised Product Certification Scheme. The current list of recognised schemes is shown on the GBCA website: http://new.gbca.org.au/product-certification-schemes/. The certificate must be current and list the relevant product name and model.

TVOC limits for paints, adhesives or sealants are detailed in the table below. Most adhesives and sealants are addressed in the 'General purpose adhesives and sealants' category of the table, unless they clearly belong in the other specialised product categories.

PRODUCT CATEGORY	MAX TVOC CONTENT IN GRAMS PER LITRE (G/L) OF READY TO USE PRODUCT
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes and wood stains	75
Primers, sealers and prep coats	65
One and two pack performance coatings for floors	140
Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250
Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100

Carpet can be certified under a recognised Product Certification Scheme (listed on the GBCA website http://new.gbca.org.au/product-certification-schemes/) or other recognised standards. The certificate must be current and list the relevant product name and model.

Carpet complies with the Total VOC (TVOC) limits for a selected compliance option, specified in the Table below.

CARPET COMPLIANCE OPTION	TEST PROTOCOL	LIMIT
ASTM D5116	ASTM D5116 - Total VOC limit*	0.5mg/m^2 per hour
	ASTM D5116 - 4-PC (4-Phenylcyclohexene)*	0.05mg/m^2 per hour
ISO 16000 / EN 13419	ISO 16000 / EN 13419 - TVOC at three days	0.5mg/m^2 per hour
ISO 10580 / ISO/TC 219 (Document N238)	ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours	0.5mg/m^2 per hour

*Both limits should be met when testing against ASTM D5116

Additional requirements set on Clause 8.8.3

7.2.5.2 Engineered Wood Products

The Contractor must demonstrate that either no new engineered wood products are used in the building, or at

least 95% (by area) of all engineered wood products meet the formaldehyde emission limits specified in the table below.

Engineered wood products include particleboard, plywood, Medium Density Fibreboard (MDF), Laminated Veneer Lumber (LVL), High-Pressure Laminate (HPL), Compact Laminate and decorative overlaid wood panels. Timber veneers are excluded. Where only part of a product is composed of an engineered wood product, the limits apply only to that portion of the product, not the entire item.

The following applications of engineered wood products are excluded:

- Formwork;
- Car park applications; and
- Non-engineered wood products such as milled timber.

The products can be certified under a recognised Product Certification Scheme. The current list of recognised schemes is shown on the GBCA website http://new.gbca.org.au/product-certification-schemes/. The certificate must be current and list the relevant product name and model.

All engineered wood products used in the building must meet the relevant limits specified in the table below as per the specified test protocol or have product specific evidence that it contains no formaldehyde.

TEST PROTOCOL	EMISSION LIMIT/ UNIT OF MEASUREMENT
AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	≤1mg/ L
AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1.5 mg/L
AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1mg/ L
AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)	≤1mg/ L
Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL	≤1mg/ L
JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr*
ASTM D5116 (applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr
ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to	≤0.1 mg/m²hr (at 3 days)

high pressure laminates and compact laminates	
ASTM D6007	≤0.12mg/m³**
ASTM E1333	≤0.12mg/m³***
EN 717-1 (also known as DIN EN 717-1)	≤0.12mg/m³
EN 717-2 (also known as DIN EN 717-2)	≤3.5mg/m²hr

*mg/m²hr may also be represented as mg/m²/hr.

**The test report must confirm that the conditions of Table 3 comply for the particular wood product type, the final results must be presented in EN 717-1 equivalent (as presented in the table) using the correlation ratio of 0.98.

***The final results must be presented in EN 717-1 equivalent (as presented in the table), using the correlation ratio of 0.98.

7.2.6 Thermal Comfort

7.2.6.1 Mechanical Performance for Advanced Thermal Comfort

The Contractor is required to engage a suitably qualified professional to undertake a thermal simulation of the final building envelope and systems, separate from the NABERS forecasting simulation. This simulation is to conform to the zoning requirements set out under the 14.1.2.B Thermal Modelling Requirements in the Green Star Design & As-Built v1.2 Submission Guidelines.

The simulations is to demonstrate that the Predicted Mean Vote (PMV) levels throughout regularly occupied areas (those defined as Primary or Secondary within Green Star Design & As-Built v1.2) are between -0.5 and +0.5 in accordance with either ISO 7730-2005 or ASHRAE Standard 55-2013.

7.3 ENERGY

7.3.1 Greenhouse Gas Emissions

7.3.1.1 NABERS Energy Commitment Agreement Pathway

The Contractor is required to achieve 6.6 points under the NABERS Energy Commitment Agreement Pathway. This is equivalent to a 55% reduction in greenhouse gas emissions compared to a NABERS Energy 5 Star baseline. The 55% reduction may be met through any combination of building envelope performance, building systems efficiency, lighting and equipment energy efficiency, and onsite renewable energy generation and onsite electrical energy storage.

The Contractor is required to meet the performance specifications set in the NABERS Energy Modelling Tabular Excerpt v00 appended to this ESD Performance Specification.

Where the final design differs from that modelled in the above report, updated calculations in line with the Handbook for estimating NABERS ratings are required to be undertaken by the Contractor. Refer to Section 9.1 for the detailed specifications of NABERS protocols.

Offsite renewable energy or 'Greenpower' purchase agreements that extend into the operational life of the building are not within the Contractor's remit and may not be used to meet the 11 point requirement.

.

7.3.1.2 Peak Electricity Demand Reduction

The Contractor is required to engage a suitably qualified professional to simulate the final design against an NCC 2019 compliant reference building. The final design is to achieve a 30% reduction in peak electrical energy demand compared to the reference building. The peak demand may be reduced through any of the following:

- Envelope performance
- Mechanical systems efficiency
- Lighting and equipment efficiencies
- Onsite generation of electricity.

7.4 TRANSPORT

7.4.1 Sustainable Transport

7.4.1.1 Low Emissions Vehicle Infrastructure

Minimum of 2no or 5% of total car parking spaces (whichever is greater) is to be dedicated to electric vehicles and charging infrastructure is provided for each space in accordance with the following:

- Must be easily accessed by the users of dedicated electric vehicle spaces
- Must comply with all relevant Standards and health and safety legislation

OR

15% of total car parking spaces are dedicated to fuel efficient vehicles such as hybrids. Fuel efficient vehicles are defined as those having 5L/100km or

115gCO2/100km or better. A maximum of 5% of the 15% can be dedicated to motorcycles.

7.4.1.2 Active Transport Facilities

The Contractor must demonstrate that bicycle parking and associated facilities are provided to a proportion of the building's regular occupants. The specific proportion that must be met for regular occupants is outlined in the table below.

BUILDING TYPE	CYCLE FACILITIES FOR REGULAR OCCUPANTS
Class 3 to 9: Office, Retail Centre, Industrial and Healthcare	Secure bicycle parking for regular occupants is provided for 7.5% of total regular occupants; with associated end-of-trip facilities.

Facilities can be provided within the building's boundary, or outside. If the facilities are outside the site boundary, they must be under the control of the building owner and be accessible to all building occupants and visitors (depending on the users being served by those facilities).

Secure bicycle parking is defined as that which is in accordance with AS 2890.3.

End-of-trip facilities are defined as showers, changing amenities with appropriate drying space, and lockers. The number of end-of-trip facilities that must be provided is specified in the table below.

NUMBER OF REGULAR OCCUPANTS	SHOWERS	LOCKERS
0 – 12	1 (unisex)	1.2 per 1 bicycle space
13 – 49	2	1.2 per 1 bicycle space
50 – 149	4	1.2 per 1 bicycle space
150 - 299	6	1.2 per 1 bicycle space
300 – 500	8	1.2 per 1 bicycle space
Greater than 500	Additional 2 per extra 250 occupants	1.2 per 1 bicycle space

The design of the end-of trip facilities must be appropriate to encourage their use over that of private vehicle use.

The Contractor must demonstrate that bicycle parking is provided to a proportion of the building's regular visitors. The specific proportion that must be met for regular occupants is outlined in the table below.

BUILDING TYPE	CYCLE FACILITIES FOR VISITORS
All other building Classes	Secure bicycle parking is provided for 5% of peak visitors.

7.5 WATER

7.5.1 Potable Water

7.5.1.1 WELS Ratings

The Contractor must demonstrate that all fixtures are within one star of the WELS rating stated below:

FIXTURE / EQUIPMENT TYPE	WELS RATING
Taps	6 Star
Urinals	6 Star
Toilet	5 Star
Showers	3 Star (>4.5 but <= 6.0) **
Clothes Washing Machines	5 Star
Dishwashers	6 Star

** The 3-star (>4.5 but <=6.0) requirement relates to Range F which is specified for both High Pressure and Low Pressure Showers as per Table 3.1 and Table 3.2 respectively of the AS NZS 6400-2016 Water Efficient Products standard. For showers, within one star of this Category F WELS rating means showers must be either 3 star (6.0 but <=7.5), 3 Star (> 4.5 but <= 6.0), 4 Star (>6.0 but <=7.5) or 4 Star (> 4.5 but <= 6.0).

7.5.1.2 Landscape Irrigation

The Contractor must demonstrate that either drip irrigation with moisture sensor override is installed, or that no potable water is used for irrigation.

7.5.1.3 Fire Protection System Testing Water

The Contractor must demonstrate that no more than 20% of the potable water used in fire system testing is expelled to sewer during the testing and maintenance of fire protection systems, i.e. less than 20% of test water is expelled, or 80% of expelled test water is reused. This provision applies to all regulatory fire hydrant and sprinkler test water.

7.6 MATERIALS

7.6.1 Life Cycle Assessment

7.6.1.1 Concrete

The Contractor must demonstrate that cement replacement products are used in over 50% of project's the concrete mixes by volume.

7.6.2 Responsible Building Materials

7.6.2.1 Structural and Reinforcing Steel

The Contractor must demonstrate that at least 95% of the building's steel (by mass) is sourced from a Responsible Steel Maker; and

a. For concrete framed buildings, at least 60% (by mass) of all reinforcing bar and mesh is produced using energy-reducing processes in its manufacture (measured by average mass by steel maker annually); or

b. For steel framed buildings, at least 60% of the fabricated structural steelwork is supplied by a steel fabricator/steel Contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute (ASI)

7.6.2.2 Timber

The Contractor must demonstrate that at least 95% (by cost) of all timber used in the building and construction works, including formwork, is either:

a. Certified by a forest certification scheme that meets the GBCA's 'Essential' criteria for forest certification (like FSC); or

b. Is from a reused source.

7.6.2.3 Permanent Formwork, pipes, flooring, cables, and blinds

The Contractor must demonstrate that at least 90% (by cost) of all permanent formwork, pipes, flooring, blinds and cables in the project either:

- Do not contain PVC and have a recognised product declaration; or
- Meet the GBCA's Best Practice Guidelines for PVC.

Products that do not contain PVC, the Contractor must demonstrate that PVC products used in the project do not contain PVC by providing either a:

- Safety data sheet (SDS) or equivalent, that describes the composition of the products; or
- Environmental Product Declaration (EPD) for the product. Compliance may be demonstrated with an industry-wide EPD.

Products that meet the GBCA's Best Practice Guidelines for PVC, the Contractor must demonstrate that PVC products used in the project do not contain PVC by providing either a:

- A valid audit verification certificate for each of the PVC blinds specified or used in the project. The certificate must clearly state the product name, compliance against the GBCA's Best Practice Guidelines for PVC, date of validity, auditor's name, and signature. The auditor must be JAS-ANZ accredited.

A product accreditation certificate from a Green Building Council of Australia accredited scheme. The scheme must clearly reference the guidelines in their standard.

7.6.3 Construction and Demolition Waste

7.6.3.1 Percentage Benchmark

The Contractor must demonstrate that the construction and demolition waste diverted from landfill meets a percentage benchmark of 90% by mass. Waste shall be reported in Kilograms.

Any number of initiatives can be used to achieve compliance, such as reusing or recycling construction waste, and implementing construction waste avoidance measures like incorporating design solutions that make use of modular and prefabricated installations.

7.7 LAND USE & ECOLOGY

7.7.1 Heat Island Effect

The Contractor is to demonstrate that greater than 75% of the site area viewed from the roof plan comprises elements that reduce the impact of the heat island effect. Surfaces that contribute to the 75% requirement include:

- Vegetation
- Green roofs
- Roofing materials, including shading structures, for;
  - Flat roofs < 15deg a three year SRI of minimum 64, or initial SRI of minimum 82
  - Pitched roofs > 15deg a three year SRI of minimum 34, or initial SRI of minimum 39
- Unshaded hardscape a three year SRI of minimum 34 or an initial SRI of minimum 39
- Hardscape shaded by overhead vegetation or solar panels
- Water bodies, water courses
- Areas directly to the south of building elements that are shaded during the summer solstice

7.8 EMISSIONS

7.8.1 Light Pollution

7.8.1.1 Light pollution to neighbouring bodies

The impact of light pollution from all external lighting sources in operation must be eliminated as far as possible using the guidelines of AS 4282:1997 *Control of the obtrusive effects of outdoor lighting*.

For Class 5 office uses, the conditions of the AS 4282:1997 Table 2.1 Column 3.C must be applied to all site boundaries of adjoining properties. Site boundaries adjoining roads are excluded from these requirements.

7.8.1.2 Light Pollution to Night Sky

This covers all external lighting of a project. In addition to other types of external lighting, luminaries in the following locations are considered to be external:

- Glazed atria; and
- On the uppermost uncovered deck of an outdoor carpark.

The following may be excluded:

- Signage related to emergency exits;
- Emergency lighting that only illuminated in the event of an emergency/power failure; and
- Lighting for public roads and other public thoroughfares.

The Contractor must demonstrate that direct illuminance from external lighting in operation produces a maximum initial point illuminance value no greater than:

- 0.5 Lux to the site boundary; and
- 0.1 Lux to 4.5 metres beyond the site into the night sky, when measured using a calculation plane set at the highest point of the building.

Calculations shall be in accordance with AS 4282:1997. The calculation plane must cover the area between the site boundary and building façade or vertical service to be illuminated. The horizontal calculation plane shall be set at the top of the building fabric, excluding spires. Calculation plane grid points shall have a 0.5m spacing. All illumination results shall be reported to within 2 decimal places.

7.8.2 Microbial Control

7.8.2.1 Microbial Control

Waterless heat rejection systems are to be used to eliminate the risk of legionella.

Additional measures to be found on Clause 8.2.2.

7.9 INNOVATION

7.9.1 Innovative Technology or Process

7.9.1.1 Onsite Renewable Energy

The Contractor must install renewable energy sources on site to power at least 10% of the building energy.

7.9.2 Improving on Green Star Benchmarks

7.9.2.1 Ultra-low VOCs

Ultra-low VOC paints are to be used for over 50% of paint products (by volume) in the Works. Ultra-low VOC paints are defined as having a maximum TVOC content of 5g/L.

The TVOC level must be verified by an approved paint test method as listed in part **Error! Reference source not found.** of this specification.

7.9.3 Innovation Challenge

7.9.3.1 Financial Transparency

The Contractor, in cooperation with the Principal, must disclose all material, consulting, and certification costs of the project to the GBCA. A template is provided by the GBCA that must be completed, highlighting any additional costs incurred by pursuing a Green Star rating, compared to costs if the project were not pursuing a Green Star rating.

The Contractor is required to contribute written narratives to the submission template, including comments on any benefits to the project team, and any difficulties faced by the project team encountered during pursuit of Green Star rating.

7.9.4 Global Sustainability

7.9.4.1 WELL – W04.1 Enhanced Water Quality

The Contractor will install water filtration media to water delivered to the project for human consumption in order to meet the following thresholds:

a) Aluminum less than or equal to 0.2 mg/L.

b) Chloride less than 250 mg/L.

c) Fluoride less than 2 mg/L.

d) Manganese less than 0.05 mg/L.

e) Sodium less than 270 mg/L.

f) Sulfate less than 250 mg/L.

g) Iron less than 0.3 mg/L.

h) Zinc less than 5 mg/L.

i) Total dissolved solids less than 500mg/L

7.9.4.2 WELL – W08.1 Handwashing: Provide Adequate Sink

The Contractor will install bathroom and kitchen sinks that meet the following requirements:

a) The sink column of water is at least 25 cm [10 in] in length (measured along flow of water, even if at an angle).

b) The sink column of water is at least 8 cm [3 in] away from any edge of the sink.

The sink basin is at least 23 cm [9 in] in width and length.

8. WELL Core

8.1 AIR

The Contractor must demonstrate that the quality of air in the project under occupied conditions comply with this section. In case it does not, the contractor must take adequate measures to ensure compliance.

8.1.1 Air Quality

8.1.1.1 Meet thresholds for Particulate matter

The Contractor must demonstrate all spaces comply with the thresholds specified in the table below:

PARTICULATE MATTER THRESHOLDS	SPACES
PM2.5 < 12 µg/m³.	All spaces except commercial kitchens
PM10 < 30 µg/m³.	
PM2.5 < 35 µg/m³	Commercial kitchens

8.1.1.2 Meet thresholds for Organic Gases

The Contractor must demonstrate all non-leased spaces of the building comply with the thresholds specified in the table below:

COMPOUND NAME	CAS NO.	ALLOWABLE CONCENTRATION (MG/M3)
Formaldehyde		27 ppb
Benzene	71-43-2	30
Carbon disulfide	75-15-0	400
Carbon tetrachloride	56-23-5	20
Chlorobenzene	108-90-7	500
Chloroform	67-66-3	150
Dichlorobenzene (1,4-)	106-46-7	400
Dichloroethylene (1,1)	75-35-4	35
Ethylbenzene	100-41-4	1000
Hexane (n-)	110-54-3	3500
Isopropyl alcohol	67-63-0	3500
Methyl chloroform	71-55-6	500
Methylene chloride	75-09-2	200

Methyl tert-butyl ether	1634-04-4	4000
Styrene	100-42-5	450
Tetrachloroethene	127-18-4	17.5
Toluene	108-88-3	150
Trichloroethylene	79-01-6	300
Vinyl acetate	108-05-4	100
Xylene (m, o, p combined)	108-38-3 + 95-47-6 + 106-42-3, 179601-23-1 + 95-47-6, or 1330-20-7	350

8.1.1.3 Meet thresholds for Inorganic Gases

The Contractor must demonstrate all non-leased spaces of the building comply with the thresholds specified below:

- Carbon monoxide less than 9 ppm.
- Ozone less than 51 ppb.

8.1.2 Smoke Free Environment

This feature requires the Contractor to provide signing to indicate outdoor smoking in banned on the site. Signage must indicate:

- A smoking ban within 7.5 of all entrances, operable windows and building air intakes.
- A smoking ban on all decks, patios, balconies, rooftops and other regularly occupied exterior building spaces.
- In outdoor areas within the project boundary that allow smoking (if any), signs are placed along walkways (not more than 30 m [100 ft] between signs) that describe the hazards of smoking.

8.1.3 Ventilation Effectiveness and Enhanced Ventilation

8.1.3.1 Ensure Adequate Ventilation

See section 7.2.1.2.

Additionally, Contractor must facilitate tenant achievement for 100% increase in outside air compared to AS1668. 15L/s/person.

8.1.3.2 Conduct System Balancing

See section 7.1.1

8.1.3.3 Increase Outdoor Air Supply

See section 7.2.1.2.

8.1.4 Construction Pollution Management

The Contractor must ensure moisture and dust management procedures are followed:

- absorptive materials are stored in a separate designated area protected from moisture damage.
- All active areas of work are isolated from other spaces by sealed doorways or windows or through the use of temporary barriers.
- Walk-off mats are used at entryways to reduce the transfer of dirt and pollutants.
- Saws and other tools use dust guards or collectors to capture generated dust.

Additionally, see section 1.1.1.

8.1.5 Air Quality Monitoring and Awareness

8.1.5.1 Indoor Air Quality Monitors

The Contractor must demonstrate that the following requirements are met:

a. Monitors measure at least three of the following within a regularly occupied or common space in the non-leased areas of the building:
   1. PM2.5 or PM10 (accuracy 2 µg/m³ + 15% of reading at values between 0 and 150 µg/m³).
   2. Carbon dioxide (accuracy 50 ppm + 3% of reading at values between 400 and 2000 ppm).
   3. Carbon monoxide (accuracy 1 ppm at values between 0 and 10 ppm).
   4. Ozone (accuracy 10 ppb at values between 0 and 100 ppb).
   5. Nitrogen dioxide (accuracy 20 ppb at values between 0 and 100 ppb).
   6. Total VOCs (accuracy 20 µg/m³ + 20% of reading at values between 150 and 2000 ppm).
   7. Formaldehyde (accuracy 20 ppb at values between 0 and 100 ppb).

b. Monitors are sited at locations compliant with relevant parameters in the WELL Performance Verification Guidebook. Monitor density is minimum one per floor or one every 325 m, whichever is more stringent.

c. Measurements can be taken at intervals of no longer than 10 minutes for particulate matter and carbon dioxide and no longer than one hour for other pollutants.

d. Data can be recorded and processed in order to be shared annually with the IWBI.

8.1.5.2 Air Quality Awareness

The Contractor must demonstrate that the system has the capability for real-time display of air pollutants measured in section 8.1.5.1. is made available to occupants through one of the following:

a. At least one monitor screen is prominently positioned at a height of 1.1–1.7 m per 930 m² of regularly occupied space.

b. Required data are hosted on a website or phone application accessible to occupants. At least one visible sign is positioned per 930 m² of regularly occupied space indicating where the data may be accessed.

8.1.6 Source Separation

8.1.6.1 Manage Pollution and Exhaust

See clause 7.2.1.3.

8.1.7 Air Filtration

The Contractor must install air filtration media to mechanically ventilated spaces. The following minimum air filtration required for all mechanically ventilated spaces is required:

- F5, MERV 8, or G4

8.2 WATER

8.2.1 Water Quality

The Contractor must demonstrate that the quality of water delivered to the project under normal utility conditions comply with this section. In case it does not, the contractor must take adequate measures to ensure compliance.

8.2.1.1 Meet Sediment Thresholds

The Contractor must demonstrate the water delivered to the project for human consumption, handwashing and showers/baths meets the following threshold:

- Turbidity less than or equal to 1.0 NTU.

8.2.1.2 Meet Microorganisms Thresholds

The Contractor must demonstrate the water delivered to the project for human consumption, handwashing and showers/baths meets the following threshold:

- Contains 0 CFU / 100 mL total coliforms (including E. coli).

8.2.1.3 Meet Dissolved Metal Thresholds

The Contractor must demonstrate the water delivered to the project for human consumption meets the following thresholds:

- Lead less than 0.01 mg/L.
- Arsenic less than 0.01 mg/L.
- Antimony less than 0.006 mg/L.
- Mercury less than 0.002 mg/L.
- Nickel less than 0.07 mg/L.
- Copper less than 1.0 mg/L.
- Cadmium less than 0.005 mg/L.
- Chromium (total) less than 0.1 mg/L.

8.2.1.4 Meet Organic Pollutant Thresholds

The Contractor must demonstrate the water delivered to the project for human consumption meets the following thresholds:

- Styrene less than 0.02 mg/L.
- Benzene less than 0.005 mg/L.
- Ethylbenzene less than 0.3 mg/L.
- Vinyl chloride less than 0.002 mg/L.
- Toluene less than 0.7 mg/L.
- Xylenes (total: m, p and o) less than 0.5 mg/L.
- Tetrachloroethylene less than 0.005 mg/L.

8.2.1.5 Meet Disinfectant Byproducts Thresholds

The Contractor must demonstrate the water delivered to the project for human consumption meets the following thresholds:

- Total trihalomethanes (sum of dibromochloromethane, bromodichloromethane, chloroform and bromoform) less than 0.08 mg/L.
- Total haloacetic acids (sum of chloroacetic, dichloroacetic, trichloroacetic, bromoacetic and dibromoacetic acids) less than 0.06 mg/L.

8.2.1.6 Meet Herbicide and Pesticide Thresholds

The Contractor must demonstrate the water delivered to the project for human consumption meets the following thresholds:

- Atrazine less than 0.003 mg/L.

- Simazine less than 0.002 mg/L.
- 2,4-Dichlorophenoxyacetic acid less than 0.07 mg/L.

8.2.1.7 Meet Fertiliser Thresholds

The Contractor must demonstrate the water delivered to the project for human consumption meets the following thresholds:

- Nitrate less than 50 mg/L (11 mg/L as nitrogen).

8.2.1.8 Meet Public Water Additive Thresholds

The Contractor must demonstrate the water delivered to the project for human consumption meets the following thresholds:

- Fluoride less than 4 mg/L.
- Total chlorine less than 4 mg/L.
- Chloramine less than 4 mg/L

8.2.1.9 Meet Drinking Water Taste Properties

The Contractor must demonstrate the water delivered to the project for human consumption meets the following thresholds:

- Aluminum less than or equal to 0.2 mg/L.
- Chloride less than 250 mg/L.
- Fluoride less than 2 mg/L.
- Manganese less than 0.05 mg/L.
- Sodium less than 270 mg/L.
- Sulfate less than 250 mg/L.
- Iron less than 0.3 mg/L.
- Zinc less than 5 mg/L.
- Total Dissolved Solids less than 500 mg/L

8.2.1.10 Test and Display Water Quality

The Contractor must demonstrate that the results of the quarterly water tests can be made available to occupants through:

1. Visual displays prominently located near sources of drinking water.
2. Hosting the required data on a website accessible to occupants. Visible signs should be positioned near sources of drinking water indicating the website where the data may be accessed.

8.2.2 Legionella Control

The Contractor must demonstrate through a narrative (Legionella Management Plan) how the building addresses Legionella, and include the following:

a. Documentation of the plan and its implementation.

b. Formation of a team for Legionella management in the building.

c. Water system inventory and production of process flow diagrams.

d. Hazard analysis of water assets.

e. Identification of control points and measures.

f. Monitoring actions to ensure control measures are within performance limits and determining corrective actions.

g. Verification and validation procedures.

Areas to consider in this plan may include domestic hot and cold water systems, decorative fountains, shower heads and anywhere else that could generate water aerosols.

8.2.3 Filter Drinking Water

The Contractor must demonstrate the following requirements are met:

- At least one drinking water dispenser (minimum one per floor) is located within 30 m [100 ft] walk distance of all regularly occupied floor area and in all dining areas.
- All newly installed drinking water fountains are designed for water bottle-refilling.

8.2.4 Drinking Water Promotion

The Contractor must demonstrate that at least one drinking water dispenser is located within 30 m walk distance of all regularly occupied floor area and in all dining areas on the Ground Level.

For the office levels, the Contractor must provide at least one water supply and drainage point that can be connected to a drinking water dispenser within each 900 m^2 of leased space, or a minimum of 1 per floor, whichever is more stringent.

The Contractor must also consider mouthpieces/outlets, protective guards and basins of drinking water fountains and dispensers that are all easy to clean.

8.2.5 Handwashing

8.2.5.1 Sink Sizing

The Contractor must demonstrate that all installed bathroom and kitchen sinks meet the following requirements:

- The sink column of water is at least 25 cm in length (measured along flow of water, even if at an angle).
- The sink column of water is at least 8 cm away from any edge of the sink.
- The sink basin is at least 23 cm in width and length.

8.2.5.2 Handwashing Support

The Contractor must demonstrate that at all sink locations, following are provided:

- Systems to provide fragrance-free hand soap placed in dispensers with disposable and sealed soap cartridges.
- Systems to provide paper towels for hand drying.

8.2.6 Exterior Liquid Water Management

The Contractor must demonstrate that the following requirements are met:

a) A continuous drainage plane (e.g., a weather-resistant barrier integrated with flashing systems at penetrations) is constructed interior to the exterior cladding.

b) To prevent the wicking of porous building materials, one of the below capillary break methods is used:

   a. Free-draining spaces (e.g., between exterior cladding, weather-resistant barriers in wall assemblies).

   b. Non-porous materials (e.g., closed-cell foams, waterproofing membranes, metal) between porous materials.

8.2.7 Moisture-Sensitive Materials Management

The Contractor must demonstrate that moisture-resistant materials have been selected and/or moisture-sensitive materials are being protected, considering the following:

- Exterior glazing and entrances to the building from its surroundings.
- Porous cladding materials.

Finished floors and interior sheathing in basements, bathrooms, kitchens and high-humidity spaces.

8.3 NOURISHMENT

8.3.1 Food Advertising

The Contractor must demonstrate that designated eating areas or common areas contain at least three different instances of messaging that communicate at least one of the following:

a. Encouragement of the consumption of whole, natural foods.
b. Encouragement of the consumption of drinking water.

8.4 LIGHT

8.4.1 Visual Lighting Design

8.4.2 General Lighting

See section 7.2.3.2.

8.4.3 Glare Control

8.4.3.1 Control Solar Glare

See section 7.2.4.1.

8.4.3.2 Control Glare From Electric Lighting

See section 7.2.3.3

8.4.4 Lighting Fixture Performance

See section 7.2.3.1.

Additionally, the Contractor must demonstrate that all electric lighting meets at least one of the following colour rendering requirements. Decorative fixtures, emergency lights and other special-purpose lighting may be excluded from these requirements.

METRIC	THRESHOLD
CRI	CRI > 90
CRI, R9	CRI > 80 with R9 > 50
IES TM-30-18	IES Rf ≥ 78, IES Rg ≥ 100, -1% ≤ IES Rcs,h1 ≤ 15%

All electric lights (except decorative lights, emergency lights and other special-purpose lighting) used in regularly occupied spaces meet at least one of the following requirements for flicker:

- A minimum frequency of 90 Hz at all 10% light output intervals from 10% to 100% light output.
- LED products with a “low risk” level of flicker (light modulation) of less than 5%, especially below 90 Hz operation as defined by IEEE standard 1789-2015 LED.

8.4.5 Mercury-free lamps and electrical system

The Contractor must demonstrate that all newly installed products meet the following:

Illuminated exit signs, thermostats, switches and electrical relays are mercury-free.

Low-mercury or mercury-free lamp technology meets the following specifications:

FLUORESCENT LAMP	MAXIMUM MERCURY CONTENT
Compact, integral ballast	3.5 mg
Compact, non-integral ballast	3.5 mg
T-5, circular	9 mg
T-5, linear	2.5 mg
T-8, eight-foot	10 mg
T-8, four-foot	3.5 mg
T-8, two- and three-foot	3.5 mg
T-8, U-bent	6 mg
High-Pressure Sodium Lamp	Maximum Mercury Content
400 W or less	10 mg
Over 400 W	32 mg

8.5 MOVEMENT

8.5.1 Bicycle Storage

See section 7.4.1.1.

8.5.2 End of Trip Facilities

See section 7.4.1.1.

8.6 THERMAL COMFORT

See section 7.2.6. The Contractor must also demonstrate the additional requirements detailed in this section are met.

8.6.1 Dedicated Outdoor Air Systems

In spaces where an independent system is used for heating and/or cooling, dedicated outdoor air systems meet one of the following requirements:

- The system complies with ASHRAE Design Guide For Dedicated Outdoor Air Systems (2017).
- A detailed design review of the proposed system is conducted by an independent, qualified and registered professional mechanical engineer demonstrated not to have a conflict of interest. The review addresses thermal comfort (dry-bulb temperature, humidity and air velocity, at a minimum) and ventilation rates, as well as overall serviceability and system reliability.

8.6.2 Thermal Monitoring

The Contractor must demonstrate that dry-bulb temperature, relative humidity, and mean radiant temperature sensors have been placed in regularly occupied areas within the building core, satisfying the following requirements:

- Measurements can be taken in occupied zones at least 1 m away from exterior walls, doors, direct sunlight, air supply/exhausts, mechanical fans, heaters or any other significant source of heat or cold.
- The sensor placement density is minimum one per floor or one every 325 m2, whichever is more stringent.
- Measurements are taken at intervals and heights specified in the table below:

PARAMETER	SAMPLING INTERVAL	SAMPLING HEIGHT ABOVE THE FLOOR
Dry-bulb temperature	10 minutes or less	1.1–1.7 m
Relative humidity	10 minutes or less	1.1–1.7 m
Air speed (only if elevated air speed is used)	3 months or less	1.1–1.7 m
Mean radiant temperature	3 months or less	1.1–1.7 m

- Data can be recorded, displayed in real time and analysed for annual statistics.

8.7 SOUND

8.7.1 Sound Mapping

8.7.1.1 Manage Background Noise Level

See Clause 7.2.2.1.

8.7.1.2 Manage Acoustic Privacy

The Contractor must demonstrate that at least one of the following requirements to address acoustical privacy is met:

- An architectural drawing provided that indicates the projected acoustical performance of typical walls that separate regularly occupied spaces throughout the project (e.g., STC/Rw, NIC/Dw or equivalent sound transmission metrics denoted on a partition schedule from an architectural drawing set).
- A professional narrative provided that indicates the measured level of acoustical privacy between regularly occupied spaces or within open workspace environments (e.g., NIC/Dw (or equivalent) or SPP data across partitions).

8.7.1.3 Label Acoustic Zones

The Contractor must demonstrate that the following zones are identified and labelled on the project floor plan:

- Loud zones: includes areas intended for appliances, mechanical equipment or amenities (e.g., kitchens, fitness rooms, social spaces, recreational rooms).
- Quiet zones: includes areas intended for focused work, wellness, rest, study and/or privacy.
- Mixed zones: includes areas intended for learning, collaboration and/or presentation.

8.7.2 Maximum Noise Levels

See Clause 7.2.2.1.

8.7.3 Implement Sound Reducing Ceilings

The Contractor must demonstrate that ceiling finishes meet the following specifications.

- Ceiling treatment meets the minimum NRC/ α w values described below:

SPACE TYPE	NRC/ α_w
Open Workspaces Enclosed Offices Dining Spaces	0.7 for at least 75% of available ceiling area
Conference Rooms	0.7 for at least 50% of available ceiling area

8.8 MATERIALS

8.8.1 Restrict Asbestos

The Contractor must demonstrate that the following newly installed building materials contain asbestos less than 1% by weight:

- Thermal system insulation (applied to pipes, fittings, boilers, breeching, tanks, ducts or other like components to prevent heat loss or gain).
- Surfacing material (that is sprayed, troweled or otherwise applied to surfaces, for example acoustical plaster or fireproofing materials).
- Wallboard/millboard, resilient floor covering, roofing and siding shingles (including metal cladding) and construction mastics

8.8.2 Restrict Lead

The Contractor must demonstrate that indoor paints and surface coatings contain less than 90 ppm total lead.

8.8.3 Low Emitting Materials

Comply with section 7.2.5 for the specifications required under this section. Additionally, the Contractor must demonstrate the following.

8.8.3.1 Volatile Organic Compounds

The following requirements are demonstrated:

- At minimum, 20% by cost of the following newly installed components contain halogenated flame retardants at less than 100 ppm or the extent allowable by local code:
    1. Furniture.
    2. Window and waterproofing membranes, door and window frames and siding.
    3. Flooring, ceiling tiles and wall coverings.
    4. Piping and electrical cables, conduits and junction boxes.
    5. Sound and thermal insulation.
    6. Duct and pipe insulation.
- At minimum, 20% by cost of the following newly installed components contain urea-formaldehyde at less than 100 ppm or the extent allowable by local code:
    1. Composite wood products.
    2. Laminating adhesives and resins.
    3. Thermal insulation.

8.8.3.2 Flooring and Insulation Materials

The Contractor must demonstrate that all newly installed flooring and thermal and acoustic insulation (excluding duct insulation) inside the building meet any of the following VOC emission thresholds or certifications:

- California Department of Public Health (CDPH) Standard Method v.1.1-2010 or any more recent version.
- Floorscore
- Global GreenTag
- ACCS Certification
- OEKO-TEX
- GECA BIM v2.0-2017
- GreenGuard Gold Certification
- MAS Certified Green©
- Indoor Air Comfort - Gold Certification
- M1 classification
- CRI Green Label Plus
- eco-INSTITUT method and thresholds for VOC emissions
- SCS Indoor Advantage Gold (Furniture and Building Materials)

8.8.3.3 Adhesives, Sealants, Paints and Coatings

Comply with section 7.2.5.1 for the specifications required under this section.

Additionally, at least 50% (by volume) of all newly applied adhesives, sealants, paints and coatings applied inside the building meet all VOC emission thresholds set by the California Department of Public Health (CDPH) Standard Method v.1.1-2010 or any more recent version for VOC emissions. Equivalent standards and certifications are:

- Floorscore (for adhesives only)
- Indoor Advantage Gold
- Global GreenTag
- GECA PCv2.2iii-2012
- MAS Certified Green©
- M1 classification
- CRI Green Label Plus
- eco-INSTITUT method and thresholds for VOC emissions
- Indoor Air Comfort - Gold Certification

8.8.3.4 Furniture and Furnishing Materials

The Contractor must demonstrate that 50% (by cost) of all newly installed furniture and furnishings meet VOC emission thresholds set by one of the following programs:

- AFRDI Green Tick Certification
- Global GreenTag
- Level© 'Low Emitting' credit, irrespective of the certification achieved (1, 2 or 3)
- TÜV Rheinland Green Product Mark Furniture
- GreenGuard Gold Certification
- MAS Certified Green©
- VOC ETL class 2 and 3, VOC+ ETL Environmental and Formaldehyde-Free
- Indoor Air Comfort - Gold Certification
- M1 classification
- GECA Standard FFFMv3.0-2017 (Furniture, Fittings, Foam and Mattresses)
- eco-INSTITUT method and thresholds
- SCS Indoor Advantage Gold (Furniture and Building Materials)
- SCS Indoor Advantage – Furniture

8.8.4 Exterior Paint and Soil

If any original bare soil is exposed, the Contractor must fulfill the following (as applicable):

a. Lead soil hazard assessment, remediation or interim controls are applied based on AS/NZS 4361.1-2017 and AS/NZS 4361.2-2017

b. Industrial surface paints and coatings contain less than 0.1% by weight lead in the form of lead or lead compounds.

8.9 COMMUNITY

8.9.1 Accessibility

The Contractor must demonstrate that the building meets local accessibility laws and/or codes without exclusions or exemptions.

8.9.2 Bathroom Essential Accommodations

The Contractor must demonstrate that all bathrooms have systems in place to provide the following:

- Toilet paper.
- Trash receptacles in stalls (in women's and single-user bathrooms). If toilet paper cannot be flushed down toilets, trash receptacles must be in all bathroom stalls.

- Sanitary pads and/or tampons at no cost or subsidized by at least 50% (in women's and single-user bathrooms).

The Contractor must demonstrate that at least one bathroom per floor provides the following:

- Syringe drop box.
- Infant changing tables.

8.9.3 Family Bathrooms

The Contractor must demonstrate that all bathrooms have systems in place provide the following:

- Toilet paper.
- Trash receptacles in stalls (in women's and single-user bathrooms). If toilet paper cannot be flushed down toilets, trash receptacles must be in all bathroom stalls.
- Sanitary pads and/or tampons at no cost or subsidized by at least 50% (in women's and single-user bathrooms).

The Contractor must demonstrate that at least one bathroom per floor provides the following:

- Syringe drop box.
- Infant changing tables.

9. NABERS

9.1 NABERS ENERGY

The Green Star Design & As Built pathway, credit 15, will be delivered through compliance with the NABERS rating Commitment Agreement. The Commitment Agreement must comply with 5 Star requirements.

The Works include metering, monitoring, documenting, and commissioning systems. They also include identifying underperforming elements within the retained equipment reporting to the Principal.

9.1.1 Metering and Monitoring

Comply with sections 7.1.5 and 8.1.5 for the specifications required under this section.

9.1.1.1 Energy Metering Schedule

Meters that are to be installed to optimise building tuning include but are not limited to the following:

LOCATION / END USE
ELECTRICITY METERS
Chillers
AHU Fans (VSD)
Cooling Towers (fans)
Chilled water pumps
Condenser water pump
Hot water pump
Hydrant pumps
Sprinkler pumps
Domestic water pumps
General Power floor by floor
General Power per 1000m^2 NLA
Lighting per floor
Plug loads per floor
Server/Data Centres (electrical load)
Lifts
Commercial Kitchen/Cafe
Electric Vehicle Rechargers
GAS METERS
Domestic Hot Water
Commercial Kitchen

9.1.1.2 Commissioning

Contractor is to provide a comprehensive building commissioning process developed in line with requirements of the ICA. Current conditions and operational efficiency are to be reported for all existing building systems (systems to be nominated by the ICA) and are required to operate at efficiency deemed adequate to achieve NABERS 5 Stars (efficiency to be nominated by ICA and ESD Consultant).

Where components are unable to be tuned to the required efficiency the Contractor will be required to report to the Principal.

9.1.2 High Performance Blinds

Blinds are to be installed with high performance thermal properties to reduce the penetration of solar gains through the existing glazing. Metallic backed blinds shall be installed with a solar energy transmission factor no greater than 0.25 or 25%.

9.2 NABERS WATER

NABERS Water 4 Star rating is to be achieved within 18 months of occupation in line with the Principal's requirements.

The Works include metering, monitoring, documenting and commissioning existing systems.

9.2.1 Metering and Monitoring

Comply with section 7.1.5 for the specifications required under this section.

9.2.1.1 Water Metering Schedule

Meters that are to be installed to optimise building tuning include but are not limited to those in the schedule below:

LOCATION / END USE
WATER METERS
Floor by floor sanitary blocks
Cooling towers
Irrigation
Fire hydrant
End of Trip Facilities
Wash down systems (basement - floor by floor)
Domestic hot water
Commercial Kitchen/Cafe

9.2.2 Tuning and Commissioning

Comply with section 7.1.6 for the specifications required under this section.

9.2.3 Fire Test Water

Comply with section 7.5.1.3 for the specifications required under this section.

All regulatory fire hydrant and sprinkler test water to be recirculated to the fire water tank as per Fire Specifications.

Appendix A

GREEN STAR DESIGN & AS BUILT MATRIX

Appendix B
WELL CORE MATRIX