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Guide to Design for Performance

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1 Introduction

1.1 Summary

Design for Performance (DfP) provides a framework by which projects can commit, pre-construction, to achieve a NABERS Energy for Offices rating in post-construction performance. This guide sets out the minimum steps and processes required for a project implementing the **DfP** process (see Figure 1.1).

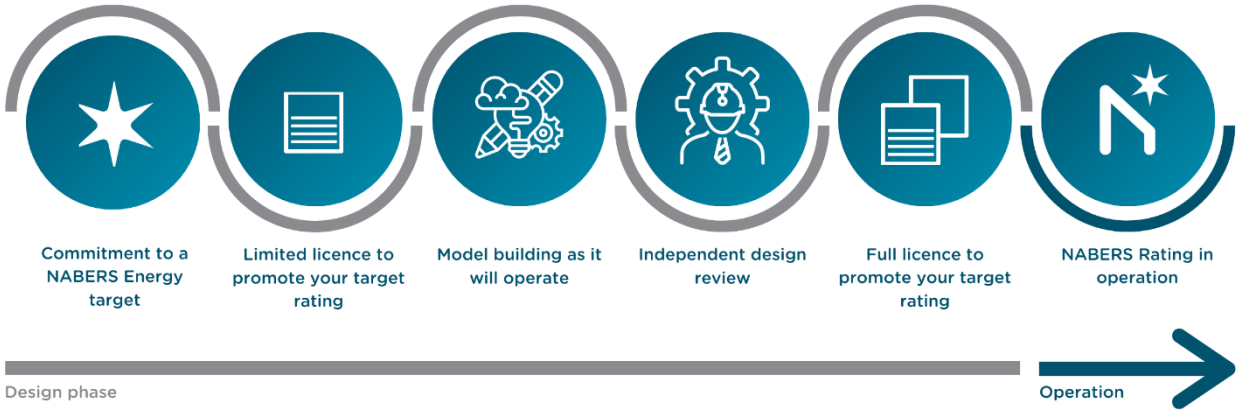


Figure 1.1 Design for Performance Process

1.2 Audience

This Guide is intended to provide assistance for all parties involved in the **Design for Performance** process, and in particular the **Applicant** and associated project team, the **Independent Design Reviewer** and the person(s) conducting the building performance simulation, referred to in this document as the **Simulator.**

1.3 The Design for Performance Agreement

1.3.1 General

A **DfP Agreement** is a contract between the **Scheme Administrator** and the **Applicant** to design, build, commission and operate the nominated building to achieve a NABERS Energy for Offices star rating of 4 stars or more.

The contract typically spans a number of years and remains in effect until the building has received its NABERS rating in operation.

The **DfP Agreement** allows developers, building owners and tenants to promote and market the expected energy performance of a new or refurbished office from the design stage.

1.3.2 Minimum Requirements of a DfP Agreement

As laid out in the **DfP Agreement**, the following minimum steps must be undertaken or commissioned by the **Applicant** and their project team:

a) Nomination of the **Target Rating**. This is the NABERS Energy rating target that the project is aiming to achieve.

b) **Rating Achievement Plan**: A short document describing how the **Applicant** will maintain sufficient control of the design, construction and operation of the building to be able to deliver the **Target Rating** when measured post-occupancy.

c) The **Simulation**: An estimation of the NABERS rating for the building, undertaken using a computer simulation package and following the requirements of this guide.

d) The **Independent Design Review**: A review of the **Simulation**, the building design and the **Rating Achievement Plan** to advise on the risks and opportunities associated with the achievement of the **Target Rating**.

e) **Post-construction Progress Reports**. A quarterly update of the project progress towards its **Target Rating** in the period after the building is occupied.

f) **Certified Rating.** The certified NABERS Energy for Offices rating undertaken to determine whether the building has achieved its **Target Rating**.

All consultants and contractors involved in the project must be advised of the intent to achieve the **Target Rating** and the obligations of the **Applicant** in relation to the **DfP Agreement.**

1.3.3 Rights of the Applicant under a DfP Agreement

1.3.3.1 Target Rating Licence Period

The Target Rating Licence Period commences on the **Agreement Date** and expires on the earliest of:

a) The date the Project is awarded a **Design Reviewed Target Rating**;

b) The Building Permit Date for the Project; and

c) The date the **DfP Agreement** is terminated or expires for any reason.

During the Target Rating Licence Period, the **Applicant** is entitled to make use of limited rights under the **DfP Agreement** as follows:

1) Use of NABERS word only and no other Trade Marks.

2) Use of the NABERS word is limited to use on standard size documents and on websites and social media. The NABERS word may not be used on large signs, banners etc.

3) Use of the NABERS word must be accompanied by the words “Targeting” or “Target Rating”, such as: *“NABERS Target Rating of [specify Target Rating] Stars with a signed Design for Performance Agreement”;*

4) The font size to be used for the word “Target” or “Targeting” must be the same font size used for the word “NABERS” or larger.

5) Only the **Target Rating** that has been nominated (and is current at the relevant time) for the Project may be referred to.

1.3.3.2 Design Reviewed Target Rating Licence Period

The status of **Design Reviewed Target Rating** is awarded by the **Scheme Administrator** after they have received and accepted the **Independent Design Review**.

The Design Reviewed Target Rating Licence Period commences on the date on which the **Design Reviewed Target Rating** is awarded by the **Scheme Administrator** and expires on the earliest of:

a) The date the Project is awarded a **Certified Rating**;

b) The date that is 40 months after the Certificate of Completion for the Project; and

c) The date this Agreement is terminated or expires for any reason.

During the Design Reviewed Target Rating Licence Period, the **Applicant** is entitled to make use of extended rights under the **DfP Agreement** as follows:

1) Use of the NABERS word and other Trade Marks associated with **Design Reviewed Target Rating** and the Design Reviewed Target Certificate (subject to the below).

2) Use of the NABERS word must be accompanied by the words “Design Reviewed Target Rating”, such as “NABERS Design Reviewed Target Rating of [specify Target Rating] Stars”;

3) The NABERS word and other Trade Marks may appear on large signs and banners and the Design Reviewed Target Rating Certificate may be displayed.

1.3.4 Disclaimer

No party associated in any way with the production or distribution of this Guide accepts any liability for any loss, financial or otherwise, caused directly or indirectly in association with the use of this Guide.

Persons or organisations quoting a NABERS rating or **Target Rating** that is not substantiated by a NABERS certified rating or a signed **DfP Agreement** are in breach of trademark and may be subject to legal proceedings.

2 Terms and definitions

Term	Definition
Applicant	The signatory organisation for the **DfP Agreement**
Assessor	An accredited **Assessor** of the NABERS UK scheme, authorised by the **Scheme Administrator** to conduct accredited ratings.
Base case model	A reference model that represents the office space as it is expected to operate.
Certified Rating	A NABERS Rating undertaken at the end of a **DfP Agreement** by an **Assessor** and approved by the **Scheme Administrator,** in order to determine whether the project has achieved its **Target Rating**.
Date of Agreement	The date the **DfP Agreement** fee payment has been received *and* the **Scheme Administrator** has counter-signed the **DfP Agreement** contract. The **Date of Agreement** will be designated by the **Scheme Administrator**.
Design for Performance Agreement ("DfP Agreement")	The contract between the **Scheme Administrator** and the **Applicant** to design, build and commission the premises to achieve a **Certified Rating** of 4 or more stars.
Design Reviewed Target Rating	The **Target Rating** nominated in the **DfP Agreement** after the Independent Design Review has been reviewed and accepted by the **Scheme Administrator.**
Independent Design Review ("Review")	A review, following the requirement in this Guide, of: • The **Rating Achievement Plan**; • The **Simulation** of the NABERS rating for the project; and • The building design; with a view to determine the risks and opportunities associated with the achievement of the **Target Rating**.
Independent Design Reviewer ("Reviewer")	A person appointed by the **Applicant** to undertake the **Independent Design Review** for the project. The **Independent Design Reviewer** must be: • A member the NABERS UK Independent Design Review panel (appointed and maintained by the **Scheme Administrator**) • Independent of the **Applicant** and all members of the Project Team
Independent Design Review Template ("Template")	The spreadsheet format template provided by the **Scheme Administrator** that must be used to conduct and document the **Review**.

Term	Definition
Metering system	Device(s) providing an individual measurement which include all of the following: • The meter • The processes that convert the initial meter signal into an energy reading (for example, current transformers and K factors for electricity meters and pressure correction factors for gas meters) • The interface through which the meter reading is taken (for example, manual readings, energy management system or a Building Management System).
Minimum energy coverage	Minimum scope of energy consumption to be included in a NABERS Rating. The minimum energy coverage is defined in the relevant version of **The Rules**.
NABERS Rating Input Form	The tool provided by the **Scheme Administrator** for use by Assessors in the calculation of accredited ratings.
Scheme Administrator	The body responsible for administering NABERS UK, in particular— a) establishing and maintaining the standards and procedures to be followed in all aspects of the operation of the system, and b) determining issues that arise during the operation of the system and the making of ratings, and c) accrediting **Assessors** and awarding accredited ratings in accordance with NABERS UK standards and procedures. The functions of the **Scheme Administrator** are undertaken by the Building Research Establishment (BRE). **Note:** The term 'Scheme Administrator' applies to the UK context and should not be confused with the term 'Scheme Administrator' that appears in NABERS Australia publications.
Off-axis model	A model that represents the office space after factoring in a minimum of four off-axis scenarios.
Off-axis scenario	A scenario representing operational change/s, such as how a building is occupied, controlled or maintained. Off-axis scenarios are designed to test a building's ability to reach the targeted star rating with modelled changes to assumptions and inputs.
Rating Achievement Plan	A description provided by the **Applicant** of how they will maintain sufficient control of the design, construction and operation of the building to be able to deliver the target NABERS rating in post-construction.
Reverse calculator	The reverse calculator is available on the NABERS UK website. Reverse calculators allow the calculation of the maximum amounts of energy a building can use to achieve a star rating that is specified.

Term	Definition
Ruling	An authoritative decision by the **Scheme Administrator** which acts as an addition or amendment to **The Rules**.
Simulation	The building energy model used to estimate of the energy consumption of the Project and create an estimate NABERS Energy, developed in accordance with the requirements of this Guide. The calculation process must account for hourly changes in loading, internal conditions, and the impact of the thermal inertia of the building. Minimum outputs from the simulation model include energy consumption, internal temperatures achieved and plant and equipment loading. The **Simulation** does not constitute a **Certified Rating**.
Simulation Report	The report submitted to the **Reviewer** and **Scheme Administrator** that sets out a realistic estimate of the operational energy performance based on the **Simulation** of the Project, as defined by Section 4.16. This is arranged and paid for by the Applicant.
Simulator	The person(s) who develop(s) the NABERS Energy rating **Simulation**. While there are no compulsory requirements for the **Simulator**'s qualifications or experience, it is recommended that the **Simulator**'s skills include: • Ability to conduct a NABERS Energy for Offices performance assessment. This could be demonstrated, for example, if the **Simulator** is an **Assessor** • Ability to construct a thermal simulation in an appropriate simulation package Ability to identify performance risks that are likely to emerge for the types of building, services and technology covered by the **Simulation**. This could be demonstrated, for example, by the **Simulator**'s experience working in similar buildings.
Simulation package	A software package used to input, run and report on the thermal simulation model. The simulation package must: • meet the requirements of ANSI/ASHRAE Standard 140; and • contain a thermodynamic representation of the building, its content and its environment. The dynamic simulation model may be supplemented by other simulation tools (such as a simulation of light levels or data centre IT equipment) for small / low energy consuming systems. All large systems, such as the HVAC central plant, must be modelled in an appropriate simulation package. A variety of other estimation techniques may be used for small / low energy consuming systems, but all methodologies and assumptions must be described and disclosed for the **Independent Design Review**.

Term	Definition
Target Rating	The NABERS Energy for Offices rating nominated in the **DfP Agreement**
The Rules	The version of the NABERS UK Rules that is current at the Date of Agreement. The latest versions can be found on the NABERS UK website. The Rules must be considered together with any current Rulings issued by the Scheme Administrator.

3 Rating Achievement Plan

3.1 Introduction

3.1.1 Purpose

The purpose of the **Rating Achievement Plan** is to set out how the design intent for energy efficiency is going to be maintained from design through to occupation and rating measurement. This is necessary because many projects fail to meet their design intent through decisions made as the project proceeds, often by stakeholders outside the original project team. For a **DfP Agreement**, it is necessary to demonstrate that there are measures in place to ensure that the design intent expressed in the materials reviewed by the **Independent Design Reviewer** and modelled in the **Simulation** will actually be carried through to building operation.

The creation and submission of the **Rating Achievement Plan** is the responsibility of the **Applicant**.

3.1.2 Format

The format of the **Rating Achievement Plan** is a set of questions which the **Applicant** needs to answer. The **Rating Achievement Plan** forms part of the materials to be reviewed by the **Independent Design Reviewer**. An inadequate **Rating Achievement Plan** may cause a **DfP Agreement** to be rejected by the **Scheme Administrator**.

There is no set format for the **Rating Achievement Plan**, other than that it must list the key questions in Section 3.2 and provide answers to demonstrate that the **Applicant** has planned for how to control common delivery risks to the achievement of the **Target Rating**.

3.2 Rating Achievement Plan Questions

3.2.1 General

In the following section, the questions that must be answered in the **Rating Achievement Plan** are presented and discussed.

3.2.2 Is the post-construction owner of the building involved in the design and construction process?

Where the post-construction owner is involved in the design and construction process, there is a higher chance that they will respect the design intent and often act as a primary driver for the NABERS UK target achievement. However, many buildings are constructed for sale with the result that there is a risk that the efficiency intent of the project is lost upon sale.

Some typical measures that can be used to manage this risk include:

a) Ensuring that potential purchasers are fully aware and committed to taking on the contractual obligations under the **DfP Agreement**.

b) Ensuring that the **Target Rating** is incorporated into lease materials for tenants.

c) Ensuring that the **DfP Agreement** and **Target Rating** have a high public profile that would be difficult to revert.

In responding to this question, the **Applicant** should identify intended ownership transactions that are likely to affect the building up to the time of the **Certified Rating** and detail the measures that will be taken to ensure that the commitment to achieve the **Target Rating** survives any such transactions.

3.2.3 How will the overall design intent be maintained through the construction process?

The design reviewed for the **DfP Agreement** will most typically be a Stage 3 or 4 design. However, in many cases the Stage 5 for-construction design will be produced by the relevant contractors, who may either seek to remove or add efficiency features or make other changes of unknown impact. As a result, the design that is built is not the design that was simulated, and thereby may not achieve the **Target Rating**.

Some typical measures that can be used to manage this risk include:

a) Placing contractual requirements for the delivery of the **Target Rating** in the builder's contract.

b) Retaining the original design team in a supervisory or controlling role through Stages 5-6 (not as a consultant to the contractor) to ensure design intent is maintained.

c) Using the original design team to produce design all the way through to Stage 5 and continuing their involvement through to at least the end of Stage 6.

d) Ensuring that proposed alternative equipment selections do not reduce efficiency by including efficiency in the review of proposed substitutions.

e) Engaging the **Independent Design Reviewer** to review the Stage 5 for-construction design.

f) Use of an Independent Commissioning Agent to ensure that commissioning activities are adequate in scope and stringency to deliver the design intent

g) Engaging the simulation consultant to simulate the Stage 5 for-construction design to test its performance potential.

In responding to this question, the **Applicant** should detail the measures that will be taken to ensure that the final building has sufficient efficiency measures in place to still achieve the **Target Rating**.

3.2.4 How will the efficiency of the design be maintained in tenant fit-out design?

Tenancy fit-outs seek to provide the optimum environment for tenants, and do not always consider the efficiency intent of the underlying building design. As a result, some intended efficiency measures from the original design may be lost during fit-out design. Similarly, tenancy fit-outs may introduce new design elements that actively detract from the efficiency of the building, such as connecting 24/7 chilled water loads to a circuit that would otherwise only run during normal office hours. The project team must put in place processes to ensure that the tenancy fit-outs do not compromise the ability of the building to achieve its **Target Rating**.

Some typical measures that can be considered in this respect are:

a) Producing a design brief or fit-out guide for tenancies that sets out boundaries of acceptable design requirements, to prevent compromise of the potential NABERS rating of the building. This should include both efficiency and metering considerations.

b) Reviewing all tenancy designs against the above brief or against other criteria to ensure that fit-out designs do not compromise the potential **Target Rating** of the building.

c) Update of the simulation model of the building incorporating the fit-out design to test whether it compromises the potential **Target Rating** of the building.

In responding to this question, the **Applicant** should detail the measures that will be taken to ensure that the tenancy fit-out designs do not compromise the ability of the building to achieve its **Target Rating**.

3.2.5 How will the HVAC plant in the tenancies be operated efficiently?

In some buildings, the tenants operate their own HVAC control systems across the equipment within their tenancies and provide maintenance for the related HVAC plant. This leaves the control of a critical part of the building's energy efficiency and NABERS rating in the hands of the tenant and will often result in poor efficiency outcomes. Significant measures are required to overcome this issue, as it is well-ingrained in leasing culture in much of the commercial real estate market.

Some typical measures than can be considered in this respect are:

a) Single BMS covering all plant including all HVAC plant (attached to central plant) within the tenancies.

b) High level interface from the base building BMS to the tenancy BMSs.

c) Building owner/operator retains control over plant control sequences and setpoints in tenancies.

d) Building owner/operator sets out minimum requirements which must be adhered to by tenants in terms of control sequences and setpoints in tenancies.

e) Building owner sets out minimum maintenance standards that must be adhered to in relation to HVAC equipment (attached to central plant) in tenancies.

f) Building owner controls maintenance in tenancies.

In responding to this question, the **Applicant** should detail the measures that will be taken to ensure that the plant in the tenancy fit-outs is controlled and maintained to achieve optimum efficiency.

3.2.6 How will the operation of the building be controlled between initial occupation and the assessment of the NABERS rating?

The first year of operation of the building, after at least 75% occupation, is used to measure and track performance, and so is critical to the achievement of the **Target Rating**. The **Applicant** must maintain sufficient control over this phase of the project to ensure that the **Target Rating** can be achieved. This may require extension of the design team and building contractor's contracts to cover operation in this period, and/or a greater level of engagement with facilities management than might normally be the case.

Some measures that could be considered in this respect are:

a) Extension of the building contractor's contract to cover control of operation in this period and holding of retentions against the contract until the target is achieved.

b) Retention of a project team to provide ongoing measurement and tracking of the building's performance in the lead up to the **Certified Rating** assessment.

c) Retention of a project team to undertake tuning improvements to the building during this period.

d) Resolution, at contractual level, of potential scope and responsibility conflicts between the construction team and the facilities management team

e) Engaging closely with and/or applying contractual controls to the facilities managers to ensure that the building is operated and maintained to the standards required to deliver the rating.

In responding to this question, the **Applicant** should detail how the efficiency of the building will be managed between handover and the achievement of the initial NABERS rating.

3.2.7 How will the building performance be monitored and tuned to achieve the NABERS rating?

In addition to having sufficient operational control over the building in the period leading up to the **Certified Rating** assessment, there must be provisions to monitor and tune the building to achieve its **Target Rating**. This involves retaining personnel to undertake such monitoring and tuning.

Some measures that could be considered in this respect are:

a) Retention of a design team member, or engagement of a third party, to undertake the monitoring and produce quarterly progress reports.

b) Retention of the simulation consultant to update the simulation to as-built design and operation to generate sub-system targets to inform the monitoring.

c) Retention of a design team member, or engagement of a third party, to undertake the identification of building tuning opportunities.

d) Integration of the reporting and resolution of building tuning issues within the defects process.

e) Clear identification of the process and contractual handling of identified building tuning issues.

In responding to this question, the **Applicant** should detail how the efficiency of the building will be measured and tuned between handover and the achievement of the **Target Rating**.

3.2.8 How will the facilities manager know what to do to operate the building efficiently?

Eventually the building will be handed over to the facilities managers, who will need to understand the building to be able to operate it efficiently. This is doubly important given that achieving and maintaining a **Certified Rating** requires departures from normal facilities management practice.

Some measures that could be considered in this respect are:

a) Provision of a full set of operations and maintenance manuals including a complete and up to date description of operation of the HVAC and lighting controls and full documentation of the energy efficiency features of the building.

b) Provision of training to the facilities managers in the efficient operation of the building.

c) Requirement for ongoing monitoring and tracking of the base building energy performance.

d) Contractual obligations on the facilities manager to maintain a given NABERS rating once it's first **Certified Rating** has been achieved.

In responding to this question, the **Applicant** should detail the how they will ensure that the facilities manager is fully equipped to manage the ongoing operation of the building at peak efficiency.

4 The NABERS Rating Simulation

4.1 Summary

NABERS ratings award stars based on energy efficiency performance, with a higher number of stars for better performance.

A NABERS rating estimation does not constitute a **Certified Rating**. A **Certified Rating** can only be provided after a period of operation and must be performed by an **Assessor**.

If there is any doubt as to the application of **The Rules** to the project, advice should be sought from an **Assessor**.

4.2 NABERS rating inputs

An estimated NABERS rating is calculated using a **Simulation** of energy consumption along with a number of other inputs. These inputs are then entered into the **NABERS Rating Input Form** which can be found on the NABERS website (www.nabers.gov.au/nabers-uk). A list of these inputs at the time of publishing is listed below, however the calculator should be checked for the input requirements current at the **Date of Agreement.**

Rules on how to calculate each of these inputs can be found in the relevant section of **The Rules** and other **Rulings** released by the **Scheme Administrator**.

Note that for each rating input, the intended operational value should be used. Variations on these inputs, including vacancy rates, should be modelled in off-axis scenarios.

The primary inputs for a NABERS rating are:

a) Address

b) Postcode

c) Rated Area

d) Rated Hours

e) Annual Energy consumption (separately by fuel)

Note that there are some secondary inputs as discussed in Section 4.13.

4.3 NABERS rating energy scope

A **Simulation** for an estimated NABERS rating must include all sources of external energy supplied to the rated premises and must cover all of the energy end uses specified in **The Rules**.

Correctly interpreting what energy consumption should be included is essential to the accuracy of the estimated NABERS rating.

The sections of **The Rules** referring to the **minimum energy coverage** for the rating must be used to ensure all required energy is being considered.

Energy outside the scope of the rating may be excluded using a **metering system**. If there is any doubt as to whether certain energy should be included in the rating, it is advised that this is checked by someone with extensive experience of **The Rules**.

If energy cannot be excluded using metering, then it must be included in the estimated energy consumption. This reflects what will happen in practice when the office space receives a **Certified Rating**.

More information on requirements for metering can be found in **The Rules**.

4.4 Estimating energy using a simulation

Energy consumption is to be estimated by simulating a new or refurbished office space as it is expected to operate using best practice inputs and principles.

Simulations for major energy systems and equipment (such as HVAC) must be completed using a compliant dynamic **simulation package**. However, it is recognised that for other small / low energy consuming systems, a spreadsheet will often be enough (such as for domestic hot water or back of house lighting). When supplementary manual calculations have been used, they must be disclosed for the **Independent Design Review**, along with justification for their use. This should include a description of the methodology and commentary on any limitations of this calculation method. Effects on the results of the calculation must be described.

Wherever possible, the inputs to the model should reflect expected operation. Sections 4.5 to 4.12 outline the parameters and considerations the **Simulator** should address in modelling the building. In all cases the following priority of information should be followed in developing the inputs to the simulation:

a) Documented design information.

b) Information based on additional enquiry beyond the documented design.

c) The professional judgement of the **Simulator.**

d) Default values as listed in Appendix A – Defaults for Simulations of this document.

Note that use of defaults should be a last resort and must be justified by the **Simulator**.

4.5 The HVAC software simulation package and model

Simulation packages should be used for the calculation of all HVAC Energy.

All HVAC simulation packages and models have limitations. It is critical that the client and the **Simulator** understand the limitations of the simulations and any models developed in order to adequately interpret the validity of the final results.

The **Simulator** is to confirm the ability of the proposed simulation package(s) to model the office space as part of the report delivered to the **Independent Design Reviewer**. The **Simulator** must:

a) Establish that the simulation package(s):

1) Support the development of a dynamic energy simulation model, assessing performance on an hourly basis for a full year.
2) Are validated through ANSI/ASHRAE Standard 140, Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs.

b) Establish that the HVAC plant and system simulation package/s:
1) Represent the proposed air conditioning system and controls with reasonable accuracy.
2) Allow part load/low load performance, staging (if applicable), minimum downturn and control strategy characteristics of plant and system components to be included. *Most models make compromises in this area and these can lead to significant differences between predicted (simulated) energy use and actual (operational) energy use.*

c) Establish that the glazing or window model:
1) Accounts for the varying angles of incidence of direct solar radiation.
2) Accounts for the total U-value and total Solar Heat Gain Coefficient (SHGC) performance.
3) Calculates daylighting effects (if applicable).

d) Identify any other aspects that have not been modelled accurately or where compromises have been made.

4.6 Weather data

Weather data used in the energy estimation is to be from a weather station with a climate representative of the climate local to the office space. Caution is required in some cities which exhibit a range of distinct weather patterns across the urban area.

Weather data should be for a reference year dataset for a local weather station representative of local area. Weather data must use actual recorded solar radiation, temperature and humidity data from the local weather station or other site-specific source.

It must either be a Weather Year for Energy Calculations (WYEC), International Weather Year for Energy Calculation (IWEC), CIBSE TRY or other standard weather year data.

If none of these climate files are available for the site, then any alternative methodology used (such as multiple years) must be justified by the **Simulator**.

Note: Additional analysis is recommended to quantify the potential effect of non-average weather conditions and climate change on future ratings, including for instance the use of CIBSE or other sources of weather data that has been modified specifically to represent future climate. It is not recommended that **Simulators** manipulate weather data files for this purpose; reputable third-party sources should be used.

4.7 The building

The building model used in the simulation software is to be a close representation of the designed building's physical shape and materials. The building should be modelled in zones that are true to the operational and thermal characteristics of its location. This includes representation of the building in which a tenancy is housed. The following items are to be considered, where relevant:

a) Building form: The building form is to be modelled completely, with all levels represented (for multi-storey buildings).

b) External shading: Shading must be represented comprehensively, including shading devices such as awnings, fins and overhangs, self-shading by parts of the structure and shading by neighbouring buildings and trees. In locations where hills cause the horizon to be substantially higher than a flat plane, additional shading or horizon modelling must be included to represent the impact of this on building performance.

c) Glazing systems: Window / glazing systems must be modelled with an incident angle modifier function and should allow specification of a complex glazing system by using BFRC (British Fenestration Rating Council) product spectral data or custom measurements from an appropriate measurement laboratory. This is particularly important when the window-to-wall ratio exceeds 25%. Impact of frame U-values must also be considered.

d) Insulation: Model input must account for thermal bridging effects in insulated wall, floor and ceiling systems. For further guidance on how to model thermal bridging, the Simulator can refer to BRE “Conventions for calculating linear thermal transmittance and temperature factors”.

e) Orientation: The building orientation is to be correctly modelled.

f) Impact of car parks on HVAC loads: Where basement parking is provided, at least one level of basement car park is to be modelled to account for heat transfer/comfort impacts between unconditioned basement and conditioned ground floor. Infiltration rates in the basement should reflect the car park ventilation system in operation.

g) Car park lighting and ventilation: Where car park lighting and ventilation energy are estimated, schedules accounting for movement sensor lighting control and pollutant controlled car park ventilation should be applied where relevant.

4.8 Occupancy

The modelled occupancy should reflect a realistic projection of the operating patterns of the site.

This can be based on the operating patterns of the tenants in previous site/s if such data is available.

Note: Variation in occupancy at different times of the year should be considered where appropriate, for example public holidays.

Where occupation is unknown, a default value and schedule as deemed appropriate by the **Simulator** can be used. Examples of defaults are given in Appendix A – Defaults for Simulations.

Design occupant densities should not be used as these are normally intended to be maximum loads rather than typical operational loads.

4.9 Lighting

4.9.1 General

The **Simulator** should distinguish between the lighting electricity consumption and the HVAC heat load produced by the lighting, to ensure that each element is treated correctly under NABERS.

Lighting energy consumption estimates should be based on the specified design and expected operating patterns for the intended occupants.

Where the lighting design is unknown, a default value and schedule as deemed appropriate by the **Simulator** can be used. Examples of defaults are given in Appendix A – Defaults for Simulations, however the appropriateness of these default values should be considered in relation to project specifics.

Note: Note that lighting energy consumption should also include any exterior lighting or signage which is covered by the **Rules** under **minimum energy coverage** for the NABERS rating.

4.9.2 Lighting power density

The installed lighting power should be assessed from the lighting layout drawings and luminaire schedules.

The power consumption used for individual fittings shall include the power consumption of the lamp along with any associated control gear and transformers. The total circuit watts of these components should be confirmed by manufacturers' data or by in-situ measurement.

4.9.3 Lighting hours of use

The lighting schedule should be set to represent the expected operating pattern, including the effect of automatic control systems. **Simulators** are also advised to give particular consideration of the after-hours operation of lights for occupancy, cleaning and security requirements, including for external lighting.

Consideration should also be given to using different lighting schedules in the common areas used to service after hours spaces and any sections with different operating hours.

Where daylight controls are to be fitted, a simulation package with daylight modelling capability should be selected. If this is not available, then a separate assessment of daylighting effects should be undertaken and incorporated into the model.

Occupancy detectors will require some judgement in relation to expected occupancy patterns.

4.10 Equipment

4.10.1 General

The **Simulator** should distinguish between the equipment electricity consumption and the HVAC heat load produced by the equipment, to ensure that each element is treated correctly under NABERS.

If the fit-out and tenants are known, the specified loads should be modelled. Hourly operating schedules should be developed based on the intended occupants/tenants.

Where the equipment levels are unknown, a default value and schedule as deemed appropriate by the **Simulator** can be used. Examples of defaults are given in Appendix A – Defaults for Simulations.

Note: Note that back of house equipment energy consumption may also need to be included.

4.10.2 Equipment loads

Loads based on fit outs should be modelled on a zonal basis to ensure that the variability of loads passed through to the air-conditioning is captured.

Please also refer to the guidance in Section 4.11.4 on System Loads when modelling equipment loads.

4.10.3 Equipment hours of operation

The equipment schedule should be set to represent the expected operating pattern. Note that it is common for a portion of equipment to be left operating overnight, or on standby.

4.11 HVAC plant and systems

4.11.1 HVAC configuration

The HVAC plant and system input to the simulation program must be an accurate representation of intended operation. This includes the specified number, capacity and configuration of plant and equipment – including but not limited to chillers, boilers, cooling towers, pumps, air handling units, fan coil units and terminal units.

Note: Default performance curves built into the simulation package for part load and low load operation are to be replaced by realistic performance data for the specified equipment.

Simulators should also note that plant performance quoted by manufacturers is generally presented under standard condenser air and water conditions which do not correctly represent part load conditions. The **Simulator** should contact the manufacturer to request performance data that represents the intended condenser air and temperature controls.

4.11.2 Hours of Operation

The building hours of operation must be modelled as the hours that the building is realistically expected to operate. This means that buildings with – or likely to have – long hours tenancies – should be modelled with hours that provide a reasonable estimate of these long hours.

Furthermore, as most buildings have a degree of after-hours operation, a degree of after-hours operation should be included in the model. Guidance for this is provided in Section A.2.4 Schedules.

4.11.3 System control

The **Simulator** must consider how well the simulated control system represents the designed control system. Some key problem areas where there is often misalignment are:

a) Economy cycle for an air-based system;

b) Primary duct temperature control for air-based systems;

c) Air tempering controls for outside air systems;

d) Control of airflow for variable speed fan systems;

e) Chiller sequencing and part load performance for larger chilled water plant;

f) Turndown ratios for large equipment;

g) Control loop type e.g. proportional, proportional-integral (PI) or proportional-integral-derivative (PID).

Simulators must also consider target temperature control ranges. While there is no specific range required for NABERS, air conditioning within the conditioned space should meet normal acceptable conditions.

4.11.4 System loads

Internal loads are not likely to be evenly distributed in the space. Zonal variation should be built into the model.

In addition, fans place a heat load on HVAC systems which must be considered in addition to their power use.

4.12 Other items

The **Simulator** must ensure that the **Simulation** covers all other energy uses within the **Minimum energy coverage.**

These could include but are not limited to:

a) Supplementary air conditioning loops – note that the electrical input into supplementary units should be determined on the basis of realistic loads;

b) Standby system and/or generator fuel (including sump heaters and any other standing loads);

c) Lifts and other vertical transport;

d) Domestic hot water;

e) Car park ventilation and lighting;

f) Servicing of back of house areas;

g) Communications equipment;

h) Security systems;

i) Fire protection systems;

j) Building Management System (BMS);

k) Access Control systems;

l) Hydraulic pumps;

m) Other building services;

n) On-site generation – in accordance with the **Rules**. Note that excess generation exported from the site cannot be used to improve a NABERS Rating.

o) Any additional energy consumption which may need to be included due to limitations of the energy metering system. If energy use outside the scope of the rating cannot be excluded using metering, then it must be included in the assessed energy consumption. This reflects what will happen in practice when the project receives a **Certified Rating**.

4.13 Secondary Rating Inputs

4.13.1 General

The NABERS rating has secondary adjustment factors for computer server rooms thermal energy inputs and HVAC loads on tenant electrical boards, which may need to be represented in the **Simulation.**

Note: Note the numerical values used for the adjustment factors are available within the current version of the **Rules**. See *NABERS UK The Rules – Energy for Offices.*

4.13.2 Computer server room thermal energy inputs

Computer server rooms, irrespective of whether they are separate functional spaces or not, are subject to benchmark modifications as follows:

a) Where a computer server room is provided with metered chilled water, the metered chilled water use is an input to the NABERS rating that is used to modify the benchmark.

b) Where a computer server room is provided with metered hot water, the metered hot water use is an input to the NABERS rating that is used to modify the benchmark.

c) Where a computer server room is provided with metered condenser water, the metered condenser water use is an input to the NABERS rating that is used to modify the benchmark.

The benchmark adjustment is calculated automatically by the **NABERS Rating Input Form** based on the thermal load figures.

4.13.3 HVAC loads on tenant electrical boards

For new buildings, the metering of HVAC loads within the minimum energy coverage should always be correct with respect to plant items on tenanted floors, such as local pumps, outside air fans and fan coil motors. However, if for some reason the design fails to capture these items correctly within the metering, the **NABERS Rating Input Form** calculates an addition to the site energy use, based on the affected floor area, for:

a) Fan coil motors

b) Local pumps used to circulate chilled water or hot water around the floor

c) Outside air and exhaust air fans used to service the general floor plate

The benchmark adjustment is calculated automatically by the **NABERS Rating Input Form** based on the input information on affected floor area and the associated hours figures for each functional space.

4.14 Modelling margin

As the modelling is conducted prior to construction and operation, various factors may prevent the building from reaching the targeted rating. Project teams should consider an appropriate margin over and above the energy consumption in the **Simulation** to allow for these issues.

The modelling margin should be expressed as:

$$M = \frac{T - E}{E}$$

Where *T* is the total kWh_e for the building achieving the exact **Target Rating** under the same conditions as the **Simulation** and *E* is the total kWh_e for the **Simulation**.

The Design for Performance process does not recommend a specific margin but requires **Simulators** to calculate the margin between their **Simulation** and the **Target Rating**.

While the design team is free to nominate their own margin, the **Independent Design Reviewer** may recommend an alternative margin based on their review of the design, the **Simulation** and the associated risks to the achievement of the **Target Rating**.

4.15 Off-axis model based on performance risks

4.15.1 General

The base case model should be varied in order to explore the building's resilience to real-world performance risks, such as:

a) Incomplete specification or substitution of equipment;

b) Incomplete specification or in-use change of controls;

c) Commissioning errors or omissions;

d) Changes or uncertainty in occupancy and other operating patterns;

e) Comfort or capacity problems;

f) Challenges around the use of sub-meters to include or exclude energy from the rating;

g) Impact of climate change.

Model variations should encompass a minimum of four changes called off-axis scenarios, to quantify these risks (and opportunities). This will provide valuable input to the design and delivery process, and to energy management when the building is in use.

The **Scheme Administrator** requires an absolute minimum of six models for **DfP Agreements**. These are:

1) The base case model, with the building operating as expected;

2) Four off-axis models, being four separate scenarios testing factors that may degrade the performance of the building;

3) One combined off-axis model, comprising four off-axis scenarios each of which individually degrades the building performance.

The scenarios should be chosen to test the impact of parameters that are the least well defined or have the potential for the most impact for a specific building.

Potential parameters are listed in the sections below. These parameters should be adapted based on the servicing arrangements in each individual project being assessed.

4.15.2 HVAC controls

Common control failure modes for the particular building or system configuration are to be identified. Consideration should be given to simulating the impact of control changes or failures.

Potential scenarios include:

a) Increased overnight infiltration rates, for example due to failure to switch off tenant kitchen exhaust fans overnight

b) Failed CO_2 sensors leading to the system continually operating at design ventilation rates rather than ramping down

c) Failed or disabled economy cycle operation

d) Tighter control bands on temperature control, for example no deadband and heating and cooling proportional bands only 0.5°C each.

4.15.3 After hours operation

Some HVAC systems may be unable to turn down to match low occupancy or other low loads. It is particularly important to determine how efficiently the plant can respond to the low loads generated from partial or after-hours operation.

Testing the effect of significant after hours operation for small zones, leading to the system running at low load, should be considered in addition to base case after-hours assumptions for relevant projects.

4.15.4 Lighting hours of use

Where there are no specific technologies in place, lighting can operate much longer than expected. The impact of these longer hours of operation on the **Simulation** should be considered.

Technology failures leading to longer lighting hours should also be considered.

4.15.5 HVAC loads

Almost all buildings will contain areas with atypical loads that can cause, for example, cooling demand in the middle of winter. The effect of this on system performance is to be considered and any inputs used or assumptions made outlined in the **Simulator's** report for the **Independent Design Review**. Specific items may include:

a) Variation in temperature set point;

b) Lower or higher occupant density or other internal loads;

c) Failed lighting controls;

d) Chiller energy consumption at low level base loads (for example a 24/7 load from a tenant computer server room attached to the chilled water system);

e) Fan turndown capability, and how this affects the minimum area to be served in response to an after-hours request.

4.15.6 Infiltration

Sensitivity of the model should be tested to a range of infiltration scenarios. This is due to the possibility of infiltration increasing if façade construction is poor, doors are left open or exhaust fans are left running longer than expected.

4.15.7 Compound effects

Buildings are highly interactive systems, so it is important to consider the compound effects of a single system not functioning as expected. **Simulators** should consider the flow-on effects to other systems to assess the total potential impacts of one system malfunctioning or functioning at lower efficiency than predicted.

The off-axis scenarios should address the individual and compound effects of failures.

4.15.8 Risk factors around other NABERS inputs

Variability around the other NABERS Energy for Offices inputs should also be considered, for example:

a) Lower or higher NABERS Rated Area due to differences in lease rate or servicing arrangements

b) Longer or shorter operating hours or trading hours.

c) Flexible working or other non-standard occupancy patterns

4.15.9 Metering systems

Where sub-meters (and in particular thermal meters) will be used to calculate a NABERS rating, it is important that the **Simulator** consider the associated operational risks.

The effects of sub-meters (in particular thermal meters) not functioning as designed - leading to all exclusions measured by that meter being included in a rating - should be considered for projects relying on this equipment for a large proportion of exclusions.

Refer also to Section 4.16.3 of this Guide.

4.16 Simulation Reports

4.16.1 General

Simulators are required to provide a **Simulation Report** to the selected **Independent Design Reviewer** which contains the following:

a) Input data and assumptions

b) Metering description

c) Simulation results

d) Risk assessment

e) Disclaimer

f) Compliance checklist.

The format for each of these items is provided in the sections below. While exact use of the format provided is not essential, at a minimum the **Simulation Report** must cover the information required in a clear and concise manner. The documentation requirements have been designed to provide a degree of error checking. The forms also provide an opportunity to list all the potential issues with the simulation model and the associated results.

Note: Simulators are strongly advised to be full and frank in identifying problems and compromises in the **Simulation.**

4.16.2 Input data and assumptions for base case model

Input data, as listed below in Table 4.1, must be outlined in the report for the **Independent Design Review** and any compromises and assumptions that have been made must be outlined and justified.

For each input, outline any differences between specification documents and what has been modelled. Provide reasons for any discrepancies and describe any measures taken to mitigate the impact of differences on estimation results.

The table below is not a comprehensive list and there may be additional information that is needed dependent on project specifics.

Table 4.1 Input data

Item	Description
Manual calculations	Describe where computer software was used and where manual calculations, such as spreadsheets, were used. Provide justification and outline assumptions for any manual calculations. Note that simulation software, not spreadsheets, must be used for all major systems and equipment.
Default inputs	Describe where default values were used and what assumptions have been used for estimates in the model. Outline why no better information was available for items where defaults have been used.
Simulation package	Provide an overview of the simulation package's capabilities, as outlined in Section 4.5. Highlight any features or characteristics which may cause inaccuracies in modelled consumption and describe how these have been mitigated / treated.
Climate data	Describe type of data and weather station locations used.
Energy coverage	Describe the energy uses and types covered. Describe what is covered by each meter and highlight any end uses that may need to be apportioned, excluded or included for a NABERS rating. Highlight any use of thermal meters and energy uses covered by these meters. Identify any exclusions or any items outside the scope of a NABERS Energy rating that have had to be included in the energy coverage because of lack of metering.
Document referencing	List drawing and specification versions and dates used to source information (for each input).

Item	Description
Building form	Describe how this has been represented. Any simplifications must be identified.
External shade	Describe how this has been represented in the model. Describe any variations from current shading to the site.
Glazing	Describe the type of glazing and how it has been represented in the model.
Insulation	Describe how insulation levels have been modelled.
Car parks	Describe what has been modelled for car parks.
Floor area	Describe the modelled floor area, which may not be the same as the rated floor area or area used for leasing purposes. Differences should be described in the report.
Lighting	**Lighting Power Density:** Identify lighting power density in each area of the model. **Lighting hours:** Provide a full description of the schedule. Include assumptions about the operations of cleaners or after-hours workers on site. **Lighting Controls:** Describe controls that have been modelled, including notes on how control effects were modelled.
Equipment	**Equipment Density:** Describe equipment type, power consumption per unit and number of units (if known). Include assumptions made for equipment load per person or per space in the model (if applicable). **Equipment Hours:** Describe the pattern of equipment use assumed for the model and the consequent effective equipment operating hours.
Occupancy	**Occupant density:** Describe how this figure was derived, e.g. based on tenancy type. **Occupancy hours:** Describe the hours for each space and how this was derived and modelled.
HVAC system type	Describe the system that has been modelled and any differences between the design and modelled systems.
HVAC hours	Describe the hours of operation of the HVAC plant.
HVAC after-hours	Describe the representation of after-hours operation used and why this figure has been used.

Item	Description
HVAC plant	Describe the plant sizes used and specifically note any areas where the simulation was allowed to default rather than use data from the design. Describe the chiller and boiler efficiencies. Describe any miscellaneous plant items (e.g. toilet exhaust systems). Describe how any limitations of the selected system/s have been modelled. Describe how low loads have been modelled.
HVAC zoning	Describe the zoning of the HVAC systems and identify any differences between the design and the model. Describe how HVAC zoning has been considered when modelling AHAC / extended hours for a NABERS rating.
HVAC control	Describe the differences between the known or likely control methodologies of the actual system and those modelled.
HVAC commissioning	Describe any known commissioning plans or strategies.
Infiltration	Describe how infiltration is modelled in internal and external zones.
Domestic hot water	Identify system type and end-use fitting selections (e.g. shower heads and taps). Describe assumptions around how hot water will be used (e.g. per occupant) and hot water distribution losses.

4.16.3 Metering description requirements

A full description of the metering arrangements assumed or required to allow the NABERS Energy rating to be conducted must be provided, as set out in Table 4.2. Any risks around metering the **minimum energy coverage** for a NABERS Energy rating should be identified. In addition, if sub-meters are to be used to calculate the NABERS Energy rating, the risks associated with this method should be noted (Refer to Section 4.15.9).

Table 4.2 Metering description requirements

Metering Requirements	Energy Coverage
Meter 1 Description and Location	Describe the energy items covered by this meter.
Meter *n* Description and Location	Repeat as necessary for additional meters. Include any sub-metering required to exclude non-rated energy from the assessment.

The project team may also find it useful to have a monthly breakdown of expected energy consumption by meter or meter group for use during building operation. This may assist with tuning of the building after occupancy.

As noted in Section 4.15.9, it is important that the **Simulator** note the operational risks associated with sub-meters. Where there are no specific risks which can be modelled, the **Simulator** may note the following in their Energy Efficiency Risk Assessment:

> *There are operational risks associated with the use of sub-meters to calculate NABERS ratings, for example relating to commissioning, record-keeping, reliability and accuracy across the full load range. In general, ratings that rely on thermal metering are more likely to be problematic. A meter management plan should be developed to identify and mitigate these risks.*

4.16.4 Simulation inputs and results for base case and off-axis models

A minimum of six models is required, the first being a base case model, four being single factor off-axis scenarios and one being a combined off-axis model representing a minimum of four off-axis factors (i.e. four operational changes or failures).

This section must list each scenario, identifying:

a) Any changes between this scenario and the base case

b) The purpose of the scenario

c) Results for the scenarios and model in the format presented in the following subsections.

4.16.5 NABERS rating inputs summary

The following information contained in Table 4.3 regarding each input must be presented for the base case model and each off-axis model.

Table 4.3 Rating inputs

Item	Figure used for NABERS Rating	Notes
Rated Area		Explain how this figure was determined and any significant discrepancies from values being used for leasing purposes..
Hours		Explain how this figure was determined.
Post code		For reference

Additionally, identify the modelling margin used and describe why this figure is appropriate for the building being modelled. Consider stage of design and specification drawings, any unknown factors relating to design, construction or operation and limitations of modelling simulation software when deciding on and describing the appropriateness of the selected modelling margin.

4.16.6 NABERS rating energy consumption summary

For the energy consumption inputs, the information must be presented as follows for the base case model and each off-axis model. All figures relate to one year of consumption.

Table 4.4 Example of presentation of energy consumption inputs

Energy End Use	Total Electricity Use (kWh)	Total Gas / Fuel Use (kWh)	Total Imported Chilled Water (kWh_{th})	Total Imported Hot Water (kWh_{th})	Electricity included in the Rating (kWh)	Gas / Fuel Included in the Rating (kWh)	Imported Chilled Water included in The Rating (kWh_{th})	Imported Hot Water included in the Rating (kWh_{th})
Energy by end use 1								
….								
Energy by End use N								
Total Energy all end uses								

For the purpose of the rating energy consumption summary, the following list provides a guideline as to the level of detail expected in terms of energy end uses. Individual buildings may use different categories but should aim for a comparable level of detail:

a) Chilled water production/import: Energy used by chillers or imported chilled water

b) Hot water production/import: Energy used by heat generators for space heating or imported hot water for space heating

c) Primary packaged AC or VRF: Energy used by packaged AC or VRF systems that service the tenanted areas

d) Secondary packaged AC or VRF: Energy used by packaged AC or VRF systems that service non-tenant areas, such as BMS rooms, security rooms, lift motor rooms

e) HVAC fans: Energy used by fans that provide air movement or ventilation to conditioned spaces

f) HVAC pumps: Energy used by pumps that circulate chilled water or hot water for space heating/cooling

g) Common area lighting: Energy used by common area lighting excluding car parks

h) Common area power: Energy used by common area equipment, including miscellaneous equipment such as: Communications equipment, security systems, fire protection systems, Building Management System (BMS), access control systems, hydraulic pumps

i) Lifts: Energy used by lifts (not including lift room ventilation/cooling)

j) Miscellaneous ventilation: Ventilation fans to unconditioned spaces

k) Domestic hot water. Heating and pumping energy associated with domestic hot water

l) Car park lighting. Lighting in car parks

m) Car park ventilation. Ventilation in car parks

n) External lighting

o) Generator fuel and energy overhead: Fuel used by generator in testing plus energy used by the generator in standby (i.e. jacket heating)

p) On-site generation. Energy generated on-site, e.g. PV systems.

4.16.7 Monthly Energy Summary

In addition to the annual summary above, the **Simulator** must provide a table of the monthly energy use by energy carrier (kWh, and where different kWh_e) included in the **Simulation** for each of the end uses in the monthly energy summary required in Section 4.16.6.

Note: The monthly energy use is useful as an insight into the way the building has been controlled, and thus as a potential error check. It is also useful as a starting point for the setting of post-construction monitoring targets at subsystem level.

4.16.8 NABERS rating results summary

The estimated NABERS Rating for the base case model and the off-axis model (or each off-axis scenario if relevant) must be obtained using the **NABERS Rating Input Form** and the inputs detailed in Section 4.16.5 and 4.16.6. The results obtained must be presented and include the following information:

a) The estimated NABERS rating in stars to one decimal place

b) The energy use in kWh_e p.a.

c) The energy intensity in kWh_e/m^2

d) The Target Rating in Stars

e) The Target Rating energy use in kWh_e

f) The Target Rating energy intensity in kWh_e/m^2

g) The modelling margin.

4.16.9 Risk assessment

The **Simulator** must summarise any risk factors that might prevent the project from achieving its estimated rating. These risks must include at a minimum:

a) Differences between the specification documents and model

b) Building design

c) Materials specified

d) Equipment specified

e) Risks as derived from the off-axis scenarios

f) Risks associated with changes made after the design phase

g) Risks associated with commissioning and controls when in operation

h) Any other risks identified through assumptions and inputs used when estimating the rating.

Other risks for a specific project must also be included in the report for the **Independent Design Reviewer**.

For each risk outlined, the **Simulator** must describe the potential impact as well as how the risk has been or might be mitigated. Table 4.5 below can be used for this.

Table 4.5 Risk, Impact & Mitigation Matrix

Risk	Potential Impact	Potential Mitigation
Describe the area of risk, e.g. "Mechanical equipment hours of use sensitivity"	Describe the potential impact, e.g. "Changing mechanical equipment hours of use changed the rating from four stars to three stars."	Describe how the problem might be approached, e.g. “Ensure adequate plant run time monitoring is in place to avoid mechanical equipment running unintentionally or unnecessarily."
	Repeat as necessary.	

4.16.10 Reporting of achieved space conditions

In addition, it is required that the following information at a minimum is provided for each model:

a) The percentage of occupied hours that any conditioned spaces lie outside the nominated control range (i.e. temperature control targets not being met).

b) The percentage of plant operation hours that the HVAC plant fails to meet the system load demands (i.e. system failing to meet peak demand).

4.16.11 Disclaimer

The report must include, as a minimum, the following disclaimer:

> *Computer simulation provides an estimate of performance. This estimate is based on simplifications that do not and cannot fully represent all of the intricacies of performance once built. As a result, simulation results only represent an interpretation of the potential performance. No guarantee or warrantee of performance in practice can be based on simulation results alone.*

4.16.12 Compliance checklist

This table must be completed in the report submitted to the **Independent Design Reviewer**. A complying estimation must include all the items listed in the compliance table.

Table 4.6 Independent Design Review Compliance Checklist

Item	Included?	Notes
Input data, including assumptions and source documentation referencing for base case model	Yes / no	
Metering requirements	Yes / no	
Off-axis scenarios and off-axis model listing	Yes / no	
NABERS rating inputs summary for base case and off-axis models	Yes / no	
NABERS Energy end-use summary for base case and off-axis models	Yes / no	
NABERS rating simulation results for base case and off-axis models	Yes / no	
Reporting of achieved space conditions	Yes / no	
Risk assessment	Yes / no	
Disclaimer	Yes / no	

5 The Independent Design Review

5.1 Overview

5.1.1 Purpose

The role of an **Independent Design Review** is to provide a risk assessment of the ability of the project to achieve its **Target Rating**. This includes review of the following items:

a) The **Rating Achievement Plan**

b) The Project Design

c) The **Simulation Report**

The results of the **Review** are not binding on the **Applicant** but may influence the **Scheme Administrator** in the acceptance or continuance of the **DfP Agreement.**

In general, it is expected that the **Applicant** will make reasonable modifications to their design and/or process to respond to the issues and risks raised in the **Independent Design Review**. Such changes may follow the recommendations of the review or may adopt alternative solutions to the issues raised.

Further details on the role of the **Independent Design Reviewer** and what a **Review** should entail are included in Appendix B: Requirements for Independent Design Reviewers.

5.1.2 The Independent Design Reviewer

5.1.2.1 General

Members of the Independent Design Review Panel are recognised experts in both the energy efficient design and operation of buildings. They are engaged by the **Applicant** to provide the **Independent Design Review**.

5.1.2.2 Being 'Independent'

An **Independent Design Reviewer** cannot review any design in which they or their company/organisation has a stake in the design. Thus, they cannot come from the same company as any of the members of the design team, the project team, or the project/building owner.

A litmus test of independence is whether the **Reviewer** or their organisation would be potentially affected in terms of capital costs, design/construction time via rework or similar arising from the implementation of any recommendation that might be made as part of a **Review**.

Independent Design Reviewers are selected from the panel and engaged by the **Applicant**. The fees charged for an **Independent Design Reviewer's** services are a commercial matter between the **Reviewer** and their client.

These limitations do not preclude an **Independent Design Reviewer** being associated with the provision of the following services to the project:

a) Preliminary design advice or review

b) Simulation (including the simulation for the **DfP Agreement**)

c) Additional design advice or review after the completion of the **Review**

d) Independent Commissioning Agent

e) Assistance with building tuning

f) Post-construction monitoring and verification.

Note however that the **Independent Design Reviewer** is precluded from conducting the **Certified Rating** that verifies whether the building has achieved its **Target Rating**.

5.2 The Review

5.2.1 Materials to be reviewed

The **Reviewer** must be provided with the following materials for **Review**:

a) **Rating Achievement Plan**, as described in Section 3.

b) The **Simulation Report**, as described in Section 4.

c) Building design information, to the extent available at the time of the reviews, including but not limited to:

1) Mechanical drawings and specifications,

2) Electrical drawings and specifications,

3) Hydraulic drawings and specifications,

4) Architectural plans including façade construction details, façade/glazing materials and other relevant architectural specifications

5) HVAC control strategy documentation

Other documents might also be reviewed dependent on the project.

5.2.2 The Independent Design Review

The **Independent Design Review** is conducted using the **Independent Design Review Template** provided by the **Scheme Administrator**. The **Template** is designed to provide a framework that ensures that the **Review** covers all the relevant services and questions that should be asked. While an **Applicant** can request a **Review** in a different format (e.g. a full written report) from a **Reviewer** at their own cost, the completed **Independent Design Review Template** is the only item that will be considered by the **Scheme Administrator**.

The review process will typically take a minimum of four weeks to turn around by the **Reviewer** from the date of receipt of the materials to be reviewed. During this time, **Applicants** should expect that the **Reviewer** will ask additional questions and seek additional documentation, depending on the documentation originally provided.

5.2.3 When to conduct an Independent Design Review

The **Independent Design Review** should be generally conducted during Stage 4 design. This ensures that there is sufficient documentation and design detail for the **Simulator** to produce a credible **Simulation** and for the **Reviewer** to produce a detailed review.

The **Scheme Administrator** may, at their discretion, reject a **DfP Agreement** if the **Independent Design Review** has been based on documentation too early in the design or after construction has commenced.

Note: Considerable additional value may be achieved if the **Reviewer** is engaged to undertake a preliminary design review during Stage 3 design or earlier. This enables the reviewer to provide input to larger scale design decisions that may be difficult to change at Stage 4. However, such additional engagement with the **Reviewer** is optional.

5.2.4 Review Recommendations

The **Independent Design Review** will include a large number of recommendations. The intent of these recommendations is not to provide a prescription for achievement of the nominated target rating; rather, they are intended to identify risks and opportunities in the design that the design team should consider. It is important for the design team to consider the recommendations in a constructive rather than a defensive manner.

To assist in interpretation and prioritisation, recommendations are classified as follows:

a) P1: A major issue with a potential impact of 0.5 stars or greater;

b) P2: A significant issue with a potential impact of (approximately) 0.1-0.5 stars;

c) P3: A smaller issue with a potential impact of (approximately) less than 0.1 stars;

d) N: A general note or advisory that does not necessarily deliver a specific Star rating benefit but contributes to overall design improvement.

Note: All recommendations should be given due consideration by the **Applicant** and the design team, as multiple P2 and P3 recommendations may add up to be just as important as the P1 recommendations and will probably be easier to implement.

5.2.5 Independent Design Review Workshop

The findings of the **Independent Design Review** should be discussed in a workshop between the **Reviewer** and the Project team. The objectives of such a workshop are to:

a) Facilitate constructive discussion of recommendations.

b) Identify any areas where documentation has been missed or misinterpreted by the **Reviewer**.

c) Agree actions necessary to (a) technically respond to the **Review** and (b) finalise the **Review** for submission to the **Scheme Administrator**.

5.2.6 Responding to a negative overall Independent Design Review outcome

In the situation where the **Reviewer** identifies that the project is unlikely to achieve the nominated target rating, the **Applicant** must either:

a) Revise the target rating to a lower level that the **Reviewer** would accept as being achievable; or

b) Revise the design and the **Simulation** to improve the performance sufficiently for the **Reviewer** to accept the potential for the building to achieve the nominated **Target Rating**.

Where the **Reviewer** identifies that the **Simulation Report** is inadequate in content, documentation or presentation (as opposed to the actual **Simulation** in itself) for the purposes of verifying the achievability of the nominated target rating, the **Applicant** must obtain a revised **Simulation Report** that meets the needs identified by the **Reviewer**. Note that the limits of what can be sought by the **Reviewer** are set by the requirements for **Simulation** included in this Guide.

Satisfactory completion of these actions is necessary for the **Scheme Administrator** to be able to award the **Design Reviewed Target Rating** status under the **DfP Agreement**.

5.2.7 Responding to Independent Design Review Recommendations

Responses to recommendations typically fall into the following categories:

a) A good idea, but too late for the design to change. A **Reviewer** may nominate options for major changes in design or plant selections. However, owing to the timing of the **Review**, it may not be practical to consider such changes for this project. Typically, the recommendation should be taken on board as a consideration in future projects; however, in some design and construct projects the contractor may wish to consider such changes to the consultant design.

b) A viable recommendation. If it is practical to make a change based on a recommendation, then this should be given due consideration before being accepted or rejected.

c) A viable recommendation prompting an alternative design response. Often the best outcomes from an **Independent Design Review** occur when the design team takes on board the recommendation from the **Reviewer** but reinterprets this into an alternative design outcome than that recommended, frequently superior to both the original design and the **Reviewer's** recommendation.

d) A recommendation relating to aspects of design or construction processes that are not yet resolved. In this case the recommendation should be taken on board for consideration in the completion of the design, either by the consultant or by the contractor.

e) A recommendation based on a misunderstanding of the design. In the situation where the **Reviewer** has misunderstood the design, the **Applicant** should provide information explaining the design and seek a revision of the **Review** to correct this misunderstanding.

f) A recommendation based on out of date documentation. In the situation where the **Reviewer** made recommendations based on out of date documentation, the **Applicant** should provide the **Reviewer** with the updated documentation. However, the **Applicant** should expect that the **Reviewer** will seek additional fees for this update.

It is recommended that the design team responds individually to each review recommendation within the template format and that the review process is completed with a workshop between the **Reviewer** and the design team to discuss the **Review** and the design team responses.

5.2.8 Disputes

Any disputes relating to an **Independent Design Review** that cannot be resolved between the **Applicant** and the **Reviewer** should be referred to the **Scheme Administrator**. The **Scheme Administrator's** ruling on any such dispute is final.

6 During Construction

6.1 Requirements of the DfP Agreement

The **DfP Agreement** has no fixed deliverables in the period from the award of **Design Reviewed Target Rating** status through to the production of the first **Project Progress Report.** However, this is of course a critical period for the works that will deliver the **Target Rating**.

The requirements under the **DfP Agreement** during this period are for the applicant to make reasonable endeavours to:

a) Construct the project to the same design and specifications as were used for the **Independent Design Review**, insofar as these elements are relevant to the achievement of the **Target Rating.**

b) Consider the recommendations and observations of the **Review** with respect to the construction of the project.

c) Where there are significant changes to design or specifications that have the potential to impact the ability of the project to achieve the **Target Rating**:

   1) Update the **Simulation** to reflect the changes, and provide the updated **Simulation Report** to the **Scheme Administrator**

   2) If required by the **Scheme Administrator**, arrange for the **Reviewer** to update the **Review** based on the modified design, and provide the updated **Review** to the **Scheme Administrator**

If the outcomes of the updated **Simulation** and **Review** are negative, the **Scheme Administrator** may unilaterally revise the **Design Reviewed Target Rating** to correspond with the updated design or may terminate the **DfP Agreement**.

Whilst not a specified requirement of a **DfP Agreement**, all buildings with a Certificate of Completion date on or after 1 January 2021 must validate all the non-utility metering systems used in the calculation of the **Certified Rating**, as detailed in the **Rules**. Meter validation is therefore a critical step throughout the construction and commissioning process and Applicants must plan for how this will be evidenced.

6.2 Activities during construction

It is strongly advised that the following activities are considered during the construction phase:

a) Progressive update of the **Simulation** based on design changes and refinements as the design details are finalised.

b) Comprehensive review of the proposed HVAC controls for the building. This should be conducted by the **Reviewer** or other appropriate expert, along the following lines:

1) The HVAC controls contractor should produce a reverse brief in the form of a Description of Operations document for the HVAC controls, detailing the control sequences to be used for each component of plant. This must be produced well before coding commences.
2) This brief should be reviewed in detail by the nominated expert;
3) A workshop should be held between the HVAC controls contractor, the design team and the expert reviewer to discuss recommendations and agree solutions;
4) If necessary, the model used for the **Simulation** should be used to test the impact of different control options, in order to inform discussion;
5) The HVAC controls Description of Operations should be revised by the contractor and iterated with the design team and expert reviewer until all are in agreement;
6) This revised document should be treated as a controlled document for the balance of construction, with the contractor being held to the requirements of the document and any changes requiring authorisation of the design team and updating of the document before implementation;
7) The document should also be used as the basis of functional testing during commissioning.

> **Note:** A similar process is also recommended for lighting control systems.

c) A comprehensive commissioning process should be developed including:

1) Development of a commissioning brief and plan for each service, including a set of required commissioning tests arranged into a logical sequence. As far as possible, each test should have a defined acceptance criterion;
2) Development of individual methodology statements for each test (by the contractor), submitted and approved by the relevant consultants;
3) Witnessing of key tests and critical review of all test results by the relevant consultants;
4) Documentation of all tests in the Operations and Maintenance Manuals.

> **Note:** The use of an Independent Commissioning Agent is strongly recommended.

d) Tenancy design process. The design of tenancies, and in particular the HVAC design, should be subject to review to ensure that:

1) The tenancy HVAC design and intended utilisation patterns do not unnecessarily compromise the ability of the building to achieve the **Target Rating**.
2) The tenancy metering is configured such that energy use of HVAC plant within the tenancy is captured by metering.

7 Project Progress Reports

7.1 Quarterly Project Progress Reports

It is a requirement of the **DfP Agreement** that the **Applicant** provides the **Scheme Administrator** with quarterly progress reports from the time that building has commenced operation through to the completion of the **Certified Rating**.

The purpose of these reports is to provide the **Scheme Administrator** with confidence that the project is being managed towards, and is tracking towards, the achievement of its nominated target rating.

7.2 Minimum requirements

A **Project Progress Report** must as a minimum include the following:

a) Identification of the project;

b) **Data Collection Start Date**;

c) **Target Rating**;

d) Building Occupancy (% floor area) tracking from **Data Collection Start Date**;

e) Performance tracking from the **Data Collection Start Date**;

f) Activities summary, briefly describing what activities such as building tuning have been undertaken in the quarter towards the achievement of the **Target Rating**;

g) Review of the risks identified by the meter management plan.

7.3 Performance Tracking Requirements

The minimum performance tracking requirements are as follows:

a) A monthly benchmark for total base building kWh_e energy use based on the most recent **Simulation;**

b) A monthly tracking of the actual total base building kWh_e energy use;

c) Monthly tracking of rated area as a percentage of the rated area used in the **Simulation;**

d) Monthly tracking of the building hours compared to the hours used in the **Simulation**;

e) An evaluation of the cumulative percentage difference between the above figures, to provide a single figure assessment of projected performance relative to target.

It is strongly recommended that, for internal project purposes, the performance tracking should also include the following features:

1) Monthly benchmarks for major building sub-systems (chillers, heat generators, fans, pumps, etc) compared against sub-metered energy consumption of those subsystems;
2) Modification to benchmarks if required to compensate for lower occupancy;
3) Modification of benchmarks if required to compensate for changes in hours of occupancy;
4) Average daily consumption profiles for the whole base building and for the major subsystems (including tenancies, where possible), to understand out-of-hour behaviours for the building.

8 Certified Rating

8.1 Undertaking the Certified Rating

The **Certified Rating** is based on the measured performance of the building after 12 months of operation at above 75% occupancy. It must be undertaken by an **Assessor** who meets the following criteria of independence:

a) no direct or indirect involvement with the design, construction or commissioning of the project; nor

b) no direct or indirect interest (pecuniary or otherwise) in any part of the project; nor

c) no direct or indirect involvement in any capacity with the **Applicant** (other than as an **Assessor**).

The **Independent Design Reviewer** is not permitted to undertake the **Certified Rating**.

The **Certified Rating** must be undertaken within 40 months of the Certificate of Completion for the project.

8.2 Target Rating achieved

If the **Target Rating** is achieved in the **Certified Rating**, then the **Applicant** must:

a) Advise the project team and contractors of the successful achievement of the **Target Rating**

b) Advise the building occupants of the successful achievement of the **Target Rating**

From the point of achievement of the **Target Rating**, the **DfP Agreement** and associated rights terminate and are replaced by the rights associated with the **Certified Rating**.

8.3 Target Rating not achieved

If the **Target Rating** is not achieved in the **Certified Rating**, then the **Applicant** can seek to extend the DfP Agreement by up to 16 months to improve and re-rate the performance, and eventually undertake a further **Certified Rating**.

If the **Target Rating** is achieved in this further rating, then the provisions of Section 8.2 apply. If the **Target Rating** is not achieved within the extended period, the final status (as discussed in Section 0) is recorded as “Not Achieved”. This status is *not* altered if at some later point in time the **Target Rating** is achieved or exceeded by the building.

8.4 Final status record

The final status record of the **DfP Agreement** is recorded as one of the following:

a) **Not Valid – terminated by the Scheme Administrator**. This applies if the **Scheme Administrator** terminates the **DfP Agreement** at any stage.

b) **Not Valid – terminated by the Applicant**. This applies if the **Applicant** terminates the DfP Agreement at any stage.

c) **Not Valid – terminated due to project transfer**. This applies if the **Applicant** sells some or all of the project and the purchaser does not sign a deed of novation of the **DfP Agreement**

d) **Achieved** – This applies once a project's first (or second, where the **DfP Agreement** has been extended) **Certified Rating** is awarded that is equal to or higher than the **Target Rating**

e) **Not Achieved** – This applies once a project's first (or second, where the **DfP Agreement** has been extended) **Certified Rating** is awarded with a star rating that is less than the **Target Rating**.

These are all final statuses and cannot be altered.

Appendix A – Defaults for Simulations

A.1 Summary

Wherever possible, Simulations must include data from the design and expected operation of the office space being modelled.

Where this is not available, the following defaults or other appropriate defaults can be used. The Simulator must explain and justify any use of defaults.

A.2 Internal Loads

A.2.1 Occupancy

Peak design occupancy will be a defined parameter of the design. However, the maximum typical occupancy in practice is 70% of the peak, as listed in the default schedule in Section A.2.4 Schedules.

A.2.2 Equipment loads

The default equipment load can be set at an average of 11 W/m^2. As installed equipment loads are likely to vary from zone-to-zone, this should be represented in the model. By default, zone loads should be set at 50%, 75%, 100%, 125% and 150% of average equipment loads in approximate area ratios of 1:1:2:1:1. The resultant average load should be calculated to ensure that it is in the range 10-12W/m^2.

A.2.3 Lighting

The default lighting load (W/m^2) in tenancies can be set at the relevant minimum compliance value derived from Part L requirements, or by using a default calculation of 1.6W/m^2 per 100 lux design illuminance for open plan spaces.

A.2.4 Schedules

Default Schedules which can be used are provided below.

The schedules correspond notionally to a 50 hour a week schedule. However, this is sensitive to the relative size of the after-hours zones.

The “Saturdays (after-hours zones)” schedule (which operates the HVAC from 9.00am – midday on Saturday) can be applied to a single after-hours operating zone of the building, as specified in the design and controls. If no information is available on the design intent for after-hours zoning, then the after-hours zone should be 5-10% of the building, arranged as one or more complete storeys, an individual and distinct tenancy with area greater than 5% of the total building, or a single contiguous are within a large floor).

Note that when modelling after-hours operation, consideration also should be given to what additional services are enabled beyond the air-conditioning within the tenancies. This may include toilet exhausts, lifts and common area lighting.

Note that in the tables below, HVAC operation schedules apply to central plant and zone-level plant. If the building has operation in set-back mode out of hours, this needs to be modelled in addition to the scheduled hours.

Table A.1: Weekdays (All Zones)

Time period	Occupancy	Lighting (Automated time of use control)	Lighting (limited control)	Equipment	HVAC Operation
0000-0100	0%	5%	15%	25%	Off
0100-0200	0%	5%	15%	25%	Off
0200-0300	0%	5%	15%	25%	Off
0300-0400	0%	5%	15%	25%	Off
0400-0500	0%	5%	15%	25%	Off
0500-0600	0%	5%	15%	25%	Off
0600-0700	0%	5%	15%	25%	Off
0700-0800	10%	30%	40%	65%	On
0800-0900	20%	75%	90%	80%	On
0900-1000	70%	100%	100%	100%	On
1000-1100	70%	100%	100%	100%	On
1100-1200	70%	100%	100%	100%	On
1200-1300	70%	100%	100%	100%	On
1300-1400	70%	100%	100%	100%	On
1400-1500	70%	100%	100%	100%	On
1500-1600	70%	100%	100%	100%	On
1600-1700	70%	100%	100%	100%	On
1700-1800	35%	75%	80%	80%	On
1800-1900	10%	25%	60%	65%	Off
1900-2000	5%	15%	60%	55%	Off
2000-2100	5%	15%	50%	25%	Off

Time period	Occupancy	Lighting (Automated time of use control)	Lighting (limited control)	Equipment	HVAC Operation
2100-2200	0%	5%	15%	25%	Off
2200-2300	0%	5%	15%	25%	Off
2300-2400	0%	5%	15%	25%	Off

The below schedule (which operates the HVAC from 9.00am – midday on Saturday) can be applied to a single after-hours zone of the building (for example, the smaller of 10% of the building, one storey, or an individual and distinct tenancy with area greater than 5% of the total building).

Table A.2 Saturdays (after-hours zones)

Time period	Occupancy	Lighting (Automated time of use control)	Lighting (limited control)	Equipment	HVAC Operation
0000-0100	0%	5%	15%	25%	Off
0100-0200	0%	5%	15%	25%	Off
0200-0300	0%	5%	15%	25%	Off
0300-0400	0%	5%	15%	25%	Off
0400-0500	0%	5%	15%	25%	Off
0500-0600	0%	5%	15%	25%	Off
0600-0700	0%	5%	15%	25%	Off
0700-0800	0%	5%	15%	25%	Off
0800-0900	5%	40%	25%	25%	Off
0900-1000	15%	40%	40%	25%	On
1000-1100	15%	40%	40%	25%	On
1100-1200	15%	40%	40%	25%	On
1200-1300	5%	15%	25%	25%	Off
1300-1400	5%	15%	25%	25%	Off
1400-1500	5%	15%	25%	25%	Off
1500-1600	5%	15%	25%	25%	Off
1600-1700	5%	15%	25%	25%	Off
1700-1800	0%	5%	15%	25%	Off
1800-1900	0%	5%	15%	25%	Off
1900-2000	0%	5%	15%	25%	Off
2000-2100	0%	5%	15%	25%	Off
2100-2200	0%	5%	15%	25%	Off

2200-2300	0%	5%	15%	25%	Off
2300-2400	0%	5%	15%	25%	Off

Table A.3 Weekends and Holidays (Non-after-hours zones) and Sundays and Holidays (After-hours zones)

Time period	Occupancy	Lighting (Automated time of use control)	Lighting (limited control)	Equipment	HVAC Operation
0000-0100	0%	5%	15%	25%	Off
0100-0200	0%	5%	15%	25%	Off
0200-0300	0%	5%	15%	25%	Off
0300-0400	0%	5%	15%	25%	Off
0400-0500	0%	5%	15%	25%	Off
0500-0600	0%	5%	15%	25%	Off
0600-0700	0%	5%	15%	25%	Off
0700-0800	0%	5%	15%	25%	Off
0800-0900	5%	15%	25%	25%	Off
0900-1000	5%	15%	25%	25%	Off
1000-1100	5%	15%	25%	25%	Off
1100-1200	5%	15%	25%	25%	Off
1200-1300	5%	15%	25%	25%	Off
1300-1400	5%	15%	25%	25%	Off
1400-1500	5%	15%	25%	25%	Off
1500-1600	5%	15%	25%	25%	Off
1600-1700	5%	15%	25%	25%	Off
1700-1800	0%	5%	15%	25%	Off
1800-1900	0%	5%	15%	25%	Off
1900-2000	0%	5%	15%	25%	Off
2000-2100	0%	5%	15%	25%	Off
2100-2200	0%	5%	15%	25%	Off
2200-2300	0%	5%	15%	25%	Off
2300-2400	0%	5%	15%	25%	Off

A.3 Tenant supplementary air-conditioning

Where the building provides a supplementary condenser water circuit for tenant use, the energy use of this can be estimated based on the following:

a) Cooling loads at 50% of the system capacity for 10 hours each day

b) Cooling loads at 20% of the system capacity for the remainder of the time.

Where the tenant is known, the energy use of the tenant units shall be modelled based on a specific estimation of the loads arising from the tenant fit-out.

Modelling of the pump energy must take into consideration the level of flow control present. In general flow control is limited in these systems and as a result the flow turndown is significantly poorer than the load turndown. For a system with shut off valves on each tenant packaged AC unit, the pump power to load relationship should be modelled as no better than linear.

A.4 Vertical transportation

Lift energy should be calculated using ISO 25745-2 (2015). Otherwise, the following equation may be used for modern lift installations:

$$E_{lifts}(kWh) = (528F + 5.5A)(1 - \alpha)$$

Where *A* is the net internal area of the building, *α* is 0.26 for lifts without regeneration and 0.37 for lifts with regeneration and

$$F = \sum_{all\ floors} n$$

Where *n* is the number of lifts serving or express bypassing the floor.

A.5 Domestic hot water

A default which can be used for domestic hot water demand is 4 litres/person/day. If there are no end-of-trip facilities and if fixtures are high water efficiency, it may be appropriate to use a lower demand estimate based on a more specific calculation. To convert the hot water demand estimate to an energy consumption estimate, the Simulator will need to consider distribution and generation losses.

A.6 Infiltration

Where no envelope air tightness testing data is available (for example in a refurbished building or from a similar building), or where the building has no measured air permeability target, use 0.5 air changes per hour throughout all zones during hours when the zone has no mechanically supplied outside air and 0.25 air changes per hour at all other times.

For situations where the building has an air permeability target and contractual process by which this will be measured and achieved, it is recommended that:

a) If the modelling software has the capability to utilise an air permeability target figure to calculate infiltration, then this capability should be used;

b) Otherwise, the air permeability target should be converted to an air change rate using the conversion tables provided in CIBSE Guide A 2015 Tables 4.16-4.19 or a suitable equivalent.

Appendix B: Requirements for Independent Design Reviewers

B.1 Educator and change agent

B.1.1 Summary

The **Independent Design Reviewer** plays a critical role in upskilling the building industry towards more reliable delivery of high efficiency building performance. This means that it is essential that **Reviewers** understand that their role is not just to review individual designs; it is to educate design teams and expand their horizons in relation to the issues and solutions relating to the achievement on in-operation performance

Reviewers must be prepared to freely share ideas, concepts and solutions with design teams. A **Reviewer** cannot be optimally effective in their role if they withhold ideas and information relevant to the improvement of the building's in-operation efficiency, whether for personal intellectual property concerns or for concerns about whether or not the design team is likely to adopt the idea.

When undertaking a review of an individual project the **Reviewer** should recognise that, at best, only some of what they recommend will be adopted in the current project. The balance of recommendations still carry value, however, in terms of educating the design team as to possibilities and considerations for future projects.

The **Reviewer** must also be prepared to learn from the designs they review and the technical and non-technical issues they encounter in undertaking a **Review**.

Reviewers must also accept that sometimes their recommendations and involvement may not always be welcome, and that skills in conflict management may be required to effectively execute their role in such situations.

Where appropriate, **Reviewers** should offer up improvements to the **Template** and the review process to the **Scheme Administrator** to ensure that this process continues to provide maximum learning and change value to the industry as experience in the delivery of high in-operation efficiency develops.

B.1.2 Individual responsibility

An **Independent Design Reviewer** is an individual person and not a team. While it is acceptable in practice for an **Independent Design Reviewer** to call on others to contribute specific inputs to a review, the **Independent Design Reviewer** has complete responsibility for the quality and sufficiency of the **Review**.

B.2 The Design Review Template

B.2.1 General

The use of the **Independent Design Review Template** is mandatory; and the **Scheme Administrator** will not accept a **Review** in any other format.

The **Template** has been formatted to maximise the value of the **Review** to all parties by:

a) Using a spreadsheet format that minimises unnecessary time spent on wordsmithing and presentation, maximising value for money

b) Providing prompts for key questions in relation to each component of the **Review**

c) Providing a structure that drives specific recommendations as an outcome from the **Review**

d) Providing a common methodology for prioritisation of recommendations

e) Providing a basis of continuous improvement of **Reviews**

f) Standardising reporting to facilitate ongoing quality assurance and process improvements to the **Review** by the **Scheme Administrator**.

It is acceptable for a **Reviewer** to supplement the **Template** by adding items not covered in the **Template**. However, they must not delete any component of the **Template** except where a whole worksheet is irrelevant to the project.

The **Reviewer** must use the most recent version of the **Template** made available by the **Scheme Administrator**.

B.2.2 Using the Template

The **Template** uses a standard format throughout consisting of:

a) **Question.** This consists of a primary question relating to the issue at hand in bold. Additional commentary, questions and suggestions are provided in standard text below the main question.

b) **Design Response.** This is a blank cell in which the **Reviewer** must provide a response to the question(s) raised. The response should be sufficiently complete to enable a third party to understand the context and detail of the response. This is important for quality assurance, as a clear statement of the **Reviewer's** understanding of the design also enables the **Applicant** to compare their understanding of the design with that of the **Reviewer**.

c) **Recommendation.** Where the **Reviewer** identifies an issue relating to the question, they should provide a recommendation. The phrasing and content of the recommendation should be as specific and actionable as possible, as discussed further in Section 0.

d) **Recommendation priority**. This cell enables the **Reviewe**r to select a priority level for the recommendation from the following list:

1) P1: A major issue with a potential impact of 0.5 stars or greater

2) P2: A significant issue with a potential impact of (approximately) 0.1-0.5 stars

3) P3: A smaller issue with a potential impact of (Approximately) less than 0.1 stars

4) N: A general note or advisory that does not necessarily deliver a specific Star rating benefit but contributes to overall design improvement.

The Template is designed to enable the recommendations to be collated automatically to assist in obtaining and managing design team responses.

B.3 Guidelines for recommendations

B.3.1 General

The quality of an **Independent Design Review**, and its likelihood of achieving positive outcomes, depends entirely on the quality of the recommendations.

The following parameters ("SANER") describe the features of a good recommendation:

a) **Specific:** Recommendations must be sufficiently specific that the following are clear without reference to additional context:

   1) What component/system is being discussed

   2) What the problem or issue is that underlies the recommendation

   It should be noted that the collation of recommendations in the **Template** and subsequent manipulation of recommendation lists by clients will tend to abstract recommendations from their original context.

b) **Actionable:** The recommendation should provide a clear design suggestion or action that can be followed up by the design team. A recommendation with no clear action will tend to be ignored.

c) **Neutral:** The recommendation is made in a constructive, non-judgemental manner using objective language. Where possible, reference should be made to external design standards, as this provides a more objective baseline to any recommendation.

d) **Engaging:** The recommendation should be expressed in complete sentences, avoiding the use of the imperative. This aids communication and reduces ambiguity.

e) **Respectful:** The recommendation assumes that the design team has good intentions and that where apparent major flaws are present, these are raised in a respectful manner that acknowledges the possibility of miscommunication.

B.3.2 Examples

B.3.2.1 General

Consider the following potential responses to a lighting design that uses T8 fluorescent lamps in an open plan office environment to achieve a lighting power density of 15W/m^2 and for which the drawings show no method of switching.

B.3.2.2 Appropriate recommendations

a) *"Area Z Lighting. The use of fluorescent lamps in this application has been superseded by LED technologies. Based on common practice, a modern LED installation would achieve a reduction in lighting power density of more than 50% relative to the current design. Standard X indicates an appropriate target for this space would be 7W/m^2. It is noted however that the lighting in the tenancies is outside the direct scope of the NABERS Energy for Offices and thereby only has a second order impact on the rating."*

b) *"Area Z Lighting Control. We were unable to determine the method of switching for the lights. We recommend that lights are controlled using a lighting control system in combination with occupancy sensors, with daylight dimming for the row of fittings adjacent to the windows."*

These recommendations meet the SANER criteria by being:

1) Specific: Clearly identifying what they relate to, so they can be quoted without supporting context.
2) Actionable: Providing clear actions for the design team, with some reference to external standards where appropriate.
3) Neutral: Avoiding value-based statements about the design even in the face of apparent major deficiencies.
4) Engaging: Full sentences are used to effectively communicate.
5) Respectful: Rather than assuming fault on the part of the design team with respect to the apparently absent lighting controls, the recommendations allow for the possibility of missing information or miscommunication.

B.3.2.3 Poor recommendations

The following are examples of poor recommendations:

a) *"Area Z Lighting. The lighting design is very poor and could be much better".* The recommendation makes value judgements that are likely to offend the design team, while making no constructive recommendation for an alternative.

b) *"We were unable to determine the method of switching for the lights. We recommend that lights are controlled using a lighting control system in combination with occupancy sensors, with daylight dimming for the row of fittings adjacent to the windows"* This is identical to the second recommendation in the appropriate recommendations section above, but is missing any indication of what component of the lighting design it refers to, making it difficult to work with once abstracted from its original context.

c) *"Area Z lighting. High lighting power density and no switching"* The recommendation is not actionable and is expressed in abbreviated (and abrupt) language.

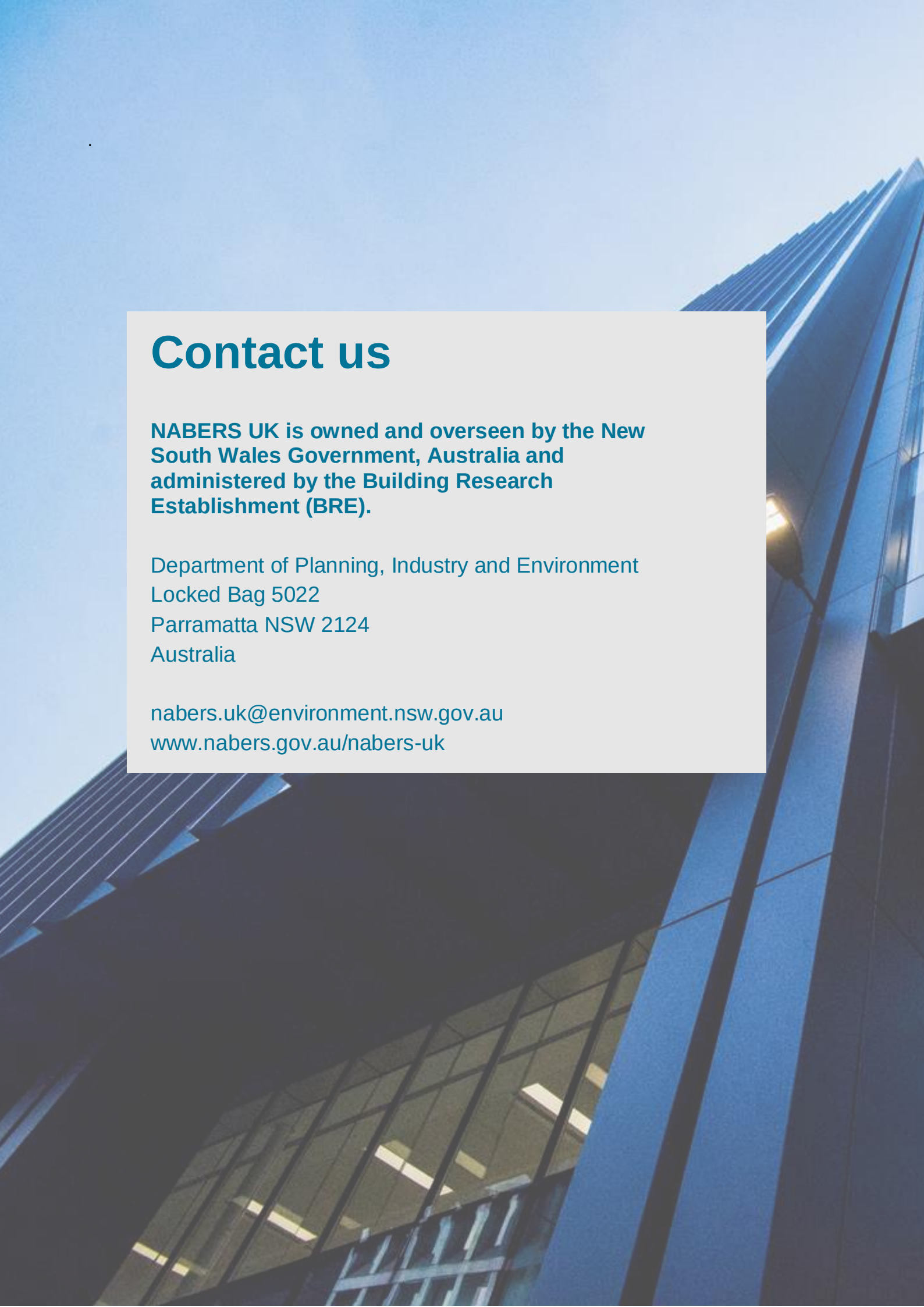
d) *"Area Z lighting control. The lack of light switches is a significant risk to the design and should be rectified thought the addition of a lighting controls system in combination with occupancy sensors, with daylight dimming for the row of fittings adjacent to the windows".* The phrasing of the recommendation assumes that the lack of switches is intentional as opposed to being missing information or miscommunication; this reads as disrespectful to the design team.

In all cases, these recommendations have a greater chance of providing a defensive response from the design team, which will significantly detract from the value that the **Review** should have provided.

B.3.3 Design Team Responses

After the **Review** has been completed, it should be provided to the **Applicant**. The **Applicant** will then distribute the **Review** to their design team for responses.

It is strongly recommended that once these responses have been received in writing, a design review workshop is held to discuss their responses. This workshop should include the **Applicant** as well as the design team, to assist in decision making.



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