

BUILDING ENERGY PERFORMANCE MANUAL POLICY OVERVIEW AND CLARIFICATION

This Appendix provides an overview of the Building Energy Performance Manual (BEPM) intent and clarification of several areas.

1.0 INTENT OF THE BUILDING ENERGY PERFORMANCE MANUAL

The broad intent of the Building Energy Performance Manual is policy which:

- Identifies Defence's obligations to reduce greenhouse gas emissions and Defence's responsibility for optimising the efficient use of energy and resources in buildings.
- Identifies associated BCA requirements, and in particular the application of BCA Section J Energy Efficiency in the design, delivery and use for all Defence buildings.
- Describes a process which assures compliance with Defence's obligations and requirements by:
 - Requiring provision of objective evidence throughout the building design and delivery process that clearly establishes Defence's obligations and responsibilities are capable of being met by the completed buildings.
 - Requiring post-construction verification via appropriate metering and reporting that the energy targets determined during the design process have been achieved or exceeded by the operating buildings.
 - Requiring remedial action where compliance is not achieved.

For all Defence buildings including offices there are two paths to BCA Section J compliance. These are a Deemed-to-Satisfy Provisions (DTS) approach and an Alternative Solution approach. (These are described in detail in the BCA and associated guidance publications and are not described here). Service Providers may develop Defence buildings using either approach.

(The term 'Service Provider' in this context should be read as referring to the particular service being provided at that time. I.e. the Design Service Provider during design; the Construction Service Provider during construction and during the defects liability period).

The BEPM acknowledges that whilst it applies to all types of Defence buildings, Defence projects cover a wide and diverse range of building types, sizes and complexity and as such projects may have different requirements for the extent of application of the BEPM and the BCA. BEPM clause 3.1 includes a statement to this effect. The term 'complexity' in this context should be understood to mean complex in relation to projects covering multiple Defence bases, each with multiple types of buildings, a diverse range of services and a complex delivery process, and that some buildings may fall outside of BCA Class 2 to Class 9.

2.0 BCA COMPLIANCE

2.1 DTS PROVISIONS APPROACH

- Where a DTS approach is taken Defence requires the general information about the project to be recorded and reported (e.g. project site and details, climate zone, project stage, building GFA, NLA, Class and use etc) together with specific information used in the DTS approach such as building fabric details, wall and floor types, glazing types etc. A tabular approach is proposed for the provision of this information.

- This information provides a record of the basis for the DTS approach and is intended to be recorded in BEPM Appendix B.
- In addition to the above information, Defence requires an Energy Performance Summary Report to be provided for the DTS approach with the information detailed in BEPM Appendix A for annual regulated consumption. The purpose of this information is to provide design energy performance targets for annual regulated consumption which can be compared to the post-construction actual operating building performance. Modelling for this purpose shall be carried out to determine the annual regulated energy consumption and greenhouse gas emission rates described in BEPM Appendix A. The annual unregulated and total (regulated and unregulated) annual energy consumption and greenhouse gas emission are NOT required for this particular purpose. Modelling shall be carried out with suitable energy rating software such as NABERS Guide to Building Energy Consumption Estimation.
- The information required under the DTS provisions approach is to be provided at each reporting stage and progressively updated to demonstrate and record development of the design throughout the delivery process. Reporting stages are set by the respective project. (The extent of information which can be provided at each reporting stage is determined by development of the project and the design work carried out up to the particular reporting stage).
- Prior to construction, the Service Provider shall provide design drawings which document the mechanical services energy saving features and energy saving details of the DTS approach. The intent of this requirement is for Service Providers to provide to Defence, signed, approved and verified drawings which clearly show and record the features and details of the pre-construction DTS building design. The required information may be provided on the design drawings or on a separate set of drawings specifically for this purpose. The choice is at the discretion of the Service Provider however, the information and its purpose must be clear and unambiguous.
- Post-construction, the Service Provider shall provide as-built services drawings which document the energy saving features and energy saving details incorporated into the completed building. The intent of this requirement is for Service Providers to provide to Defence signed, approved and verified drawings which clearly show and record the features and details of the constructed building. This allows comparison between the pre- and post-construction features and details for verification purposes. The intent is for this requirement to be recorded in BEPM Appendix A information.

2.2 METERING ASSOCIATED WITH DTS APPROACH

- To facilitate the post-construction verification process, electricity and gas metering systems shall be installed. The systems shall be capable of separating regulated energy from unregulated energy where these are defined as:
 - Regulated energy is the base building energy use of mechanical, artificial lighting, lifts and internal transport devices and hydraulic (domestic hot water) services.
 - Unregulated energy is the energy consumption which beyond procurement of the completed building is largely under occupant control. It covers equipment and processes contained within the building that are not part of the base building and typically includes

occupant controlled computer equipment, tenancy artificial lighting, conference room supplementary air conditioning, occupant equipment and the like.

- The separation of regulated and unregulated energy use shall be achieved by providing metering of regulated energy use and metering of total energy use (where total comprises regulated plus unregulated). The intent is not to require metering of unregulated energy use for BEPM purposes. Where metering of unregulated energy use is required for other contractual or practical reasons such as Defence Energy Efficiency and Resource Management (DEERM) Policy, NABERS Tenant Rating etc, this will be covered by policy other than the BEPM.
- To comply with this requirement, metering shall be provided in accordance with BCA Part J8 Provision J8.3 and electrical metering shall also comply with the specific requirements for metering described in the MIEE for High Voltage infrastructure.
- Where the building requires a NABERS rating other metering requirements are described below under clause NABERS AND EEGO.
- The intent of the BEPM is for the Service Provider to monitor via the metering system, the regulated and total energy use of the completed and occupied building, and report on this monthly during the defects liability period (DLP) or during the initial twelve months of continuous occupation in situations where the building is unoccupied for a period of the DLP.
- This allows a comparison of performance between the pre-construction design regulated energy targets and the actual post-construction occupied, operating building.
- Monthly demonstration is required that the regulated energy use of the occupied, operating building is not more than 110% of the pre-construction building design energy targets.
- Where the 110% is exceeded, the Service Provider shall undertake remedial action to achieve contract compliance.

BCA Provision J8.3 (a) floor area limitation of more than 500 m² for recording gas and electricity consumption shall not apply to Defence buildings. A Defence building must have the facility to record the consumption of gas and electricity, irrespective of the building area. However, exceptions to this requirement will occur due to the variety of building types, sizes and uses within Defence Estate. Typically, exceptions will occur where due to the floor area, type of use, or particular application, the provision of gas or electricity metering may be accepted by Defence as being unnecessary or not viable. In these specific situations, clarification of the requirements for gas and electricity consumption metering shall be sought by the Service Provider from DEEP, via the Project Officer or Project Director.

(Refer also to DEERM policy for any building metering requirements which may be subject to floor area or building type limitations).

The BCA's 2,500 m² minimum floor area limitation for the facility to record individually the regulated energy consumption of plant, equipment and systems described in BCA Provision J8.3(b) (i) to (vi) shall apply to Defence buildings unless NABERS or EEGO compliance is required as described under clause 3.0 of this document. In this situation, BCA Provision J8.3(b) minimum floor area limitation of 2,500 m² shall be reduced to 2,000 m² for the building to record individually the regulated energy consumption.

2.3 ALTERNATIVE SOLUTION APPROACH

- Where an Alternative Solution approach is taken Defence requires the general information about the project to be recorded and reported (e.g. project site and details, climate zone, project stage, building GFA, NLA, Class and use etc). This is the basic project information which is presently shown at the front of BEPM Appendix A, (Tables A1, A2). The Service Provider can equally attach this information to BEPM Appendix C.
- The Service Provider demonstrates BCA compliance by following the Alternative Solution approach using JV3 of BCA Section J and energy analysis/energy simulation software which is compliant with the Australian Building Codes Board (ABCB) Energy Analysis Software protocols.
- BEPM Appendix C describes the steps Defence requires for the Verification Method. These are as described in the ABCB handbook 'BCA Section J - Assessment and Verification of an Alternative Solution.'
- Modelling information and results are recorded in BEPM Table C1 to provide a record of the basis for the Alternative Solution approach and the post-construction energy use targets.
- From the modelling program results the simulated regulated energy use is extracted to provide post-construction targets for compliance verification purposes.
- This information is to be provided at each reporting stage and progressively updated to demonstrate and record development of the design throughout the delivery process. Reporting stages are set by the respective project. (The extent of information which can be provided at each reporting stage is determined by development of the project and the design work carried out up to the particular reporting stage).
- Prior to construction, the Service Provider shall provide design drawings which document the mechanical services energy saving features and energy saving details of the Alternative Solution approach. The intention of this requirement is for Service Providers to provide to Defence, signed, approved and verified drawings which clearly show and record the features and details of the pre-construction Alternative Solution approach building design. The required information may be provided on the design drawings or on a separate set of drawings specifically for this purpose. The choice is at the discretion of the Service Provider however, the information and its purpose must be clear and unambiguous.
- Post-construction, the Service Provider shall provide as-built services drawings which document the energy saving features and energy saving details incorporated into the completed building. The intention of this requirement is for Service Providers to provide to Defence signed, approved and verified drawings which clearly show and record the features and details of the constructed building. This allows comparison between the pre- and post-construction features and details for verification purposes. The intent is for this requirement to be recorded in BEPM Appendix A information.

2.4 METERING ASSOCIATED WITH ALTERNATIVE SOLUTION APPROACH

This is the same as described for the DTS approach.

3.0 NABERS AND EEGO

Some Defence buildings require a NABERS Energy rating. Typically, the requirement is stated in the contract documents, applies to offices and is a 4.5 stars NABERS rating. The reasons for a NABERS rating may include Energy Efficiency in Government Operations (EEGO) compliance as described below or may be a project

specific requirement intended to ensure best energy use applied to Defence buildings other than offices and applied to buildings of less than 2,000 m² size.

3.1 EEGO COMPLIANCE

Compliance with EEGO requirements was covered in the September 2005 Defence policy document 'Defence Green Buildings Requirements - Part 1.' Reference to EEGO requirements was therefore also included in the Building Performance Manual October 2010.

EEGO (2006) currently requires Defence to achieve 4.5 Stars NABERS Energy rating for office buildings $\geq 2,000$ m² net lettable area (NLA) with the specific rating determined by the percentage of total building area, as described under EEGO policy. Consequently, this EEGO requirement is included in the BEPM. The rating required by Defence may be base building or whole building as determined in accordance with EEGO policy applied to the particular project and as determined by the specific requirements of the Defence project contract.

The BEPM also includes the requirement that buildings less than 2,000m² net lettable area should attempt to achieve 4.5 stars NABERS Office Base Building Energy rating. This applies to any type of Defence building and should be understood as meaning "where this is practical to do so." The intent behind this requirement is that Defence must act responsibly on issues associated with minimising energy use, maximising efficient energy use and reducing greenhouse gas emissions. If current energy rating practice for office buildings greater than 2,000m² size can be reasonably applied to smaller buildings and to different types of buildings to achieve a performance which is similar to 4.5 stars NABERS, then Defence building designs should strive to achieve this.

3.2 NABERS COMPLIANCE

Where a Defence project requires a building to have a NABERS Base Building rating the building design and its services shall be modelled using the energy rating software associated with NABERS Guide to Building Energy Consumption Estimation, with details and reporting provided and with a general summary report as described in BEPM Appendix D. This energy rating modelling is in addition to any energy analysis/energy simulation and verification modelling required by the comparative BCA Alternative Solution approach. The intent is for the Base Building energy rating model to demonstrate the simulated performance of the building and thereby provide energy use targets which can be used by Defence post-construction to verify compliance.

From the energy rating software program results the simulated regulated energy use targets and the NABERS rating are extracted to provide post-construction targets. This information is to be provided at each reporting stage and progressively updated to demonstrate and record development of the design throughout the delivery process. Reporting stages are as determined in the project's contract with indicative stages being 30% CDR, 50% SDR, 90% DDR, For Construction, construction completion post - commissioning. (The extent of information which can be provided at each reporting stage is determined by development of the project and the design work carried out up to the particular reporting stage).

Defence experience has been that to achieve 4.5 stars NABERS Office Base Building Energy post-construction, the pre-construction modelled performance should be not less than 5 stars. However, it remains the Service Provider's responsibility to ensure the pre-construction rating is such as to ensure the required post-construction rating is achieved.

The intent of the BEPM is a NABERS Base Building rating. Where a NABERS Tenancy rating is required for a specific Defence project this would be covered by the contract documents and by policy other than the BEPM.

3.3 METERING ASSOCIATED WITH NABERS RATING

This is as described for the DTS approach. In addition, Service Provider's shall provide any additional metering and sub-metering necessary to allow performance comparison between the pre-construction NABERS rating and the actual operating building NABERS rating.

The Service Provider shall arrange assessment of the building and its services after 12 months of occupied operation and report the results to Defence including confirmation of having achieved the required NABERS Base Building Energy rating.

Where a Defence office building does not achieve the rating the Service Provider shall undertake remedial action to achieve compliance. Where the building occupation does not coincide exactly with the Defects Liability Period the assessment of the building and its services shall occur after 12 months of occupied operation.

4.0 ADDITIONAL METERING REQUIREMENTS

4.1 GENERAL

In addition to metering and sub-metering associated with DTS or Alternative Solution approaches and with NABERS, metering and sub-metering shall be provided as required by the BEPM for the following:

- Electrical Metering (BEPM clause 3.8.1).
- Gas Metering (BEPM clause 3.8.2).
- Other Fuel and Energy Systems (BEPM clause 3.8.3).
- Hydraulic Metering (BEPM clause 3.8.4).

The BEPM requires:

- Gas metering via gas smart meters with capability and connectivity to a National Gas Management System.
- Hydraulic metering via water smart meters with capability and connectivity to a National Water Management System.

The policy and requirements associated with smart metering and National Management Systems are covered by Defence Energy Efficiency and Resource Management (DEERM).

4.2 TENANT METERING

The BEPM is not intended to cover specific metering or sub-metering of tenant energy use unless covered by the above requirements. Specific additional metering required to manage the facility will be identified by Defence during design.

5.0 REASONABLE PAYBACK

BEPM clause 2.2.4 refers to whole of life (WOL) analysis which is based on a reasonable payback period and the calculation of the reduction in greenhouse gas emissions. Each individual case needs to be assessed to determine the 'reasonable payback period.' Guidance on what Defence considers 'reasonable' is as follows:

- A cost analysis of various HVAC system options which demonstrates that an investment is repaid in a shorter period of time for one particular system option compared to another system option is clearly a consideration, but not

the only consideration or a 'reasonable' consideration. A key consideration is the repayment period compared to the economic service life of the system. E.g. a repayment period of 10 years for an HVAC system which has an economic life of 12-15 years would be difficult to justify as reasonable. (HVAC equipment service life is clarified by Defence policy document 'Requirements for Heating, Ventilating and Air-Conditioning Systems for Defence Buildings – Part 1 General Guidance, Clause 6.9 Life Cycle Cost Analysis').

- Reasonable payback periods can be project specific. E.g. where a Defence project has a limited life of say 5 years, a payback period of 6 years is clearly not reasonable.
- The MIEE refers to the financial assessment for various electrical services equipment demonstrating a payback period of within 5 years. A reasonable payback period for most HVAC businesses is understood to be of the order of 1- 6 years, consequently, the MIEE requirement of within 5 years is considered equally applicable and suitable for HVAC systems.
- For the purposes of the BEPM a reasonable payback period is considered to be within 5 years, subject to consideration of all associated project specific matters such as the economic service life of the particular HVAC system and the life of the particular Defence project.
- The above statement is qualified by the fact that Service Providers are engaged by Defence to provide recommendations and advice based on their area of expertise and professional competence. Defence expects Service Providers to apply sound judgement when assessing and recommending what is considered a reasonable payback period in the particular circumstances.

6.0 BUILDING SEALING

6.1 COST AND PROGRAM IMPLICATIONS

Effective building sealing has been a BCA requirement since BCA 2005. In 2010 the Australian Building Codes Board (ABCB) clarified the intent of BCA Part J3 as follows:

“Section J of the BCA is designed to work as a system to ensure the building achieves the desired level of energy efficiency. Building sealing is an integral part of this system and the control of air leakage will have a major impact on the thermal performance of the building, in particular, the capacity to reduce energy required for artificial heating, cooling and humidity control.”

“The intent of Part J3 is to restrict the unintended leakage of outdoor air into the building and loss of conditioned air from the building.”

“Building sealing provisions have changed little since first introduced into Volume One in 2005.”

BCA 2012 Section J Energy Efficiency Performance Requirements JP1 states: “A building, including its services, must have, to the degree necessary, features that facilitate the efficient use of energy appropriate to ... (f) the sealing of the building envelope against air leakage.”

This same requirement is included in BCA 2008, 2009, 2010 and originally goes back to the intent of BCA 2005.

Effective building sealing has been a BCA requirement for many years and is not a recent Defence initiative. Service Providers to Defence have been contractually

required for many years to provide BCA compliant buildings which include effective and compliant sealing and to provide evidence of compliance. As such, Defence reasonably considers that Service Providers have been allowing for the cost and time required to achieve full BCA compliance, including carrying out the work required to verify compliance and providing evidence of that compliance.

The Building Performance Manual (BPM) which preceded the BEPM included the following requirement for Service Providers to submit evidence confirming compliance that leakage testing had been carried out.

“Clause 3.4.1 Building Sealing

All heated and/or cooled spaces shall be sealed in accordance with the requirements of the current edition of the BCA part “*Building Sealing*” and to the degree necessary to reduce infiltration and/or exfiltration through the building fabric to an air leakage rate of not more than $3\text{m}^3/\text{h.m}^2$ of surface area including the floor, at a static pressure of 50Pa.

All sealed buildings shall be suitably pressure tested to adequately prove performance in accordance with the procedure shown in the UK Air Tightness Testing and Measurement Association (ATTMA) *Technical Standard 1 - Measuring Air Permeability of Building Envelopes, 2007*.

Where the building is considered too large or too complex to test the entire building, consideration shall be given to alternative pressure testing procedures (e.g. testing parts of the building are used as reference to sealing adequacy implemented throughout the building).

The design leakage rate per unit fabric area and the total leakage rate calculated for the building shall be provided at each stage of documentation.

The design and tender documentation shall include the maximum leakage rate objective, the construction methods to achieve the objective and the testing methods to verify that the objective has been met.”

It is clear that before the introduction of the BEPM, BPM policy required compliance with the BCA generally and building sealing in particular. It is also clear that compliance with BCA Building Sealing has been a Defence requirement for many years. Defence can therefore reasonably expect that the time and cost implications associated with achieving and proving compliance and providing suitable evidence, have been allowed for by Service Providers.

BEPM clause 3.5.1 updates and clarifies the BPM policy requirements for building sealing. It provides guidance on an appropriate testing method and requires evidence to be provided to Defence that testing has been carried out, BCA compliance achieved, and certification provided for the project record.

6.2 APPLICATION TO DEFENCE BUILDINGS

Defence buildings cover a significant range of types, sizes and applications and typically are not simple commercial office type buildings. As such, it is not realistic to apply a blanket requirement for building sealing to all Defence buildings based on buildings above a certain size, or buildings of a certain type or application. The guiding principle in this matter is compliance with the intent of the BCA and provision to Defence of objective evidence confirming compliance.

The BCA requires building sealing to control air leakage and thereby reduce the energy required for artificial heating, cooling and humidity control. Defence requires Service Providers to provide for the project record, credible, auditable evidence of compliance with BCA requirements for building sealing and certification to that effect.

The BEPM provides guidance to Service Providers on an appropriate procedure for determining building sealing effectiveness. This does not preclude Service Providers from assuring compliance in another credible and verifiable manner and providing certification of BCA compliance.

The BCA does not qualify the building sealing requirement in terms of building size and therefore, neither does Defence. Defence does however recognise that by the very nature of Defence buildings there will be exceptions and consequently the BEPM states:

“Pressure testing for building sealing shall generally be carried out irrespective of building size. However, exceptions may apply at Defence discretion to specific building types and size which are unsuitable for the testing procedure.”

Service Providers may therefore request an alternative solution from compliance with BEPM policy for testing the entire building to prototype testing on this basis, in the existing format for project alternative solution requests and in a timely manner during design.

7.0 DATA CENTRE AIR CONDITIONING SYSTEM SELECTION

BEPM clause 3.6 states Defence requirements for Data Centre air conditioning system selection. Defence’s intent is for software used to model Defence buildings including Data Centres to be of an appropriate standard for the application. In this regard, the software must be compliant with the ABCB Protocol for Building Energy Analysis Software Version 2006.1 which permits use of computer energy modelling software which has passed ASHRAE Standard 140-2001 ‘Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs’ using the International Energy Agency BESTEST method. The Protocol defines minimum requirements for energy modelling software and for user training.