2010 Edition

ABCB

Applying energy efficiency provisions to new building work associated with existing Class 2 to 9 buildings

2010

Handbook

NON-MANDATORY DOCUMENT

INFORMATION HANDBOOK

Applying energy efficiency provisions to new building work associated with existing Class 2 to 9 buildings

2010

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The Australian Building Codes Board (ABCB) and the participating Governments are committed to enhancing the availability and dissemination of information relating to the built environment. Where appropriate, the ABCB seeks to develop non-regulatory solutions to building related issues.

This Handbook on applying energy efficiency measures to new building work associated with existing Class 2 to 9 buildings (the Handbook) is provided for general information only and should not be taken as providing specific advice on any issue. In particular, this Handbook is not mandatory or regulatory in nature. Rather, it is designed to assist in making information on this topic readily available.

However, neither the ABCB, the participating Governments, nor the groups which have endorsed or been involved in the development of the Handbook, accept any responsibility for the use of the information contained in the Handbook and make no guarantee or representation whatsoever that the information is an exhaustive treatment of the subject matters contained therein or is complete, accurate, up-to-date or reliable for any particular purpose.

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Users should exercise their own skill and care with respect to their use of this Handbook and should obtain appropriate independent professional advice on any specific issues concerning them.

In particular, and to avoid doubt, the use of this Handbook does not –

- guarantee acceptance or accreditation of a design, material or building solution by any entity authorised to do so under any law;
- mean that a design, material or building solution complies with the Building Code of Australia (BCA); or
- absolve the user from complying with any Local, State, Territory or Australian Government legal requirements.

This document was first published in 2007. It was revised in 2010 in line with revisions to energy efficiency in the Building Code of Australia as part of the National Strategy on Energy Efficiency.

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Preface

The Inter–Government Agreement (IGA) that governs the Australian Building Codes Board (ABCB) places a strong emphasis on reducing reliance on regulation, including consideration of non–regulatory alternatives such as non–mandatory documents.

This Handbook is one of a series produced by the ABCB. This series of Handbooks is being developed in response to comments and concerns expressed by government, industry and the community that relate to the built environment. ABCB Handbooks are informative non-mandatory documents containing generic advice on factors that may be considered, or approaches that may be taken, in dealing with specific building issues. Any numerical values or specific instructions contained in this Handbook should be considered as examples of outcomes from the proposed process rather then specific guidance on the issues. It should be noted that the Handbook represents the views of the ABCB and the authors and there may be other equally valid points of view on these topics.

The application of the Building Code of Australia (BCA) to existing buildings being altered, extended or undergoing a change of use or classification is covered in the relevant building legislation in each State and Territory. This Handbook has been produced to provide guidance in generic terms. The Administrations in the States and Territories may also produce advisory documents.

It is expected that this Handbook will assist a broad range of stakeholders to understand the application of the BCA energy efficiency provisions to new building work associated with existing buildings. It will also assist in developing appropriate building solutions by better understanding the requirements of the BCA and the powers that the building control authority have under building legislation.

Energy efficiency provisions are relatively new to the BCA and industry has sought guidance on how the provisions would be applied to new building work in existing buildings. Although each project is unique, and each jurisdiction has different requirements in its building legislation, this Handbook provides some advice on general principles.

To make comment on this Handbook or to seek further information please contact the General Manager of the ABCB at e-mail address abcb.office@abcb.gov.au or mail address GPO Box 9839 Canberra ACT 2601.

Acknowledgments

The 2010 energy efficiency updates to the BCA are a joint initiative of Australian, State and Territory Governments as part of the National Strategy on Energy Efficiency.

The ABCB acknowledges the valuable contribution of the building control administrations in the States and Territories. The ABCB is also appreciative of photographs provided by:

- The Australian Institute of Refrigeration Air-conditioning and Heating (AIRAH)
- The Insulation Council of Australia and New Zealand (ICANZ)
- Department of Environment, Water, Heritage and the Arts (DEWHA)

Terminology

There is a range of different terms used by the construction industry and contained in State and Territory building legislation to describe new building work carried out within an existing building (e.g. an alteration, refurbishment, renovation or fit-out) or a new part of a building (e.g. an addition, extension or new construction). In this document the term "new building work associated with an existing building" will be used. The term "new building work" covers work on building elements such as roofs, walls, ceilings, glazing etc and also work on services such as air-conditioning, lighting and hot water supply.

A change of use or classification may also be a trigger for new building work in an existing building. The designer may not wish to make any significant changes with respect to energy efficiency, but if, for example, a building that previously was a shop is to be fitted out as a restaurant (both Class 6 buildings) different BCA requirements may necessitate a change such as more fresh air for the increased number of occupants. This could, in turn, lead to a new air-conditioning unit. Will that unit then need to comply with the energy efficiency provisions? The answer may depend upon the legislation in the particular jurisdiction.

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1 Introduction

Reminder:

This Document is not mandatory or regulatory in nature and compliance with it will not necessarily discharge a user's legal obligations. This Document should only be read and used subject to, and in conjunction with, the general disclaimer at pages i and ii.

This Handbook also needs to be read in conjunction with the building legislation of the relevant State or Territory. It is written in generic terms and it is not intended that the content of the Handbook counteract or conflict with the legislative requirements, any references in legal documents, any handbooks issued by the Administration or any directives by the building control authority. See Appendix A for Summary of State and Territory advice.

1.1 Background

Energy efficiency provisions were introduced into the Building Code of Australia (BCA) in stages. The first was in 2003 for Class 1 and 10 buildings (BCA Volume Two). This was followed in 2005 by provisions in Volume One for Class 2 and 3 buildings and Class 4 parts of buildings. The range of buildings became complete in 2006 when provisions for Classes 5 to 9 buildings were also added to Volume One. At the same time, the provisions for Classes 1 and 10 in Volume Two were made more stringent. In 2010 the stringency of the provisions in both Volumes was increased.

This Handbook provides guidance on the application of the BCA energy efficiency provisions to new building work associated with existing Class 2 to 9 buildings. It does not provide guidance with respect to Class 1 or Class 10 buildings.

Designers are often required to consider the extent of BCA compliance that is required for new building work associated with existing buildings. Likewise, building control authorities undertake the same consideration when assessing an application for compliance. The approach taken in applying the energy efficiency provisions should be no different to the approach taken in the application of other BCA provisions. This Handbook reinforces this approach with general principles and with examples involving specific elements and systems to which the BCA energy efficiency provisions apply.

It is intended that this Handbook be read in conjunction with the relevant BCA provisions, including the relevant Objectives, Functional Statements, Performance Requirements and Deemed-to-Satisfy Provisions, and other informative and training material produced by the ABCB and the State and Territory governments.

These include but are not limited to -

- BCA Volume One for Class 2 to 9 buildings.
- Guide to the BCA for Class 2 to 9 buildings.
- Information Handbook – Energy Efficiency Provisions for BCA 2010 Volume One

The requirements of the BCA relating to energy efficiency represent the minimum acceptable building standards as determined by wide consultation with governments, industry and the community.

This Handbook also needs to be read in conjunction with the building legislation of the relevant State or Territory. It is written in generic terms and it is not intended that the content of the Handbook counteract or conflict with the legislative requirements, any references in legal documents, any handbooks issued by the Administration or any directives by the building control authority.

This Handbook does not override or replace the BCA, but rather provides additional information and guidance with the principles explained. It also uses examples to aid the user in the application of the new BCA energy efficiency provisions associated with an existing building. It is recommended that users of this Handbook seek specialist advice in its application to specific projects.

Reminder:

This Handbook is not intended to-

- override or replace any legal rights, responsibilities or requirements;
- provide comprehensive or detailed guidance or provide specific design solutions for a particular building or site; or
- replace available published information.

1.2 Legislation governing building

Building control is the responsibility of each State and Territory. The BCA is adopted by the State and Territory building legislation as the technical standard for the design and construction of buildings. The legislation generally applies the BCA to new buildings, new building work in existing buildings and changes in building classification

or use. The legislation details when the BCA must be complied with and this varies to a degree in each State and Territory. It may be when development approval is sought, it may be when building approval or a building assessment is sought or it may apply to any work covered by the BCA even if a permit or approval is not needed.

Building control authorities are often required to determine whether to approve the application of the BCA and the extent of BCA compliance for existing buildings undergoing change. The building legislation in some jurisdictions may specifically refer to a building control authority having discretionary powers in relation to existing buildings.

Building legislation is generally not retrospective, that is it does not usually require existing buildings that are not undergoing building work to be upgraded to present day requirements. There are a few exceptions in special circumstances in some jurisdictions where existing parts may need to be upgraded. Examples of such exceptions include sprinklers, smoke alarms and pool fencing.

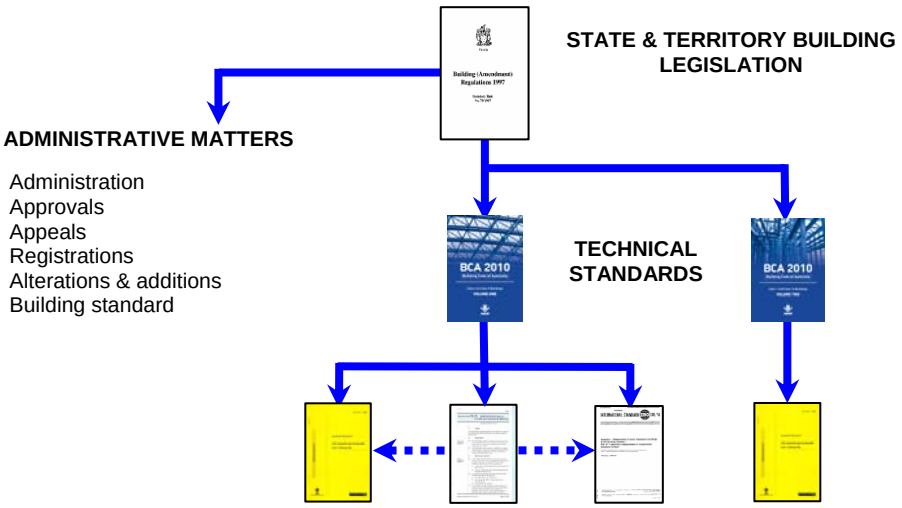
The BCA is applied to all new building work be it for a new building or associated with an existing building. The new building work associated with an existing building may be at the owners' choice or may be required as a result of a public safety matter or the building undergoing a change of use or classification. An example of the latter would be if an office building (a Class 5 building) is changed into a shop (a Class 6 building) or a shop (a Class 6 building) is changed into a restaurant (a Class 6 building).

The provisions generally do not apply to the refurbishment of an existing building that is purely undergoing repair and maintenance such as replacement of surface finishes. In these circumstances the general principle is to replace like with like and not to reduce the existing level of safety. Again, depending upon the jurisdictions, there may also be special powers to order other additional work to an existing building. These may be conditions for development approval which is different to building approval.

In some jurisdictions building legislation includes a trigger for upgrading the whole of the existing building under certain circumstances.

There may also be exemptions or partial compliance concessions in the building legislation for new building work in heritage listed buildings so as to preserve the heritage value of the building.

The following diagram shows the relationship of the building legislation, administration of building matters, the BCA and BCA reference standards.



As stated earlier, another legislative trigger may be where the building's use or classification is being changed. The designer may not wish to make any significant changes with to respect energy efficiency, but may be required to if the new use or classification has specific requirements. Generally a change of use or classification will require planning consideration and building approval.

1.3 The Building Code of Australia (BCA)

For completely new buildings, the application of the BCA is straightforward as it is applicable to all aspects of the construction. For new building work associated with an existing building, the BCA is generally only applicable to the new building work, to those parts of the building directly affected by the new building work or to those parts where the building's use is being changed.

Under certain circumstances, however, such as for change of use or change of classification, the whole of an existing building may be required to achieve compliance with the BCA but that may not necessarily mean Deemed-to-Satisfy compliance. This is dependent on the requirements of the particular State or Territory building legislation and the extent of any changes.

The BCA is amended annually and the date of adoption is May 1 unless otherwise stated in the History of Adoption at the rear of the BCA. Most jurisdictions have transitional arrangements for work planned or in progress when the BCA is changed.

When the BCA is changed, the new BCA provisions do not automatically apply to existing buildings where no new work is being undertaken.

Notwithstanding the application of the BCA to new building work associated with an existing building, a building control authority in some jurisdictions may grant a dispensation from the need to comply with the BCA or certain provisions of the BCA. This will depend upon the nature of the changes to the existing building and the dispensation powers given to the building control authority by the applicable State or Territory building legislation.

Similarly, energy efficiency maintenance provisions do not apply to an existing building where there is no new work being undertaken. However, the new maintenance provisions will apply to any new work carried out in association with an existing building again, subject to State or Territory legislation.

The following provides general guidance on the application and extent of compliance required for an existing building undergoing change. It should be noted, however, that the final decision is one for the building control authority and is dependant upon the particular characteristics of the existing building and the type and extent of work being carried out. Appendix A provides additional guidance specific to the various States and Territories.

1.4 Assessment of compliance

A number of Parts of Section J may require the assistance of specialists in order to determine compliance; in particular, the air-conditioning systems and the lighting systems.

Due to the diverse range of systems for which such input may be required, it is unlikely that any single specialist could assist with all the services systems. However, specialists covering a range of services are available in the marketplace.

Some professional associations whose members may provide appropriate specialist professionals are:

- The Australian Institute of Refrigeration Air-conditioning and Heating
- Engineers Australia
- The Association of Consulting Engineers Australia
- The Association of Building Sustainability Assessors
- The Society of Building Services Engineers

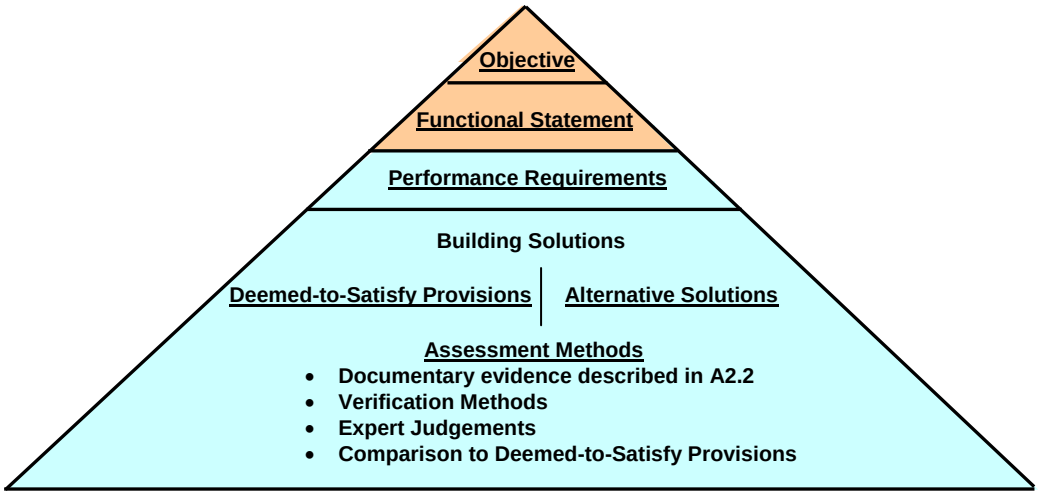
- The Illuminating Engineering Society of Australia and New Zealand

There may also be a State or Territory accreditation or registration scheme for these specialist practitioners including other competent persons (refer to regulation).

1.5 The performance based BCA

The BCA was redeveloped in 1996 into a fully performance-based building code. This includes a performance-based hierarchy consisting of Objectives, Functional Statements and Performance Requirements. The Performance Requirements have been developed to satisfy both the BCA Objectives and Functional Statements.

The Objective describes community expectations and the Functional Statement describes how the building is to fulfill that expectation - both are provided as guidance. The Performance Requirement sets the minimum acceptable performance that must be achieved in order to meet the Objective. It is the fundamental mandatory component of the BCA and describes the level of performance which must be met by building materials, components, design factors and construction methods in order for a building to meet the Objectives and Functional Statements. The Performance Requirements are generally qualitative.



BCA Clause A0.5 states that compliance with the Performance Requirements is achieved by using an appropriate Building Solution. There are essentially three options for that Building Solution:

- Compliance with the Deemed-to-Satisfy Provisions.
- Use of an Alternative Solution justified by the appropriate Assessment Method.
- A mixture of both Deemed-to-Satisfy Provisions and Alternative Solution.

The Deemed-to-Satisfy Provisions for energy efficiency prescribed in the BCA contain a range of practical, commonly used and cost effective building solutions such as insulation in roofs, walls and floors, glazing of low solar heat and conductance characteristics, shading, energy efficient air-conditioning plant and energy efficient lighting. However, the Deemed-to-Satisfy Provisions are only some of the Building Solutions that will meet the Performance Requirements.

The other type of Building Solution that may meet the Performance Requirements is an "Alternative Solution". An Alternative Solution is a Building Solution that complies with the Performance Requirement other than by reason of satisfying the Deemed-to-Satisfy Provisions. This can be assessed for compliance with the Performance Requirement using one, or any combination of, the four Assessment Methods described in BCA Clause A0.9. They are:

- Evidence to support that the use of a material, form of construction or design meets a Performance Requirement or Deemed-to-Satisfy Provision as described in Clause A2.2.
- Verification Methods such as:
  - the Verification Method in the BCA; or
  - other Verification Methods that the Building Control Authority accepts for determining compliance with the Performance Requirements.
- Comparison with the Deemed-to-Satisfy Provisions.
- Expert Judgment.

2 The BCA energy efficiency provisions

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The BCA energy efficiency provisions were developed on the basis of them being cost-effective for a long term building owner using certain defined financial criteria. Guidance on the economic criteria used in developing the BCA energy efficiency provisions can be found in the Regulation Impact Statements on the ABCB web site. While the economic criteria used in this report may change over time, the basic principles for determining long-term cost effectiveness remain the same.

2.1 Principles with respect to existing buildings

The following broad principles provide guidance when applying the BCA energy efficiency Performance Requirements to new building work associated with an existing building.

1. The new work must comply unless the State or Territory legislation exempts the building to some degree, which may be the case with a heritage building, or the legislation permits the building control authority to exercise discretion.

2. The existing building and its services must be made to comply where required by State or Territory legislation.

3. The new work must not reduce the existing building's level of energy efficiency below that which was required by the BCA at the time of its construction or its most recent work.

4. The new work should not reduce the existing building's level of energy efficiency even if it were constructed prior to energy efficiency provisions being introduced into the BCA.

5. The energy efficiency of the existing space, or the services directly associated with the new building work, should be improved if the improvement is reasonable, cost effective and practical.

2.2 Performance Requirements

When carrying out new building work associated with an existing building, there are a number of factors that may compromise the ability of the new building work to fully comply with the BCA provisions.

These factors are generally related to the location of the existing building on the site, which may, for example, prevent the addition of shading devices if they encroach over boundaries, the practicality of replacing major building elements, the internal configuration of existing spaces and the services being reused.

The Performance Requirements JP1 and JP2 in BCA Volume One contain the phrase *"to the degree necessary"*. This phrase potentially allows flexibility in determining the compliance of Alternative Solutions, particularly those developed for new building work associated with an existing building. This means that, provided it is demonstrated that the "degree (of compliance) necessary" is achieved, the building control authority may accept an Alternative Solution which is different to the Deemed-to-Satisfy Provisions but appropriate for that particular building.

Performance Requirement JP1

A building, including its *services*, must have, to the degree necessary, features that facilitate the efficient use of energy appropriate to-

(a) the function and use of the building and *services*; and

(b) the internal environment; and

(c) the geographic location of the building; and

(d) the effects of nearby permanent features such as topography, structures and buildings; and

(e) solar radiation being-

(i) utilised for heating; and

(ii) controlled to minimise energy for cooling; and

(f) the sealing of the building *envelope* against air leakage; and

(g) the utilisation of air movement to assist heating and cooling; and

(h) the energy source of the *services*.

It should be noted that this is not an excuse for non-compliance. The building control authority will consider an Alternative Solution using an Assessment Method and ascertain the appropriateness of the chosen "degree (of compliance) necessary". Meeting the Performance Requirement is mandatory.

Consideration could also be given to still applying the provisions, but in a less stringent manner, or by compensating in some way for the under performance of certain elements. Some States and Territories have panels or boards that can grant a concession or provide an opinion on whether a proposed solution meets the Performance Requirement.

A test of "to the degree necessary" must be objective in determining what is a reasonable degree of compliance for acceptance. The test of reasonableness could include consideration of how practical or constructible a provision may be in a particular instance and the likely cost and benefit, provided that the Performance Requirement is met.

In some instances it may seem unreasonable to apply the provisions to an extension or a building being altered (e.g. the sealing requirements) because the nature of the existing building (unsealed) may compromise the benefits to be gained by constructing the new building work to the minimum provisions. However, to the extent allowed under the respective State or Territory legislation, such issues should be considered holistically as a building undergoes many redevelopments over its life. As such, it could be expected that at some point the remainder of the building may also be required to be upgraded to meet minimum provisions.

The energy efficiency of the existing building should be dealt with in the same manner as structural and fire safety issues and access for people with disabilities, in that it may form part of an overall building upgrade plan.

As with any performance-based solution, such decisions would need to be documented, including details of the justification using one of the Assessment Methods in order to demonstrate compliance with the Performance Requirement.

2.3 Verification Method

A Verification Method is one way of demonstrating compliance with the Performance Requirement and Section J currently contains a Verification Method for Classes 2 to 9 buildings titled JV3.

By using a Verification Method it may be possible to demonstrate that the work associated with an existing building complies with the Performance Requirement even if some of the elements do not comply with the Deemed-to-Satisfy Provisions. For an existing building receiving a new roof some jurisdictions may require all BCA requirements to be addressed but it may not be practical for the wall insulation, for example, to comply if the lining was not intended to be removed. In this case, if compliance was a requirement, more insulation could be added to the roof to compensate. Similarly, to use another example, it may be impractical to increase the amount of insulation on services sealed within riser shafts but it may be possible to use more efficiency fans or pumps to compensate.

The Verification Method is intended as a whole-of-building approach and so in many cases it may not be appropriate to apply them to a small extension. For a large, stand-alone extension there may be cases where the extension could be treated as a separate building that happens to be abutting, and accessible to, another building; particularly where the extension has its own services. In this way, the annual energy consumption of the extension's services could be modelled as part of a Verification Method assessment.

2.4 Deemed-to-Satisfy Provisions

It is not possible to address all of the situations involving new building work associated with existing buildings that may be confronted by a designer or building control authority.

For completely new buildings the application of the BCA provisions is straightforward applying to all aspects of the construction but for existing buildings being altered, extended or refurbished, the BCA is generally only applicable to the new building work, that is, to those parts of the building directly being affected by the new building work.

For a building undergoing a change of use or change of classification the application of the BCA may require new work to be done to bring the existing building and services up to the current BCA requirements.

2.5 Building fabric

The thermal performance of the building fabric is of paramount importance in any building, as once established, it is unlikely to diminish while that of active systems such as air-conditioning and lighting may diminish depending upon the quality of maintenance and changes over time. Although not an energy user itself, the fabric and glazing has a major impact on the services that are, i.e. the air-conditioning and the lighting.

Where a building is being extended, the fabric of the extension must comply fully with the BCA fabric provisions. Note that for some classes of buildings, provisions only apply to the fabric of a conditioned space.

Where the new building work includes the replacement of existing elements, such as roof cladding, wall cladding or wall lining, it is likely that this would provide access to the framing of the roof or wall. In these instances, the required insulation should be added. In some situations, such as a major refurbishment or for a space being extended, the legislation may require that the insulation be added where practical even if the lining is not intended to be replaced.

If there are only minor changes to the roof cladding, wall cladding or wall lining to match the new building work and access to the framing is not provided, then it may be unreasonable to require this to be removed, solely to install insulation. Similarly, if a shop is undergoing a new fit-out and the existing fabric is not being altered in any way, then the fabric may not need to be upgraded to comply as it is not part of the new building work.

Even though a change to the existing part of a building may not be part of the new building work, the legislation in some jurisdictions may require that the thermal performance of the existing building not be diminished. For example an extension may over-shadow an existing north exposure in a cold climate and reduce passive solar heating. Some compensating provision may be needed.

Example 1:

An existing office building between a main street and a rear lane is being extended to the adjoining side allotment boundary and the existing front facade is being replaced. The fabric of the extension must comply with the BCA fabric provisions as must any new building work in the existing building. The legislation in some jurisdictions may require that insulation be added to the front wall of the existing building as elements of the wall are new and the framing is exposed while the facade is replaced, or, subject to spatial constraints, an insulating facade panel could be used. However, this may not be the interpretation in all jurisdictions.

As work is not being carried out on the rear wall of the existing building (other than painting) that wall may not have to be insulated unless, in some jurisdictions, it is required because it is part of a major refurbishment.

Example 2:

An existing shop is being refitted for a new tenant. The services (lighting and air-conditioning) are being replaced with enhanced performance equipment. The only work on the building fabric proposed is the timber panelling on the internal face of the external walls being replaced with plaster, repainting throughout and new built-in furniture. The ceiling is cathedral type with no access.

The new work must comply. The lighting and air-conditioning will be discussed later.

As for example 1, under the legislation in some jurisdictions it may be required that insulation be added to the walls as new building work is taking place on the external wall. That is, the timber panelling is being replaced with plaster so it should be possible to install wall insulation.

Unless the roofing is being lifted to install lighting wiring, there may be no requirement to install roof insulation.

Because the glazing is not being replaced it is unlikely that it would be required to comply to the current BCA provisions even though it may be possible to install external shading (subject to the proximity to the site boundary) and it would be practical to install a solar film on the outside. Such work would be over and above the BCA Deemed-to-Satisfy Provisions but could be a practical compensatory option as part of an Alternative Solution.

2.6 Glazing

Glazing is probably the most important building element in a commercial building as even the best glazing barely performs as well as an un-insulated wall.

If all the existing glazing in a building is being replaced, then the new glazing must comply with the current BCA glazing requirements as it is new building work.

Similarly, where an existing building is being extended, the glazing in the new part must comply with the BCA glazing provisions. However, this is complicated by the fact that the glazing provisions are determined on the basis of each facade in each storey. This means that the existing glazing may also need to be considered when determining compliance for the new building work.

It may be difficult for the new glazing in an extension to compensate for the poor performance of existing glazing. In this instance, an option may be to undertake the analysis to the whole façade but only require the glazing in the extension to comply.

Shading is an integral part of the performance of the glazing but there may be site constraints or planning requirements that prevent external shading from being provided. In such instances, the required level of performance may still be achieved with unshaded glazing and if not an Alternative Solution could be proposed with a reduced level of glazing performance compensated with over performing other aspects of the building or the engineering systems.

Example:

On a university campus, a new 10 storey building is being constructed close to a recently completed existing 4 storey building. The architect, being concerned about the reduction in natural light penetration into the existing building wishes to remove shading projections above and reveals at the side of, the existing windows, acknowledging that the thermal performance of the existing building may be reduced.

Any proposed work on the existing building will potentially attract consideration of BCA provisions. Although there are no new components being added to the existing building, the removal work may affect the existing glazing's thermal performance. If the building was constructed post BCA energy efficiency provisions, the required performance would need to be retained so an assessment would be appropriate. The

work would need to be assessed against the BCA performance requirement as the Deemed-to-Satisfy Provisions do not account for adjacent buildings.

2.7 Building sealing

Buildings need to be sealed to avoid the loss of conditioned air or the entry of uncontrolled outside air, particularly in the more extreme climates.

Where an existing building is being extended, the new building work must comply with the BCA sealing provisions.

Sealing is a provision that, in practice, applies to a complete space. In the case of an existing room being extended, the practicality for sealing may depend upon the condition of the existing part of the room.

When compliance of the new building work contributes little to the thermal performance of the space, some strategy to improve the situation could be considered, such as an Alternative Solution, measured against the principles of viability, cost effectiveness and practicality.

In the case of a space being extended, if one part of a space has large areas of unsealed louvered glazing then there may be little benefit in sealing the other part. The complete space may need to be considered in applying any relevant concessions. The final decision may depend on the relative size of the space and the extent to which the existing part is unsealed. Another consideration is the likelihood of the existing part being sealed in the future.

In the case of a new extension to an existing unsealed building, a practical approach may be to physically separate the new and existing parts of the building in order to isolate sealed and unsealed spaces.

Example 1:

A hardware shop in climate zone 6 is to be extended to add a warehouse for timber, etc. The shop is heated but not the warehouse, other than spot heating at the storemen's counter (less than 15 W/m^2) but the owner wants free movement between the two.

Again, all the new building work must comply with the BCA Performance Requirement and if the heating load for the warehouse is more than 15 W/m^2 then it becomes a conditioned space and must be sealed (as well as meeting other provisions).

It may be more cost effective to separate the old from the new and install automatic doors between the two.

Example 2:

An existing laboratory building is undergoing a change in the layout of the individual laboratories including new benching, fume cupboards and some minor partitioning changes. The existing building is not well sealed and the architect is unsure as to the level of sealing needed.

All new building work must comply with the BCA requirements. Benching, fume cupboards and minor partitioning are not directly regulated in any specific way in those provisions, however their installation, particularly the fume cupboards, may impact on the sealing provisions. Clause J3.1 exempts "a building or space where the mechanical ventilation required by Part J4 provides sufficient pressurisation to prevent infiltration."

There are a number of factors relating to the degree of pressurisation but this would need specialist input. For example, the building may need more outside air than usual to reduce contaminate levels from the experiments which could help to pressurise the building and so reduce the need for sealing. Another factor is the type of fume cupboards as some only exhaust air while others introduce outside air to balance the exhaust. An air balance assessment by a specialist may be needed as part of a performance-based solution.

2.8 Air-conditioning and ventilating systems

Air-conditioning and ventilating systems may consist of new systems that are installed in a new building or in an extension. They may also be partly new and partly existing systems within the existing building.

New systems and new elements in new parts of a building and new elements and systems in existing parts of a building must all comply with the BCA services provisions.

Some air-conditioning provisions in the BCA relate to the system while others relate to the equipment. System related aspects include outside air economy cycles, controls, time switches and fan motor power. If these are part of the new building work then they must comply with the BCA provisions. If they are existing but may effect the operation of the new part of the system then they must also be assessed and possibly made to comply with

the BCA provisions. However, if they are existing and only affect existing elements and not the new building work, they are not required to comply other than when a full upgrade is required by a legislative trigger in some jurisdictions.

New items such as a boiler, chiller, fan, package air-conditioner, pump, piping insulation (for new piping) and the like must comply with the BCA provisions.

New piping and ductwork, whether within a new or existing part of a building, must comply with the BCA provisions. Existing piping and ductwork serving areas that are not being changed is not required to comply.

It may be that in some jurisdictions existing ductwork that is being extended to service new parts of a building should be brought into compliance. Sometimes it may be impractical to increase the size of the existing ductwork, or the amount of insulation on the existing ductwork, if it is concealed behind fixed ceilings and risers. Possibly these may contain asbestos and should not be disturbed. However, if existing ductwork and piping is to be replaced or extended as part of a new refurbishment the new ductwork and piping, including terminal flexible ductwork, must comply with the BCA provisions.

A typical situation would be new rooms added to an existing building or the refurbishment of an existing building. The new or refurbished space may be served by a totally new air-conditioning system or by extending the existing system. If it is a totally new air-conditioning system then it must comply in all respects with the BCA provisions. If an existing system is to be extended, then only the new components would need to comply.

Example 1:

The air distribution elements of an existing air-conditioning system are being modified as part of a refurbishment. Some of the existing uninsulated ductwork is being repositioned and some is being replaced. All new ductwork must comply as must all repositioned ductwork because in its new position it will be performing as new ductwork.

All new and relocated ductwork in the area being refurbished should be sized and insulated to the current BCA requirements. However, because of structural constraints or the need to lower ceilings it may not be practical or cost effective to comply with all provisions, such as the maximum fan power provision where there is insufficient space for low-loss ductwork.

Example 2:

Another floor is being added to an existing building and the existing air-conditioning system is being extended and its capacity increased to serve the extension. The central air-conditioning unit in the basement is being modified to provide more capacity. The main ductwork runs are not being replaced because of limited riser space.

The new components on the new floor must comply as must any new components of the system elsewhere in the building.

The existing main ductwork and the central air-conditioning unit may need to be looked at for compliance, particularly if the duty of the existing air conditioner is affected by the extra ductwork. This is similar for a sprinkler system where it is necessary to check the water supply if the system is extended. However, in most cases, the existing part is not likely to be required to comply with the current BCA provisions for insulation or performance. Even if a larger fan motor is required (because of the increased resistance in the air ducts), with limited space and access it may be impractical to enforce requirements for the fan power limit and for an outside air economy cycle (because of the difficulty of installing the ductwork to the outside).

2.9 Artificial lighting and power

Artificial lighting and power systems are similar to air-conditioning and ventilating systems in that new elements and new systems in new parts of buildings must comply with the BCA provisions, as must new elements and new systems in existing parts. However, unlike air-conditioning and ventilating systems, most lighting components are within, or adjacent to, the space being served, which means that they are generally more accessible and therefore more easily upgraded. This makes lighting easier to make compliant. It also makes lighting a candidate for consideration as part of an Alternative Solution in order to compensate for some other element that may be more difficult to make compliant.

Where no building work, other then additional lighting, painting and other maintenance is being undertaken in a section of the building, only the lighting in that area needs to be considered when assessing the artificial lighting against the BCA.

Example 1:

A large shop is being extended with new lighting in the extension and retaining the existing lighting in the existing part of the shop.

J6.2(b)(i) is based on the floor area of the space. Compliance could be determined by applying the performance of the new lighting uniformly to the whole of the specified floor area for calculation purposes but only require the installation of complying lighting for the extent of the new building work.

Example 2:

A small two-storey office building is undergoing a refurbishment on the bottom storey. The lighting on the bottom storey should be brought into compliance, however because of spatial and access difficulties, the building owner has offered to upgrade the lighting on the top storey instead; it is much easier to access the lights through the roof space. This would need to be considered as an Alternative Solution.

As the upgrade on the top storey is only to compensate for under performance on the bottom storey it shouldn't automatically precipitate a review of all the other elements of the top storey. However, in some jurisdictions the new building work on the bottom storey may trigger a review which, in turn, could lead to an upgrade throughout the building.

2.10 Hot water supply and swimming pool and spa plant

Hot water supply systems (those for supplying hot water for washing and food preparation) are similar to air-conditioning systems in that they have central components and reticulated piping systems. However, they are different in that the BCA requirements only cover a heat trap, insulation on the piping and high efficiency outlets. There are no system requirements such as piping resistance and pump performance.

New hot water supply systems and new work on existing systems must comply. There will be fewer instances where compliance for the new work would not be practical or cost effective.

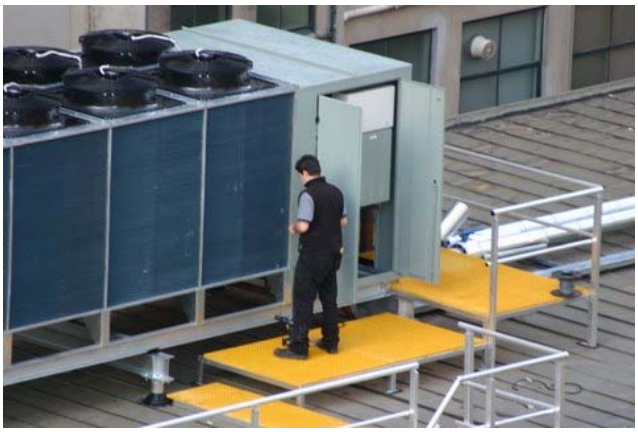
It should be noted that in some jurisdictions, these systems are regulated under different legislation (not building legislation) such as by the plumbing authority.

The requirements for swimming pool and spa plant are for the heating, pumping and pool cover. For this plant, it is likely to be clear as to whether existing plant has simply

been replaced as part of breakdown maintenance, or new plant is required for a new pool or spa. A pool or spa is unlikely to be extended.

2.11 Facilities for maintenance and monitoring

Access is required to be provided for the maintenance of new building services, however providing optimum access to new building services located in existing parts of a building may be difficult. As the BCA provisions do not specify the extent of access, a judgment against the principles of practicality and cost-effectiveness must be made, particularly when the equipment is to be located in an existing plant room. This may also vary with different types of equipment serving the same purpose, e.g. a shell and tube heater exchange requires almost the length of the exchanger for cleaning or tube replacement while a plate heat exchange needs access space all around for dismantling. The important consideration is whether there is sufficient access for the necessary maintenance to be undertaken.



In considering access for maintenance, designers should also be aware of requirements under occupational safety legislation.

Example:

A building is being extended but the air-conditioning plant for the extension is being located in the roof-top plant room of the existing part of the building because of planning restrictions on the height of the extension. In this case, the new air-conditioning plant is being placed in the existing plant room, but access must still be provided for maintenance purposes.

Facilities for monitoring need only apply to an extension but in many cases it could be extended to existing plant at reasonable cost and ease as such an extension is likely to only be sensors and wiring to a building management system. Therefore a change of use, or the jurisdictions legislation for significant new work could trigger a whole-of-building approach.

2.12 Maintenance

The maintenance provisions refer to "the components" of services, i.e. those components that are part of the new building work. The reference to components rather than systems means that only the new components of systems being extended are captured by the provisions. Being part of new building work, this would include components serving an extension or new building, or that which may be located in an existing building.

The provisions do not apply to existing components or new components that have been installed to replace existing components simply for maintenance purposes. Where the operation of new components that must comply could be adversely affected by the existing or replaced components, these existing components may also need to be maintained. Note that some jurisdictions may not specifically require maintenance under their building legislation.

While access for maintenance may involve some judgment with respect to the principles of practicality and cost-effectiveness, there is no such judgment with the maintenance itself. Where required by a jurisdiction, the plant or equipment must be maintained at the level of performance required by the BCA.

Appendix A – Summary of State and Territory advice

The following advice has been provided by the State and Territory Administrations responsible for building matters and was current at the time of publication. Any queries regarding this advice should be directed to the respective Administration.

AUSTRALIAN CAPITAL TERRITORY

Unless building work carried out in the ACT is exempt from requiring building approval under the ACT's *Building Act 2004*, section 42 of that Act requires that the work only be carried out in accordance with the BCA. Section 29 of that Act sets out the approval requirements for plans that must be complied with as part of obtaining a building approval. Section 29 provides that where plans are for the substantial alteration of a building, the building as altered must comply with the BCA.

Section 136 of that Act gives legal force to the BCA in the ACT. The BCA is therefore a subordinate law under the *Building Act 2004*. Section 7 of that Act defines what the term ***building*** means in the Act, and provides that the term ***building*** includes part of a building. It then follows that if the *Building Act 2004* requires a building to comply with the BCA that Act also requires a part of a building to comply with the BCA.

Therefore, where that Act requires a building as altered to comply with the BCA, all of the pre-existing and new parts of the building must comply with the BCA. However, the abovementioned section 29 also entitles a regulation to declare that an alteration of a building is or is not a substantial alteration; or that a part of a building (the ***unaltered part***) that has not been altered need not comply with the BCA despite section 29.

The Act's *Building Regulation 2004* declares that:

An alteration of a building is a substantial alteration if-

(a) the aggregate volume of the proposed alteration and any other alteration made to the building during the 3 years immediately before the day the application for building approval of the alteration is made is more that 50% of the volume of the original building; and

(b) the volume of a building is measured by reference to roof and outer walls.

The substantial alteration provisions of the Act and regulation are therefore commonly referred to as the '50% rule'.

Taken together the abovementioned provisions provide that if the 50% rule is triggered by alterations to, or an extension of, a pre-existing building, the whole building must be brought into compliance with the BCA, unless a regulation declares otherwise. Because it is unreasonable to make some older houses comply with the current edition of the BCA, section 16A of the *Building Regulation 2004* declares the unaltered parts of a pre-existing building that need not be brought into compliance with the BCA despite the 50% rule otherwise applying. The effect of that section is to provide alternatives to compliance with the full provisions of the BCA, and to prescribe when it is not reasonable to bring aspects of a building into compliance with certain aspects of the BCA. However, it may be the case that those alternatives only cover Class 1 and Class 10 buildings.

Other ACT legislation also regulates aspects of building construction, particularly the *Water and Sewerage Act 2000*, which has provisions aimed at reducing water usage, energy used to heat water, and thereby reducing carbon emissions from energy generated for water heating.

ACT legislation is available through— www.legislation.act.gov.au.

NEW SOUTH WALES

The *Environmental Planning and Assessment (EP&A) Act 1979* and *EP&A Regulation 2000* reference the BCA as the technical standard for the design and construction of new buildings and new building work. The application of the BCA is to work that requires development consent or is categorised as complying development. Work that is categorised as exempt development must also comply with the BCA under State Environmental Planning Policy (SEPP) 60. For councils that do not adopt SEPP 60, check with the individual exempt development policy.

The legislation does not give discretion for approval authorities to permit non compliance or partial compliance of new building work, whether that new building work is part of a new building or it is new building work to an existing building, including a heritage listed building.

The BCA adopted on 1 May each year is the BCA applicable to any building work for which a construction certificate (CC) or complying development certificate (CDC) is applied for on or after that date. (See *EP&A Regulation 2000* clauses 136A and 145)

The BCA is not generally applicable retrospectively, however approval authorities must consider the existing building when alterations and additions, and changes of use are proposed, and under specified circumstances, may require the existing part to be upgraded. For changes of use, compliance with the BCA is required in terms of specified fire safety matters and for any building work deemed necessary by the

approval authority for the purposes of the new classification (see *EP&A Regulation 2000* clauses 93 and 94). For the full text of the above mentioned legislation, refer to www.legislation.nsw.gov.au.

NORTHERN TERRITORY

The Northern Territory *Building Act* and *Building Regulations* reference the BCA as the technical standard for the design and construction of new buildings and new building work.

The legislation does not give building approval authorities any discretion to permit non compliance or partial compliance of new building work, whether that new building work is part of a new building or it is new building work to an existing building.

The *Building Act*, *Building Regulations* and the BCA are not generally applicable retrospectively, however building approval authorities must consider the existing building when alterations and additions and changes of use are proposed.

For new buildings the application of the BCA provisions is straightforward as it is applicable to all aspects of the construction.

However for an existing building being altered, extended or subject to change of use, the BCA is generally applicable to the new building work, to those parts of the building that are directly affected by the new building work or to those parts of the building being changed.

Some State/Territory Administrations have a prescriptive approach and require that the entire building be upgraded to the current technical standard when it is undergoing extensive building work. This may be where the greater part of the building is being refurbished at one time, or within a relatively short period.

Unlike these Administrations the Northern Territory has a performance based approach whereby the technical requirements apply to new building works or that part of the existing building that is undergoing new work or a change of use.

With the performance approach the discretion rests with the building approval authority. The building approval authority needs to consider the appropriateness of each criteria to the particular case.

The end result is that new works have to be compliant in their own right and cannot create a non-compliant situation for the existing building as measured against the requirements applicable for the original building.

Designers and building approval authorities commonly deal with permit applications that are for parts of a building (additions and extensions) and interpreting compliance of that part of the building with the BCA. This process is no different when considering additions and extensions in relation to compliance with the energy efficiency provisions.

The building approval authority in determining the degree of compliance needs to consider the appropriateness of each criteria to the particular case. Any decision made under this context can extend to not requiring a particular level of a performance to be achieved, if that is the appropriate action to be taken.

The ultimate decision in all situations, however, rests with the relevant building approval authority in determining compliance.

QUEENSLAND

Queensland's *Building Act 1975* (the Act) calls up the applicable building codes for all building work including the BCA, and the Queensland Development Code for Queensland specific standards. The Act defines building work to include repairing, altering or adding to a building.

All building work requires a building approval to be issued by a licenced building certifier unless it is specified under the Act to be 'self-assessable' or 'exempt'. Self-assessable building work is work that does not require a building approval to be issued by a building certifier. However, when the work is carried out it must comply with the applicable building codes such as the current edition of the BCA and any other relevant codes (see s21 of the Act). Generally, self assessable building work is minor and non structural in nature (see Schedule 1 of the *Building Regulation 2006*).

Where a building approval is required for alterations or additions to a building, a building certifier has some discretion available when applying the provisions of the BCA or other codes to the existing part of the building. Even though this discretion exists, certifiers are required to apply the Act in order to achieve its purposes. Generally the Act's purpose is to achieve health, safety, amenity and sustainability objectives of the BCA and other relevant codes.

The exercise of discretion by a building certifier in relation to the existing part of a building should reflect the benefits derived from the requirements of the BCA. If there is an ascertainable benefit to be gained by applying current energy efficiency requirements to any part of the existing building, then a certifier should consider their application. The energy efficiency requirements should be applied as completely as possible bearing in mind their expected efficacy and the costs to the owner. Certifier discretion allows all or some of the energy efficiency requirements of the BCA or other relevant codes to be applied to the existing fabric of buildings being altered.

Please note that other concessional approvals apply for Class 2-9 buildings before 14 December 1993 where a new certificate of classification is sought.

The *Building Act 1975* – key provisions:

Section 5 What is building work?

Section 21 Building work that is self-assessable for IPA.

Section 22 Building work that is exempt development for IPA.

Section 37 Provision for changes to building assessment provisions.

Section 81 Building development approval for particular alterations may require existing building or structure to comply with building assessment provisions.

Section 112 Concessional approval for particular existing buildings.

SOUTH AUSTRALIA

The *Development Act* and *Regulations 1993* reference the BCA and adopt it as part of the Building Rules for the purposes of obtaining a Building Rules Consent. The Act defines a "building" as including a portion of a building and this includes any fixtures or fittings which are subject to the provisions of the BCA. The Act also defines "building work" as any work or activity relating to construction, demolition or removal of a building. Accordingly, any new building work on an existing building which would impact on the energy efficiency must be compliant with the BCA.

Discretion should be applied in relation to heritage places where it may not be possible to obtain complete compliance with the Building Rules. However, there is still an obligation to ensure so far as is reasonably practical that adequate standards of building soundness, occupant safety and amenity are as good as can reasonably be achieved in the circumstances.

Where a change of use/classification in an existing building is proposed the relevant authority must be satisfied that the building possesses all of the attributes appropriate to its intended use. Generally this will be compliance with the current BCA to the extent that this is reasonable.

Section 53A of the *Development Act* enables the upgrading of an existing building to be made a condition of approval, in relation to an application for an alteration to that building. However, it first has to be determined that the building is unsafe, structurally unsound, in an unhealthy condition or has inadequate access for people with

disabilities and the condition can only require the upgrading to be to the extent reasonably necessary to ensure that the building is safe, conforms to proper structural and health standards, and provides adequate access. Section 53A does not refer to energy efficiency and can not be used to require the upgrading of the whole of the building for energy efficiency.

Specific information on the application of the energy efficiency provisions to existing buildings in South Australia can be found on the Planning SA website www.planning.sa.gov.au.

TASMANIA

The Tasmanian *Building Act 2000* requires building work and the maintenance of buildings to comply with the BCA. The Act provides in accordance with the *Building Regulations 2004* for a Building Surveyor to determine that any provision of the BCA in relation to a farm or historical building be altered.

In accordance with the *Building Act 2000* a current provision of the BCA does not apply to building work for which a Permit has been granted or if substantial progress had been made on the design, prior to the State's adoption of the provision.

The application of the BCA applies to all new building work even if the building work is exempted under the *Building Regulations 2004* from the requirement of a Building Permit or if in the opinion of the Building Surveyor consists of minor alterations or minor repair. Building work is defined in the *Building Act 2000* and includes amongst other things, erecting, re-erecting, constructing, altering, repairing and adding to a building. It also includes the installation of a ducted heating, cooling, ventilation or air conditioning system in a building that is not a Class 1 building or sole occupancy unit in a Class 2 or 4 building.

The *Building Act 2000* does not require upgrading of existing buildings nor is there any trigger in the Act requiring the whole of an existing building to be upgraded. A building constructed before 1 July 2004 in accordance with any relevant Act relating to buildings is taken to be constructed in accordance with the *Building Act 2000*.

The *Building Act 2000* includes provisions for the change of use of existing buildings. If a new use of an existing building requires a change of building classification or has to satisfy different requirements within the same classification, then the existing building is required to comply with the current BCA. If building work is required to be done in order for an existing building to comply with the BCA, a Building Surveyor may consent to a departure from the requirements of the BCA if he/she is of the opinion that an adverse effect is not likely on the safety, health and amenity of persons using the building, or the risk of the spread of fire between adjacent buildings or from a fire source feature.

In determining the application of the regulations in Tasmania a person may apply to the Building Appeal Board established under the *Building Act 2000* to determine whether any provision of the BCA applies or may be modified in respect of any building work that is proposed to be undertaken by the person.

Where alterations or extensions are made to an existing building, then subject to the above provisions, the Building Surveyor is the final decision maker on the application and extent of compliance required for the existing building.

To further assist in the interpretation of Tasmanian building legislation and to keep the building industry informed, the Department of Justice (Building Control Branch, Workplace Standards Tasmania) has produced, in conjunction with training on the provisions, Tasmanian specific information documents on the Energy Efficiency Provisions. Their web site is www.wst.tas.gov.au/building.

VICTORIA

To assist designers, building surveyors and building owners, the Building Commission has produced a Practice Note (2007-12) titled Applying BCA Energy Efficiency Measures to Existing Class 2-9 buildings.

It is available at www.buildingcommission.com.au.

WESTERN AUSTRALIA

While the development of a new dedicated Building Act for Western Australia is progressing, the current building control legislation is provided under Part XV of the *Local Government (Miscellaneous Provisions) Act 1960*. Under the current regime responsibility for assessing and approving building work rests with the relevant local government.

Application of the BCA to additions, alterations and repairs to existing buildings:

In general terms the BCA applies to new buildings and to new building works in existing buildings. Notwithstanding dangerous or unsafe buildings, there is currently no other trigger mechanism for applying the BCA to existing parts of buildings not subject to any new building work.

Furthermore regulation 5(2) of the *Building Regulations 1989* provides local government with a considerable amount of flexibility in the application of various provisions of the BCA to minor works. It states:

"Any alteration, addition, restoration or repair to a building shall conform with these regulations but where the local government is of the opinion that any such work

consists only of minor work and does not adversely affect the safety of persons accommodated in or resorting to a building or property in or the vicinity of a building the local government may determine that the Building Code does not apply in relation to such work and that the work shall conform to only such of the provisions of the Building Code as are specified by the local government."

Further information can be obtained at www.buildingcommission.wa.gov.au