ABCB

Energy Efficiency Provisions for Electricians and Plumbers

2010

Handbook

NON-MANDATORY DOCUMENT

ENERGY EFFICIENCY PROVISIONS FOR ELECTRICIANS AND PLUMBERS

2010

Table of Contents

1 Disclaimer

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.

The Energy Efficiency Provisions for Electricians and Plumbers Handbook (the Handbook) is non-mandatory and is designed to assist in making such information on this topic readily available.

However, neither the ABCB nor the participating Governments 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 relevant as a guide to action for any particular purpose.

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

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2 Introduction

Reminder:

The Handbook is not mandatory or regulatory in nature and compliance with it will not necessarily discharge a user's legal obligations. The Handbook should only be read and used subject to, and in conjunction with, the general disclaimer at page 2.

The 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.

In response to concerns over global warming, the Australian Government announced in July 2000 that agreement had been reached with industry and the State and Territory Governments to develop and introduce mandatory minimum energy performance requirements through the Building Code of Australia (BCA).

The BCA has energy efficiency requirements for commercial and residential buildings in both Volume One and Volume Two of BCA 2010. These requirements cover areas such as building fabric, glazing, sealing, air-movement, air-conditioning and ventilation, artificial lighting and power, hot water supply and access for maintenance. Prior to 2010 energy efficiency requirements for artificial lighting and power and supply water heaters did not apply to residential buildings (Volume Two).

In brief, the increase in energy efficiency provisions of BCA 2010 requires:

(i) a 6 star energy rating, or equivalent, for new residential buildings;

(ii) the inclusion of energy efficiency requirements for hot water heaters in new houses and lighting in new houses and apartments; and

(iii) a significant increase in the energy efficiency requirements for all new commercial buildings.

2.1 Goal of the energy efficiency provisions of the BCA

The underlying goal of the energy efficiency provisions of the BCA is to reduce greenhouse gas emissions. Initially, this was achieved by efficiently using energy; however in BCA 2010 this was broadened to also require energy to be obtained from a low greenhouse intensity source. Part of the energy efficiency measures aim to create an internal building environment in which conditions encourage occupants to minimise their use of services including artificial heating, cooling and lighting.

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 Housing Provisions). This was followed in 2005 by provisions in Volume One for Class 2 buildings (apartments) and 3 buildings (hotels, motels dormitories etc) and Class 4 parts of buildings (residences over other buildings). The range of buildings became complete in 2006 when provisions for Classes 5 to 9 buildings (all other applications) were 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 again increased. Note that these dates were when the provisions were introduced into the national BCA and not necessarily when the States and Territories adopted them into building law. For this information refer to the History of Adoption at the back of the BCA.

2.2 Scope

The Handbook has been developed to alert electricians and plumbers about the energy efficiency provisions of the BCA 2010 and how these provisions may affect them. These include energy efficiency provisions covered in previous editions of the BCA and new provisions introduced for BCA 2010.

The Handbook is written in generic terms rather than detailing specific clauses and so does not include all the requirements that may affect electricians and plumbers. It is also limited to those requirements that address energy efficiency only.

Other BCA requirements that electricians and plumbers need to be alert to and which are not covered in the Handbook, include:

- Fire separation and construction of substations, conductors, switchboards and emergency equipment.
- Hearing augmentation systems and the location of lighting switches for people with disabilities.
- Fire fighting equipment including pumping systems, alarms, sprinkler systems, fire-control centres, fire-service controls, fire and smoke detection and warning systems, smoke exhaust systems, emergency lighting, exit and direction lighting and emergency warning and intercommunication systems.
- Lift installations.
- Artificial lighting for safe movement.
- Mechanical ventilation for health including Legionella control.
- Stormwater drainage.
- Provision of floor wastes.
- Construction of sanitary and other facilities.
- Water-proofing.

2.3 Limitations

The Handbook is not intended to -

- Override or replace any legal rights, responsibilities or requirements; or
- Provide users with the specifics of the BCA.

The Handbook is intended to make users aware of provisions that may affect them, not exactly what is required by those provisions. If users determine that a provision may apply to them, the BCA should be read to determine the specifics of the provision.

3 About the Building Codes of Australia (BCA)

The ABCB is a joint initiative of all three levels of Government in Australia and includes representatives from the building industry. The mission of the ABCB is to address issues relating to health, safety, amenity and sustainability by providing for efficiency in the design, construction and performance of buildings through the BCA and the development of effective regulatory systems. This is set out in the Inter Government Agreement (IGA) dated 26 April 2006 between the Commonwealth, States and Territories.

3.1 The BCA Goal

The goal of the BCA is to achieve nationally consistent, minimum necessary standards of relevant health, safety (including structural safety and safety from fire), amenity, and sustainability efficiently.

This goal is applied so that:

(i) There is a rigorously tested rationale for the regulation.

(ii) The regulation generates benefits to society greater than the costs (that is, net benefits).

(iii) There is no regulatory or non-regulatory alternative that would generate higher net benefits.

(iv) The competitive effects of the regulation have been considered and the regulation is no more restrictive than necessary in the public interest.

3.2 Content of the BCA

The BCA contains technical requirements for the design and construction of buildings and other structures, covering such matters as structure, fire resistance, access and egress, services and equipment, and energy efficiency as well as certain aspects of health and amenity.

3.3 State and Territory variations and additions

State and Territory legislation adopts the BCA subject to the variation or deletion of some of its provisions, or the addition of extra provisions. These variations, deletions and additions are contained in a separately bound Appendices to the BCA or in the provisions of BCA Volume Two itself.

For Volume One, flags identifying variations are located within relevant Clauses and at the beginning of relevant Tables. Additional clauses to a Part of BCA Volume Two are identified at the end of that Part.

3.4 Format of the BCA

BCA 2010 is published in two volumes with three bindings. 'Volume One' pertains primarily to Class 2 to 9 buildings, 'Volume Two' pertains primarily to Class 1 and 10 buildings (houses, sheds, carports, etc) with a separate binding for Volume One Appendices.

All volumes are presented in a performance format and contain mandatory Performance Requirements and optional Deemed-to-Satisfy building solutions. The performance format allows for the approval of innovative materials, forms of construction or designs as alternative solutions to the deemed-to-satisfy provisions.

3.5 Evidence of Suitability and Performance

To facilitate assessment of compliance with the BCA the code describes various forms of evidence that may be used to support a claim that a material, form of construction or design meets the respective Performance Requirements or Deemed-to-Satisfy Provisions. Forms of evidence are described in A2.2 of Volume One and 1.2.2 of Volume Two.

For example, where additional insulation may be needed to compensate for additional downlights, an approval authority may wish to sight the manufacturer’s specifications or recommendations for a safe clearance to insulation and the calculation for the percentage of ceiling insulation lost. Similar evidence may also be needed on the lumens/watt performance of some lamps.

3.6 Other Energy Efficiency Handbooks by the ABCB

The ABCB has produced a range of Handbooks and other educational material relating to energy efficiency including:

- Information Handbook - Energy Efficiency: BCA 2010 Volume One
- Information Handbook - Energy Efficiency: BCA 2010 Volume Two
- Information Handbook - Applying Energy Efficiency Provisions to New Building Work Associated With Existing Class 2 to 9 Buildings
- BCA Awareness Resource Kit – Module 3 Understanding Energy Efficiency Provisions for Class 1 and 10 Buildings
- BCA Awareness Resource Kit – Module 4 Understanding Energy Efficiency Provisions for Class 2 to 9 Buildings

Handbooks can be found on the ABCB web site http://www.abcb.gov.au and the resource kits can be obtained from the ABCB office.

3.7 Impact of Changes

When electricians and plumbers have a role in the installation of a building system that may involve changing or adding to a design after it is approved, it is critical that no changes be made to an approved design or installation without the approval of the Building Control Authority. As an example, adding light fittings in a house may cause a change to the approved Illumination Power Density of the building and require re-evaluation of the installation to ensure compliance.

4 Electricians – Energy Efficiency Provisions of the Building Code of Australia Volume One

Part J0 – Energy Efficiency

J0.3 Ceiling fan

Where a fixed ceiling fan is proposed as part of achieving the required star rating, the fan must have a speed controller and only serve the area specified for its diameter. This provision intends to ensure that the ceiling fan achieves its optimum performance and only operates at the speed desired by the occupant.

Part J1 – Building Fabric

J1.2 Thermal construction general

J1.2 (a) (iii) requires any insulation not to interfere with the safe or effective operation of a service or fitting while J1.2 (c) (i) permits insulation to be compressed where crossed by electrical cables.

For electrical work, J1.2 (a) (iii) includes for ventilation and exhaust fans, recessed light fittings and transformers for low voltage lighting. A point to note is that even though providing any required clearance is the responsibility of the insulation installer, it is the electrician who knows what type of electrical equipment has been used and what are the required safe clearance distances. This information needs to be conveyed to the insulation installer. Note also that in some States approved covers are required over downlights.

Note that consideration should also be given to the likelihood of wiring being covered by insulation. Clause 3.4.2 of AS/NZS 3000 provides the operating temperature limits for wiring and provides guidance on suitable wiring for situations when wiring is covered by insulation.

J1.3 (c) Roof and Ceiling Construction

J1.3 (c) requires that, where for operational or safety reasons associated with exhaust fans, flues or recessed downlights, the area of required ceiling insulation is reduced, the loss of insulation must be compensated for by increasing the Total R-Value of the insulation in the remainder of the ceiling.

Table J1.3b specifies the adjusted minimum R-Value of insulation required to compensate for the loss of ceiling insulation as a result of exhaust fans, flues or recessed downlights. Depending on the original required R-Value, the percentage of the ceiling area that is allowed to be uninsulated is limited. Interpolation may also be used to determine the adjusted R-Value. Owners and tenants should be made aware that the more downlights, flues and fans that are installed, the more insulation that will be needed to comply with BCA 2010.

This provision will limit the number of exhaust fans, flues and recessed downlights that an electrician is allowed to install. The Table also provides a 'free allowance' where the R-Value for the ceiling is not required to be increased.

Electricians will need to be aware of the limit allowed for an uninsulated ceiling area and the effect the uninsulated ceiling area will have on the R-Value required for the remainder of the ceiling insulation.

Part J3 – Building Sealing

J3.5 Exhaust Fans

J3.5 requires an exhaust fan to be fitted with a sealing device such as a self-closing damper when serving conditioned spaces or habitable rooms depending upon the climate zone.

This provision is intended to seal the air path when the fans are not in use, therefore limiting the amount of heat loss or heat gain through such an opening.

J3.7 Evaporative Coolers

J3.7 requires evaporative coolers to be fitted with a self-closing damper or the like when serving conditioned spaces or habitable rooms depending upon the climate zone.

An evaporative cooler duct represents a large opening in the building envelope. This provision is intended to seal the opening when the evaporative cooler is not in use, such as in winter when a heating system may be operating.

These provisions will limit the installation of exhaust fans and evaporative coolers to those that can be fitted, or are fitted with, a sealing device such as a self-closing damper. Electricians will need to be aware of the situations in which these devices are required.

Part J5 – Air-conditioning and Ventilation Systems

J5.2 Air-conditioning and Ventilation Systems

J5.2 contains provisions that require:

a) an air-conditioning unit or system to be capable of -
   - being deactivated when the area served is not occupied; and
   - closing any motorised dampers when not in use in order to reduce infiltration; and
   - in certain instances, only operating when all balcony, courtyard or patio doors are closed; and
   - in certain instances, thermostatically controlling the temperature of each space served; and
   - in certain instances, controlling the temperature at a different temperature during sleeping periods than other periods.

b) a system that provides mechanical ventilation -
   - in certain instances, be capable of being deactivated when the building or the part of the building being served is not occupied; and
   - for a carpark exhaust, provide an atmospheric contaminant monitoring system.

J5.2 also has requirements which, depending on the air conditioning load, specify a maximum allowance for fan power. Also if the air flow is to vary this requires the fan speed to vary rather than throttle the air flow with dampers.

These provisions are intended to limit the operation of an air-conditioning or ventilation systems to only when the building or part of the building served is occupied or when the service is needed. This will limit the unnecessary use of energy by such systems when they are not required. They also intend to allow user control of systems and limit heat losses or gains through dampers when systems are not in use.

J5.3 Time Switch

J5.3 requires a time switch (often called a time clock) to be provided when installing certain systems such as air-conditioning, ventilation or heating systems. The requirement to install time switches is dependant on the output of the proposed system and only applies when serving commercial classes of buildings.

This provision is intended to regulate the power supply to those systems specified. The requirements for when time switches are required is limited to only larger systems on the basis that the cost of a time switch may not be justified for a small system and also because a small system is likely to serve a small space and is therefore capable of being efficiently controlled by the users of the space served.

J5.4 Heating and Chilling Systems

J5.4 contains provisions that require -

a) a system that provides heating or cooling for an air-conditioning system to -
    - depending on pumping output, have a maximum pump power in accordance with the BCA; and
    - be capable of varying its speed in response to varying loads except when the pump is needed to operate at full speed for safe or efficient operation; and
    - if the system contains more than one heater or chiller, be capable of stopping flow to those not operating.

b) a heater that directly heats a space, in certain instances, to -

- use a source of energy with low greenhouse intensity; and
- if outdoors, have an outdoor air temperature sensor, timer, motion detector or the like to automatically turn off the heater when not required.

These provisions are intended to limit the use of energy intensive pumps and reduce energy wastage. They are also intended to reduce greenhouse gas emissions by stating the energy source that may be used. This satisfies the performance requirement to use an energy source that is renewable or of low greenhouse gas intensity and therefore limits the use of electric resistance heating.

J5.5 Miscellaneous Exhaust Systems

J5.5 requires a miscellaneous exhaust system, when operating above a certain output, to provide the operator with the means to limit the energy used by reducing the exhaust rate when full exhaust is not necessary. This requirement is only applicable to commercial classes of buildings and does not apply to certain systems.

Summary

Depending on the situation, these provisions will require devices to be fitted to limit heat loss or heat gain, to prevent the unnecessary use of energy, and prevent the use of greenhouse gas intense sources.

Electricians will need to be aware of the situations when these provisions apply as they will affect the installation of most of the abovementioned systems.

Part J6 – Artificial Lighting and Power

J6.2 Interior Artificial Lighting

The ABCB has developed a series of glazing calculators to assist users with the calculations required by the BCA elemental Deemed-to-Satisfy energy efficiency provisions. Users simply input the necessary data into the spreadsheet, which operates in Microsoft Excel, and all table lookups and calculations are carried out automatically.

J6.2 (a) specifies the maximum allowed Lamp Power Density or Illumination Power Density (IPD) of artificial lighting for a sole-occupancy unit of a Class 2 building or Class 4 part of a building. The same values of power density can be used for both classes but with IPD the values can be increased if any of the control devices listed in Table J6.2b are used and the IPD is calculated using a formula under Table J6.2a. This means that the allowance for IPD is based on the power likely to be drawn by the system instead of just the capacity of the lamps.

If the proposed lamps are to be installed the calculation for the lamp power density is straight forward. However, if only a batten holder is installed temporarily “the power of the proposed installation” must be used. If the final design is not known at the time this will need to be estimated and approved by the Building Control Authority.

Where lamps have ballasts they must be of the electronic type. Also, halogen lamps must be separately switched from fluorescent lamps so that the occupant can choose to use a more efficient lighting source. J6.2 (b) specifies the IPD of artificial lighting for all other classes of buildings, however exemptions are provided for certain installations.

These provisions intend to set the minimum requirements for the energy use interior artificial lighting to an efficient level. This also places limitations on the use of inefficient fluorescent and halogen lamps.

J6.3 Interior Artificial Lighting and Power Control

J6.3 covers requirements for switching and other control devices for interior artificial lighting. Requirements include when certain devices are required, where they must be located, switching requirements for certain locations and limitations on the area that a switch or other control device can control. In certain instances the requirements of J6.3 do not apply.

The provisions of J6.3 are intended to save energy on lighting and power when a space is not occupied or the service is not needed. This ensures that when lighting to a small area is required, lighting to a large area is not also activated.

J6.4 Interior Decorative and Display Lighting

J6.4 requires interior decorative and display lighting to be switched and controlled separately from other artificial lighting.

This provision addresses the distinct nature of decorative and display lighting which may not be needed at weekends or out of hours while some people may still be working in the building and need general task lighting.

J6.5 Artificial Lighting around the Perimeter of a Building

J6.5 requires artificial lighting around the perimeter of a building to be controlled by a daylight sensor or timer. J6.5 also specifies a minimum light source efficacy that must be met when the lighting load exceeds 100W.

Alternatively, a motion detector must be used. The requirements of J6.5 do not apply to lighting around a detention centre or to emergency lighting.
The provisions of J6.5 are intended to ensure that efficient light sources are used or that the lighting only operates when it is required.

J6.6 Boiling Water and Chilled Water Storage Units

J6.6 requires the power supply to a boiling water or chilled water storage unit to be controlled by a time switch. Units are now available with integral time clocks.
This provision is intended to control such storage units because they can waste energy when the building is not occupied.

The provisions will also limit the area which a switch can operate and in most instances will require devices, for both lighting and water storage units, to be fitted to limit the unnecessary use of energy.

Specification J6 – Lighting and Power Control Devices

Specification J6 contains the requirements for lighting and power control devices including timers, time switches, motion detectors and daylight control sensors.

These provisions specify the required performance that the above devices must achieve. Electricians will need to be aware of this required performance as it may prevent the use of some lighting and power control devices.

Summary

Electricians will need to be aware when the above provisions apply as they limit the use of inefficient lighting systems and place restrictions on other lighting systems to prevent retrofitting to inefficient systems.

Part J7 – Hot Water Supply and Swimming Pool and Spa Heaters

J7.3 Swimming Pool Heating and Pumping

J7.3 limits the type of energy that can be used for heating spa and in certain instances requires additional measures to reduce energy wastage. The requirements of this provision also limit the operation of a circulation pump.

This provision is intended to reduce greenhouse gas emissions by stating the energy source that may be used to heat a pool. This satisfies the performance requirement to use an energy source that is renewable or of low greenhouse gas intensity and therefore prohibits the use of electric resistance heating. This provision is also intended to ensure that energy is not wasted when a non-renewable energy source is used.

J7.4 Spa Heating and Pumping

J7.4 limits the type of energy that can be used for heating and in certain instances requires a push button and a time clock to control the operation of the heater. The requirements of this provision also limit the operation of a circulation pump.

This provision is intended to reduce greenhouse gas emissions by stating the energy source that may be used to heat a spa. This satisfies the performance requirement to use an energy source that is renewable or of low greenhouse gas intensity and therefore prohibits the use of electric resistance heating.

This provision is also intended to control the use of a heater even when a low emission energy source is used.

Summary

These provisions will limit the types of heaters that an electrician is allowed to install and in the instance of pumps and systems reliant on a particular energy source may require devices to be fitted that limit the unnecessary use of energy.

J8 – Access for Maintenance and Facilities for Monitoring

J8.3 Facilities for Energy Monitoring

J8.3 requires that a building, depending on its size, is to have the facility to record the annual energy consumption of the building and certain services.
This provision is intended to allow the building owner and maintenance personnel to monitor the energy usage of plant, lighting and equipment to ensure that active energy efficiency items and services continue to operate at their required level of performance.

Electricians will need to be aware of the commissioning requirements, the information that needs to be included in a manual to facilitate maintenance and the size threshold for requiring the facility to record the annual energy consumption of the building and certain services. These provisions will effect all installations where an electrician is required.

Note that BCA 2010 Section I contains requirements for maintaining items at the required level of performance needed for compliance with Section J.

5 Electricians - Energy Efficiency Provisions of the Building Code of Australia Volume Two

Part 3.12.1 – Building Fabric

3.12.1.1 Building fabric thermal insulation

3.12.1.1 (a) (iii) requires any insulation not to interfere with the safe or effective operation of a domestic service or fitting while 3.12.1.1 (c) permits insulation to be compressed where crossed by electrical cables.

As for electrical work in Section J of Volume One, Clause 3.12.1.1 (c) includes for ventilation and exhaust fans, recessed light fittings and transformers for low voltage lighting. A point to note is that even though providing any required clearance is the responsibility of the insulation installer, it is the electrician who knows what type of electrical equipment has been used and what are the required safe clearance distances. This information needs to be conveyed to the insulation installer. Note also that in some States approved covers are required over downlights.

Note that consideration should be given to the likelihood of wiring being covered by insulation. Clause 3.4.2 of AS/NZS 3000 provides the operating temperature limits for wiring and provides guidance on suitable wiring for situations when wiring is covered by insulation.

3.12.1.2 (e) Roofs

3.12.1.2 (e) requires that, where for operational or safety reasons associated with exhaust fans, flues or recessed downlights, the area of required ceiling insulation is reduced, the loss of insulation must be compensated for by increasing the Total R-Value of the insulation in the remainder of the ceiling.

Table 3.12.1.16 specifies the adjusted minimum added insulation to compensate for loss of ceiling insulation. Depending on the original required R-Value, the percentage of the ceiling area that is allowed to be uninsulated is limited. This provision will therefore limit the number of exhaust fans, flues or recessed downlights that an electrician is allowed to install. Interpolation may also be used to determine the adjusted R-Value.

As an example, a reduction in insulation of 0.5% of the ceiling area of a 200m² sized house would permit 2 bathroom heater-light assemblies, a laundry exhaust fan, a kitchen exhaust fan and either approximately 20 recessed downlights with 50mm clearance to the insulation or 10 recessed downlights with 100mm clearance to the insulation or only 3 recessed downlights with 200mm clearance to the insulation.

Therefore in a house that requires roof insulation with an R-Value of R4.0 added to the ceiling in order to achieve the required Total R-Value, the adjusted minimum insulation to compensate for a 0.5% loss of insulation must be increased to an R-Value of R4.7.

Owners should be made aware that the more downlights and exhaust fans that are installed in a ceiling, the more insulation will be needed to comply with BCA 2010.

3.12.3 – Building Sealing

3.12.3.4 Exhaust Fans

3.12.3.4 requires an exhaust fan to be fitted with a sealing device such as a self-closing damper, filter or the like when serving conditioned spaces or habitable rooms in a building depending upon the climate zone.

This provision is intended to seal the air path when the fans are not in use, therefore limiting the amount of heat loss or heat gain through such an opening. An exhaust fan is considered to be adequately sealed when it is fitted with a filter such as is commonly used in a kitchen range hood.

3.12.3.6 Evaporative Coolers

3.12.3.6 requires an evaporative cooler to be fitted with a self-closing damper or the like when serving conditioned spaces or habitable rooms in a building depending upon the climate zone.

An evaporative cooler duct represents a large opening in the building envelope. This provision is intended to seal the opening when the evaporative cooler is not in use, such as in winter when a heating system may be operating.

These provisions will limit the use of exhaust fans and evaporative coolers to those that can be fitted or are fitted with a sealing device such as a self-closing damper. Electricians will need to be aware of the situations in which these devices are required.

3.12.4 – Air Movement

3.12.4.3 Ceiling Fans and Evaporative Coolers

3.12.4.3 requires a ceiling fan or an evaporative cooler required to comply with the air movement requirements of the BCA to be permanently fixed, have a speed controller and for a ceiling fan, only serve the area specified for its diameter.

This provision intends to ensure that the evaporative cooler is always providing the required air movement and allows user control while the requirements for a ceiling fan is to ensure that it achieves optimum performance.

These provisions will prevent the use of small ceiling fans and coolers not fitted with a speed controller. Electricians will need to be aware of these provisions when installing these systems.

3.12.5 – Services

3.12.5.4 Electric Space Heating

3.12.5.4 requires an electric resistance space heating system that serves more than one room to have separate isolating switches for each room along with separate temperature controllers and time switches for each group of rooms with common heating needs. 3.12.5.4 also places limitations on the power loads of an electric resistance space heating system.

Note that where there is an in-slab heating or cooling system there is also a requirement for insulation to be installed around the vertical edge of the slab perimeter in accordance with 3.12.1.5. This provision is intended to ensure that energy is not wasted by passing directly to outside the building via the slab.

3.12.5.5 Artificial Lighting

The ABCB has developed a series of glazing calculators to assist users with the calculations required by the BCA elemental Deemed-to-Satisfy energy efficiency provisions. Users simply input the necessary data into the spreadsheet, which operates in Microsoft Excel, and all table lookups and calculations are carried out automatically.

3.12.5.5 specifies the maximum Lamp Power Density or Illumination Power Density for artificial lighting within a Class 1 building, on a verandah or balcony attached to a Class 1 building and within a Class 10 building.
The densities must not exceed:

- 5 W/m^2 in a Class 1 building (a house);
- 4 W/m^2 on the verandah and a balcony of a house; and
- 3 W/m^2 in a Class 10 building (a garage).

The same values of power density can be used for both Lamp Power Density and Illumination Power Density (IDP) but with IDP the values can be increased if any of the control devices listed in Table 3.12.5.3 are used. It also means that the allowance is based on the power likely to be drawn by the system instead of just the lamp load.

If the proposed lamps are to be installed the calculation for the lamp power density is straight forward. However, if only a batten holder is installed temporarily "the power of the proposed installation" must be used. If the final design is not known at the time this will need to be estimated and approved by the Building Control Authority.

3.12.5.5 also requires that where lamps have ballasts they must be of the electronic type. Halogen lamps must also be separately switched from fluorescent lamps so that the occupant can choose to use the more efficient lighting source.

This provision intends to set the energy consumption of artificial lighting at an efficient level, whilst also placing limitations of fluorescent and halogen lamps in order to prevent the use of inefficient lamps.

3.12.5.6 Water Heater in a Hot Water Supply System

3.12.5.6 places limitations on the energy source that can be used for a water heater in a hot water supply system. Depending on the energy source the heater must achieve a level of performance that may include having a certain number of Renewable Energy Certificates (REC's), an energy saving percentage or a star rating. The use of electric resistance water heaters has many restrictions.

This provision is intended to reduce greenhouse gas emissions by stating the energy source that may be used by a heater in a hot water supply system. This satisfies the performance requirement to use an energy source that is renewable or of low greenhouse gas intensity and therefore limits where an electric resistance water heater can be used.

3.12.5.7 Heating and Pumping of Swimming Pools or Spas

3.12.5.7 limits the source of energy for heating swimming pools to solar and in certain instances requires additional measures to reduce energy wastage.
There are more alternatives for spas pools because of the higher temperature at which they need to operate but the use of electric resistance heating is not permitted.

This provision is intended to reduce greenhouse gas emissions by stating the energy source that may be used to heat a pool. This satisfies the performance requirement to use an energy source that is renewable or of low greenhouse gas intensity and therefore prohibits the use of electric heating. This provision is also intended to ensure that energy is not wasted when a non-renewable energy source is used.
3.12.5.7 also requires a circulation pump to have a time switch and a spa heater to have a push button and time switch to control the operation of the heater.

Summary

These provisions will prevent the use of inefficient systems and systems that use energy from a source that is not renewable or of low greenhouse gas intensity, such as from electricity. The provisions will also prevent the unnecessary wastage of energy via systems that prevent user control and are not fitted or unable to be fitted with devices to prevent unnecessary energy use. Electricians will need to be aware of these provisions as they are likely to affect installations in most households.

6 Plumbers - Energy Efficiency Provisions of the Building Code of Australia Volume One

Part J1 – Building Fabric

J1.2 Thermal Construction General

As for electrical work, J1.2 (a) (iii) requires any insulation not to interfere with the safe or effective operation of a service or fitting while J1.2 (c) (i) permits insulation to be compressed where crossed by pipes.

J1.3 (c) Roof and Ceiling Construction

Again, as for electrical work, J1.3 (c) requires that where, for operational or safety reasons associated with exhaust fans and flues, the area of required ceiling insulation is reduced, the loss of insulation must be compensated for by increasing the Total R-Value of the insulation in the remainder of the ceiling. In some jurisdictions work on fans may be considered to be plumbing work.

Table J1.3b specifies the adjusted minimum R-Value of insulation required to compensate for loss of ceiling insulation as a result of exhaust fans etc. Depending on the original required R-Value, the percentage of the ceiling area that is allowed to be uninsulated is limited.

Owners and tenants should also be made aware that the more fans and flues that are installed, the more insulation that will be needed to comply with BCA 2010.

Note that this Table also provides a ‘free allowance’ where the R-Value for the ceiling is not required to be increased as a result of uninsulated ceiling area.

Part J3 – Building Sealing

J3.2 Chimneys and flues

This clause requires the chimney or flue of an open solid-fuel burning appliance to be fitted with a damper or flap to provide a seal when the appliance is not in use.

J3.5 Exhaust Fans

This clause requires an exhaust fan to be fitted with a sealing device such as a self-closing damper when serving conditioned spaces or habitable rooms depending upon the climate zone. Again, in some jurisdictions work on fans may be considered to be plumbing work.

This provision is intended to seal the air path when a fan is not in use, therefore limiting the amount of heat loss or heat gain through such an opening.

J3.7 Evaporative Coolers

This clause requires evaporative coolers to be fitted with a self-closing damper or the like when serving conditioned spaces or habitable rooms depending upon the climate zone. Again, in some jurisdictions work on evaporative coolers may be considered to be plumbing work.

An evaporative cooler duct represents a large opening in the building envelope. This provision is intended to seal the opening when the evaporative cooler is not in use, such as in winter when a heating system may be operating.

Summary

These provisions will limit the use of exhaust fans and evaporative coolers to those that can be fitted or are fitted with a sealing device such as a self-closing damper. Plumbers will need to be aware of the situations in which these devices are required.

J5 – Air-conditioning and Ventilation Systems

J5.2 Air-conditioning and Ventilation Systems

This clause sets the minimum requirements for air-conditioning and ventilation systems and components. In most jurisdictions this would not be considered plumbing work and so the provisions will not be detailed here. However, if it is considered to be plumbing work then Clause J5.2 should be referred to.

J5.4 Heating and Chilling Systems

J5.4 sets the minimum requirements for heating and chilling systems. J5.4 contains provisions that require -

a) a system that provides heating or cooling for an air-conditioning system to -
   - have any piping, vessels, heat exchangers or tanks insulated in accordance with Specification J5.4 of BCA 2010; and
   - where water is circulated by pumping at greater than 2L/s, have a maximum pump shaft power in accordance with BCA 2010 and be capable of varying its speed in response to varying loads except when the pump is needed to operate at full speed for safe or efficient operation.

b) a heater, in certain instances, to -
   - achieve a thermal efficiency complying with BCA 2010 when tested in accordance with BS 7190; and
   - use reticulated gas if available; and
   - when directly heating a space, use a source of energy with low greenhouse intensity.

These provisions are intended to limit the use of energy intensive pumps and reduce energy wastage. They intend to also reduce greenhouse gas emissions by stating the energy source that must be used in heaters. This satisfies the performance requirement to use an energy source that is renewable or of low greenhouse gas intensity and therefore limits the use of electric resistance heating.

Plumbers will need to be aware of these requirements as they will prevent the use of inefficient pumps and limit the energy source that a system can use.

J5.5 Miscellaneous Exhaust Systems

Again, in a jurisdiction where plumbers are responsible for exhaust systems, J5.5 requires a miscellaneous exhaust system, when operating above a certain output, to provide the operator with the means to limit the energy used by reducing the exhaust rate when full exhaust is not necessary. These provisions are only applicable to commercial classes of buildings and do not apply for certain systems.

Specification J5.2 – Ductwork Insulation and Sealing

In a jurisdiction where ductwork is a plumbing responsibility the requirements in Specification J5.2 for ductwork need to be applied. In particular, the insulation must be of the specified R-Value, comply with AS/NZS 4859.1 and be installed as specified.

Specification J5.4 – Insulation of Piping, Vessels, Heat Exchangers and Tanks

Specification J5.4 contains the requirements for the insulating of piping, vessels, heat exchangers and tanks containing heating fluids or cooling fluids and specifies the required performance of the insulation. Again, the insulation must be of the specified R-Value, comply with AS/NZS 4859.1 and be installed as specified.

These provisions are intended to reduce energy loss from piping, vessels, heat exchangers or tanks. Plumbers will need to be aware when insulation is required to be installed and know the required performance that that insulation must achieve.
Note that the insulation R-Value for piping may be halved on small piping close to items of plant and also when penetrating structural members.

Summary

Depending on the situation, these provisions will require devices to be fitted to limit heat loss or heat gain, to prevent the unnecessary use of energy, and prevent the use of greenhouse gas intense sources.

J7 – Hot Water Supply and Swimming Pool and Spa Heaters

J7.2 Hot Water Supply

J7.2 requires a hot water supply system in certain instances to be designed and installed in accordance with Section 8 of AS/NZS 3500.4.

J7.3 Swimming Pool Heating and Pumping

J7.3 limits the type of energy that can be used for heating and in certain instances requires additional measures to reduce energy wastage. The requirements of this provision also limit the operation of a circulation pump.

This provision is intended to reduce greenhouse gas emissions by stating the energy source that may be used to heat a pool. This satisfies the performance requirement to use an energy source that is renewable or of low greenhouse gas intensity and therefore prohibits the use of electric resistance heating. This provision is also intended to ensure that energy is not wasted when a non-renewable energy source is used.

J7.4 Spa Heating and Pumping

J7.4 limits the type of energy that can be used for heating a spa pool. As well as other provisions, a circulating pump must also be time switched.

This provision is intended to reduce greenhouse gas emissions by stating the energy source that may be used to heat a spa pool. This satisfies the performance requirement to use an energy source that is renewable or of low greenhouse gas intensity and therefore prohibits the use of electric resistance heating.

Summary

These provisions will limit the energy sources that are allowed to be used by heaters in pools and spa pools so therefore may prevent the use of some heaters. Plumbers will need to be aware of the energy sources that are allowed to be used and the possible limitations or extra requirements that are placed on heaters when using a particular energy source.

7 Plumbers - Energy Efficiency Provisions of the Building Code of Australia Volume Two

Part 3.12.1 – Building Fabric

3.12.1.1 Building fabric thermal insulation

As for electrical work, 3.12.1.1 (a) (iii) requires any insulation not to interfere with the safe or effective operation of a domestic service or fitting while 3.12.1.1 (c) (i) permits insulation to be compressed where crossed by pipes.

J1.3 (c) Roof and Ceiling Construction

Again, as for electrical work, J1.3 (c) requires that where, for operational or safety reasons associated with exhaust fans and flues the area of required ceiling insulation is reduced, the loss of insulation must be compensated for by increasing the Total R-Value of the insulation in the remainder of the ceiling. In some jurisdictions work on fans may be considered to be plumbing work.

Table 3.12.3.4 specifies the adjusted minimum R-Value of insulation required to compensate for loss of ceiling insulation as a result of exhaust fans etc. Depending on the original required R-Value, the percentage of the ceiling area that is allowed to be uninsulated is limited.

Owners and tenants should also be made aware that the more fans and flues that are installed, the more insulation that will be needed to comply with BCA 2010.
Note that this Table also provides a ‘free allowance’ where the R-Value for the ceiling is not required to be increased as a result of uninsulated ceiling area.

Part 3.12.2 – Building Sealing

3.12.3.1 Chimneys and flues

3.12.3.1 requires the chimney or flue of an open solid-fuel burning appliance to be fitted with a damper or flap to provide a seal when the appliance is not in use.
The requirements for sealing an appliance should be read in conjunction with the fire safety requirements in Part 3.7.3.

3.12.3.4 Exhaust Fans

3.12.3.4 requires an exhaust fan to be fitted with a sealing device such as a self-closing damper when serving conditioned spaces or habitable rooms depending upon climate zone. Again, in some jurisdictions work on exhaust fans may be considered to be plumbing work.

This provision is intended to seal the air path when the fans are not in use, therefore limiting the amount of heat loss or heat gain through such an opening.
An exhaust fan is considered to be adequately sealed when it is fitted with a filter such as is commonly used in a kitchen range hood.

3.12.3.6 Evaporative Coolers

3.12.3.6 requires evaporative coolers to be fitted with a self-closing damper or the like when serving conditioned spaces or habitable rooms depending upon the climate zone. Again, in some jurisdictions work on evaporative coolers may be considered to be plumbing work.

An evaporative cooler duct represents a large opening in the building envelope. This provision is intended to seal the opening when the evaporative cooler is not in use, such as in winter when a heating system may be operating.

Summary

These provisions will limit the use of exhaust fans and evaporative coolers to those that can be fitted or are fitted with a sealing device such as a self-closing damper. Plumbers will need to be aware of the situations in which these devices are required.

3.12.5 – Services

3.12.5.0 Acceptable Construction Manual

3.12.5.0 requires a hot water supply system in certain instances to be designed and installed in accordance with Section 8 of AS/NZS 3500.4 or clause 3.38 of AS/NZS 3500.5.

These provisions require energy loss to be reduced by providing a heat trap and piping insulation of an R-Value appropriate for the climate.

3.12.5.1 Insulation of Services

3.12.5.1 requires thermal insulation for central heating water piping and heating and cooling ductwork to meet certain requirements. The insulation must be of the specified R-Value, comply with AS/NZS 4859.1 and be installed as specified.

This provision is intended to ensure that when thermal insulation is required it meets an acceptable level of performance.

3.12.5.2 Central Heating Water Piping

3.12.5.2 requires central heating water piping not located in the space being conditioned space to be thermally insulated with a material R-Value as specified in BCA 2010. Again, the insulation must be of the specified R-Value, comply with AS/NZS 4859.1 and be installed as specified.

This provision is intended to limit energy loss for water piping when passing through areas other than the one being conditioned.

3.12.5.6 A Water Heater in a Hot Water Supply System

3.12.5.6 places limitations on the energy source that can be used for a water heater in a hot water supply system. Depending on the energy source, the water heater must achieve a level of performance that may include having a certain number of Renewable Energy Certificates (REC's), an energy saving percentage or a star rating. The installation of electric resistance water heaters has many restrictions.

This provision is intended to reduce greenhouse gas emissions by stating the energy source that may be used by a heater in a hot water supply system. This satisfies the performance requirement to use an energy source that is renewable or of a low greenhouse gas intensity and therefore limits when an electric resistance water heater can be used.

3.12.5.7 Heating and Pumping of Swimming Pools or Spas

3.12.5.7 limits the type of energy that can be used for heating a swimming pool or spa and in certain instances requires additional measures to reduce energy wastage.

This provision is intended to reduce greenhouse gas emissions by stating that only un-boosted solar energy may be used to heat a domestic swimming pool. However, a spa pool (defined as being over 680 L) may be heated by solar, gas or a heat pump or a combination of these. This satisfies the performance requirement to use an energy source that is renewable or low greenhouse gas intensity and therefore prohibits the use of electric resistance heating. This provision is also intended to ensure that energy is not wasted when a non-renewable energy source is used. There are also timer and spa pool cover requirements.