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Quasar Management Services Pty Ltd

Incorporated in NSW ABN 21 003 954 210

49A Parklands Road, Mt Colah NSW 2079, Australia

p: +61 2 9482 5750

www.electronicblueprint.com.au

f: +61 2 4360 2256

info@electronicblueprint.com.au



Eco-Block Australia

Eco-Block Wall System

CodeMark Certification Scope of BCA Compliance

Rod Johnston

B Tech, M Eng Sc, MICD, CP Eng, NPER, MIE Aust, RPEQ
p: 0407 2128 926 rod@electronicblueprint.com.au

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**ELECTRONIC
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AUSTRALIA'S PREMIERE BUILDING SPECIFICATION, DETAILING & TRAINING REFERENCE

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Part 1 - BCA Assessment

Client

This report has been prepared for Eco-Block Australia

Purpose

This report provides an assessment of the scope of BCA Vol 1 and BCA Vol 2¹ compliance in respect of the requirements for CodeMark certification of:

Eco-Block Wall Systems consisting of:

Detached or Duplex Residential Eco-Block Wall System

- Eco-Block 230
- Eco-Block 280
- Eco-Block 330

Commercial / Industrial Eco-Block Wall System

- Eco-Block 230 CI
- Eco-Block 280 CI
- Eco-Block 330 CI

This report is intended to be used by Eco-Block Australia to:

- Understand the background to the CodeMark scheme,
- Identify the clauses of the BCA relevant to the CodeMark certification of the Eco-Block Wall Systems
- Identify the evidence to be used in the CodeMark certification.

This report covers only those matters listed in the "Purpose" and should not be interpreted as covering any other matter or any incomplete works. This report must be read and interpreted in the context of:

- Basis of Report
- Appendix 1 - Background to BCA CodeMark Certification
- Appendix 2 - General BCA Clauses Establishing the Certification Options
- Part 2 - Technical Opinion

¹ Building Code of Australia Volumes 1 and 2

Product Description

Detached or Duplex Residential Eco-Block Wall System

The Detached or Duplex Residential Eco-Block Wall Systems described in this manual are an Australian adaptation of the Flat ICF Wall System, described in the following publication:

Prescriptive Design of Exterior Concrete Walls for One- and Two-Family Dwellings, Portland Cement Association National Standards Development Committee, PCA 100-2007

Three systems are covered by this manual:

- Eco-Block 230
- Eco-Block 280
- Eco-Block 330

The systems consist of:

- N20 concrete core, either 101 mm or 152 mm thick
 - Eco-Block 230 Series – Concrete core is 101 mm thick
 - Eco-Block 280 Series – Concrete core is 152 mm thick
 - Eco-Block 330 Series – Concrete core is 203 mm thick
- Two “flat” Class H expanded polystyrene ICF side panels, in accordance with AS 1366.3-1992, each measuring 1219 mm long x 406 mm high x 64 mm thick. Each pair of side panels is connected by a minimum of 12 Eco-Block propriety connectors at 203 mm centres horizontally.
 - Eco-Block 230 Series – Connector length is 101 mm
 - Eco-Block 280 Series – Connector length is 152 mm
 - Eco-Block 330 Series – Connector length is 203 mm
- Fibrecon steel fibres incorporated into the concrete, dosed at 24 kg/m³
- N12 L (700 x 260 cog) vertical starter bars, set in the concrete slab at centres set out in Table 3.1 to provide lap of 500 mm
- N12 vertical steel reinforcement at centres set out in Table 3.1, lapped 500 mm with the starter bars and cogged at the top to lap with the horizontal reinforcement
- At least one additional N12 vertical steel reinforcing bar adjacent to each opening
- 2-N12 bars at the top of the wall, continuous around the building.
- Lintels as set out in Table 3.2, above each window and door opening and the 2-N12 bars continuous around the building.
- 1-N12 horizontal bar below each window opening

Commercial / Industrial Eco-Block Wall System

The Commercial / Industrial Eco-Block Wall Systems described in this manual is an Australian adaptation to the requirements of AS 3600 *Concrete structures*, of the Flat ICF Wall System, described in the following publication:

Prescriptive Design of Exterior Concrete Walls for One- and Two-Family Dwellings, Portland Cement Association National Standards Development Committee, PCA 100-2007

Three systems are covered by this manual:

- Eco-Block 230 CI
- Eco-Block 280 CI
- Eco-Block 330 CI

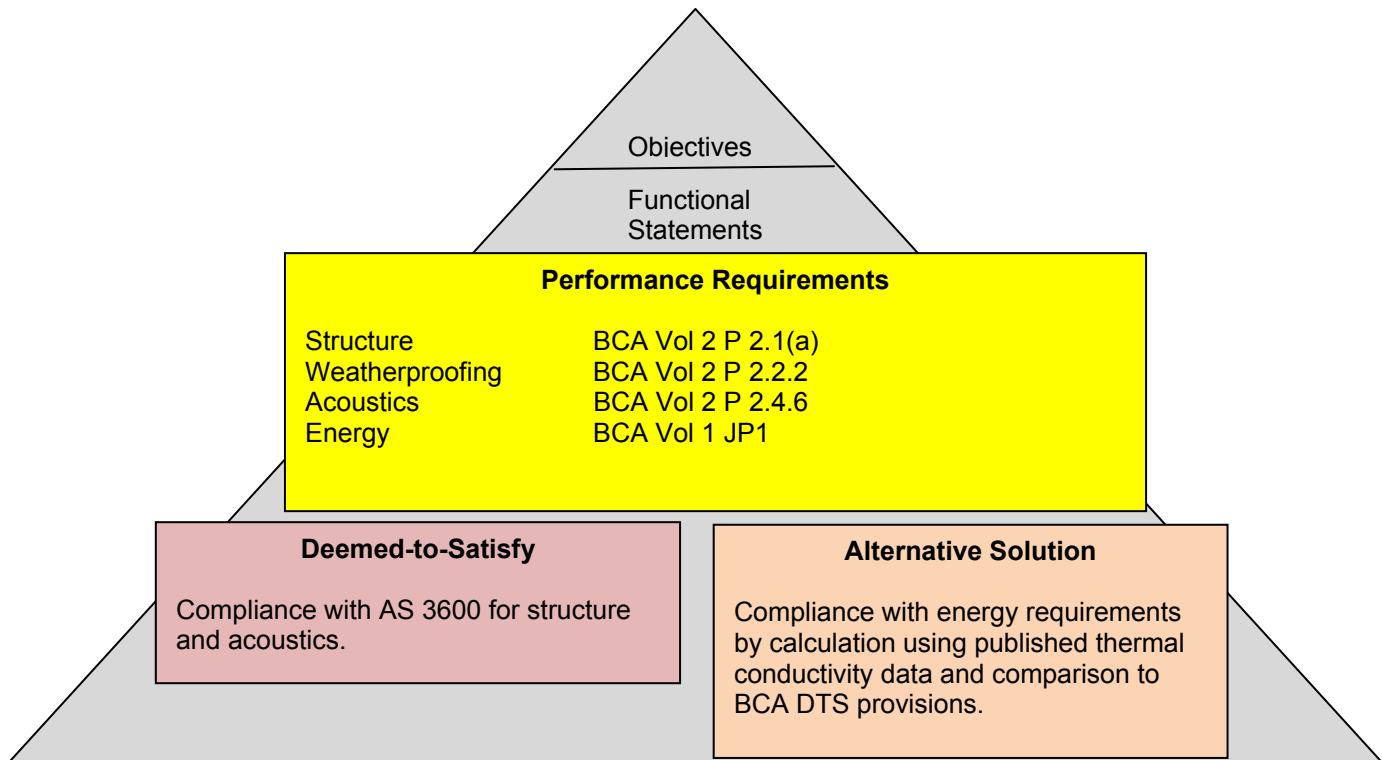
The systems consist of:

- N20 concrete core, either 101 mm or 152 mm thick
 - Eco-Block 230 CI Series – Concrete core is 101 mm thick
 - Eco-Block 280 CI Series – Concrete core is 152 mm thick
 - Eco-Block 330 CI Series – Concrete core is 203 mm thick
- Two “flat” Class H expanded polystyrene ICF side panels, in accordance with AS 1366.3-1992, each measuring 1219 mm long x 406 mm high x 64 mm thick. Each pair of side panels is connected by a minimum of 12 Eco-Block propriety connectors at 203 mm centres horizontally.
 - Eco-Block 230 CI Series – Connector length is 101 mm
 - Eco-Block 280 CI Series – Connector length is 152 mm
 - Eco-Block 330 CI Series – Connector length is 203 mm
- Reinforcement complying with AS 3600 for particular applications, including:
 - vertical loading;
 - out-of-plane horizontal loading; and/or
 - in-plane horizontal loadingin accordance with the Building Code of Australia; and AS/NZS 1170.0, 1, 2 and 3 as applicable, and AS 1170.4.
- Details shall be generally as show in the following manual, but modified to suit the BCA and Australian Standards noted above.

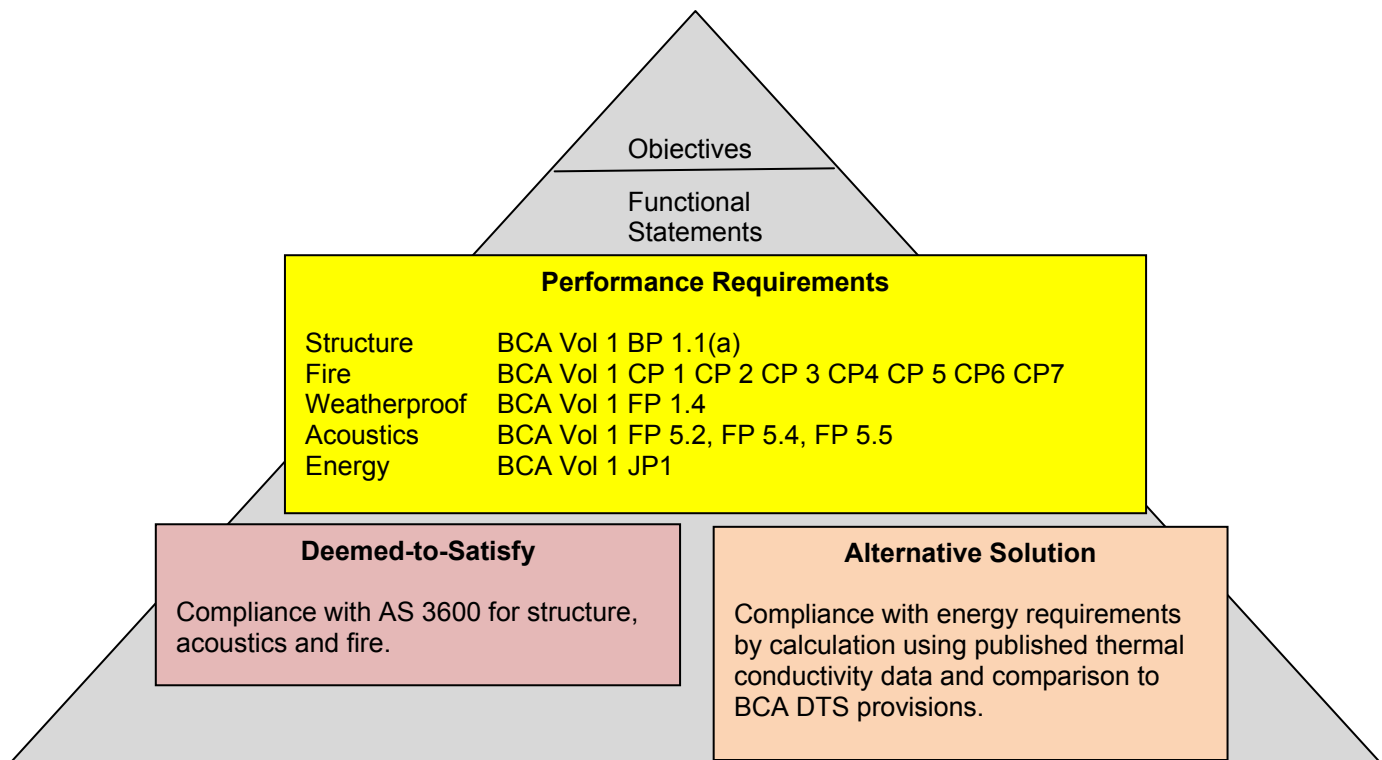
Prescriptive Design of Exterior Concrete Walls for One- and Two-Family Dwellings, Portland Cement Association National Standards Development Committee, PCA 100-2007.

BCA Compliance

Detached or Duplex Residential Eco-Block Wall System



Commercial / Industrial Eco-Block Wall System



Compliance Statement - Detached, Duplex and Some Grouped Residential Eco-Block Wall Systems

This is to certify that Detached, Duplex and Some Grouped Residential Eco-Block Wall Systems (which comply with AS 3700 Fig 12.1) (Eco-Block 230, Eco-Block 280 and Eco-Block 330) comply with Building Code of Australia (BCA) as follows:

1. Volume 2 P2.1(a) - When constructed in accordance "Eco-Block Australia Wall System Technical Manual", September 2008, the product will provide a building superstructure that complies with this part in respect of structural adequacy.
2. Volume 2 P2.2.2 - When constructed in accordance "Eco-Block Australia Wall System Technical Manual", September 2008, the product will provide a building envelope that complies with this part in respect of weatherproofing,
3. Volume 2 P 2.4.6 - When constructed in accordance "Eco-Block Australia Wall System Technical Manual", September 2008, the product will provide a building envelope that complies with this part in respect of acoustics,
4. Volume 2 P2.6.1 - When constructed in accordance "Eco-Block Australia Wall System Technical Manual", September 2008, the product will provide a wall system that complies with this part in respect of thermal resistance not less than R 3.5 m²K/W.
5. State Additions: Nil

Subject to the following conditions and limitations:

1. Product selection, and incorporation into the building design, shall be made by a professional Engineer who:
 - Has qualifications and experience acceptable to the relevant approval authorities;
 - Has received training in the use, application and technical aspects of the product; and
 - Has ready access to all the relevant technical information and test reports related to the product use.
2. Product installation shall be carried out by a competent tradesman under the direction of a Builder, both of whom:
 - Have qualifications and experience acceptable to the relevant approval authorities;
 - Have received training and accreditation (by Eco-Block) in the use, application and technical aspects of the product; and
 - Have ready access to all the relevant technical information and test reports related to the product use.

Notes:

The state administrations have differing requirements in respect of qualifications of structural engineers, including registration on the National Professional Engineers Register, and Registered Professional Engineer Queensland.

Compliance Statement - Commercial / Industrial Eco-Block Wall Systems

This is to certify that Commercial / Industrial Eco-Block Wall Systems (Eco-Block 230 CI, Eco-Block 280 CI and Eco-Block 330 CI) comply with Building Code of Australia (BCA) as follows:

1. Volume 1 BP 1.1(a) - When constructed in accordance "Eco-Block Australia Wall System Technical Manual", September 2008, the product will provide a building superstructure that complies with this part in respect of structural adequacy.
2. Volume 1 - FP1.4 - When constructed in accordance "Eco-Block Australia Wall System Technical Manual", September 2008, the product will provide a building envelope that complies with this part in respect of weatherproofing,
3. Volume 1 - FP 5.2, FP 5.5 - When constructed in accordance "Eco-Block Australia Wall System Technical Manual", September 2008, the product will provide a building envelope that complies with this part in respect of acoustics,
4. Volume 1 J1.2(a) - When constructed in accordance "Eco-Block Australia Wall System Technical Manual", September 2008, the product will provide a wall system that complies with this part in respect of thermal resistance not less than R 3.5 m²K/W.
5. Volume 1 CP1, CP2, CP3, CP4, CP5, CP6, CP7 - When constructed in accordance "Eco-Block Australia Wall System Technical Manual", September 2008, the product (with 10 mm mlasterboard internal lining and fibre-cement external lining) will provide a wall system that complies with this part in respect of fire resistance as per the following table; for.

System	Thickness of concrete core Mm	Fire Resistance Levels Structural / Integrity / Insulation mins / mins /mins
Eco-Block 230 CI	101	90/90/90
Eco-Block 280 CI	152	180/180/180
Eco-Block 330 CI	203	240/240/240
Walls must be supported top and bottom, and be designed in accordance with AS 3600.		

6. State Additions: Nil

Subject to the following conditions and limitations:

1. Product selection, and incorporation into the building design, shall be made by a professional Engineer who:
 - Has qualifications and experience acceptable to the relevant approval authorities;
 - Has received training in the use, application and technical aspects of the product; and
 - Has ready access to all the relevant technical information and test reports related to the product use.
2. Product installation shall be carried out by a competent tradesman under the direction of a Builder, both of whom:
 - Have qualifications and experience acceptable to the relevant approval authorities;
 - Have received training and accreditation (by Eco-Block) in the use, application and technical aspects of the product; and
 - Have ready access to all the relevant technical information and test reports related to the product use.

Notes:

The state administrations have differing requirements in respect of qualifications of structural engineers, including registration on the National Professional Engineers Register, and Registered Professional Engineer Queensland.

Basis of the Report

This report lists those parts of the Building Code of Australia with which the Certification Body may determine that the product complies. ^{See Note 1} The purpose of this report is assist the CodeMark certification process, and is offered for use by:

- The independent third-party JAS-ANZ accredited Certification Body (Global-Mark),
- The Australian Building Codes Board (ABCB); and
- Joint Accreditation System – Australia and New Zealand (JAS-ANZ). ^{See Note 2}

Responsibilities

The following organisations shall assume responsibility for the designated tasks.

- Product development & testing – Eco-Block Australia
- Preparation of technical manuals – Quasar Management Services Pty Ltd
- Verification of tests and manuals – Eco-Block Australia
- Operation of a quality management system based on AS/NZS ISO 9001 – Eco-Block Australia
- Preparation of documentation for a quality management system based on AS/NZS ISO 9001 – Eco-Block Australia
- Internal management auditing – Eco-Block Australia
- Preparing this scoping report, which lists those parts of the Building Code of Australia with which the Certification Body may determine product compliance – Quasar Management Services Pty Ltd
- Verification that the product complies with the nominated BCA clauses – Global-Mark
- Certification of compliance with the nominated BCA clauses – Global-Mark
- Subjective overview of tests and opinions ^{See Note 4} – Quasar Management Services Pty Ltd

Notes

1. This report deals only with the technical aspects of the product, and does not deal with the Quality Assurance aspects of the CodeMark application.
2. Notwithstanding that the purpose of this report is to assist the CodeMark certification process, it is not intended to replace independent third party assessment of the product and the supporting material (test reports and calculations), upon which the certification is to be based. The responsibility for that assessment rests with the independent third-party JAS-ANZ accredited Certification Body (Global-Mark).
3. This opinion is based on the checks listed in the fourth column of the schedule.
4. Subjectively overview the tests and/or reports to determine the relevance to the application and consistency with industry practice.

Index to Test Reports and Opinions

Set out below is an index to test reports, which form the basis of this assessment. To understand the way in which the recommendations have been derived, reference should be made to the complete test reports, since they contain the background, description of the tests and the results, necessary for correct interpretation. The complete test reports are available as separate files from the product supplier.

1. **Test** Opinion on Fire Resistance of Eco-Block wall systems to AS 1530.4 and AS 3600.
Result

System	Thickness of concrete core Mm	Fire Resistance Levels Structural / Integrity / Insulation mins / mins /mins
Eco-Block 230 CI	101	90/90/90
Eco-Block 280 CI	152	180/180/180
Eco-Block 330 CI	203	240/240/240
Walls must be supported top and bottom, and be designed in accordance with AS 3600.		

Laboratory BRANZ Limited, moonshine Road, Judgeford, New Zealand
Date 2/2/04
Reference FC2251

2. **Construction** Opinion on Fire Hazard Properties of Eco-Block wall systems, with internal plasterboard lining and external fibre-cement lining, as described below.
Opinion BRANZ opinion, "It is considered that Eco-Block wall systems with a plasterboard lining on the internal surface and a fibre-cement cladding on the external surface meets the performance requirements of the Building Code of Australia, 2005, CP4, and Part C1 Fire Resistance and Stability Clauses C1.10 Fire Hazard Properties (invoking specifications C1.10 and C1.10a) and Specification C1.1 Clause 2.4. Attachments not to impair fire-resistance on condition that:

- The internal plasterboard lining:
 - is not less than 10 mm thick;
 - is attached at no greater than 200 mm centres at the perimeter of a sheet and 400 mm centres horizontally and vertically in the field, with screws not less than 25 mm long to the plastic flanges
 - is taped and filled in accordance with the lining manufacturer's recommendations
 - complies with the Early Fire Hazard Indices or Group Number appropriate to the location and building class.
- The external fibre-reinforced cement lining is fixed at no greater than 200 mm centres at the perimeter of a sheet and 400 mm centres horizontally and vertically in the field, and finished in accordance with the lining manufacturer's recommendations.

Laboratory BRANZ Limited, moonshine Road, Judgeford, New Zealand
Date 20/1/06
Reference FSR 698

3. **Test** **UBC 26-3 Room Fire Test on Eco-Block wall with 12.5 plasterboard lining, but the forms were not concrete filled.**

Result After 15 minutes, the plasterboard had not become detached. The polystyrene had melted behind the plasterboard, but had not ignited.

Laboratory Omega point Laboratories
Date 22/1/99
Reference 15498

4. **Test** **Surface Burning ASTM E 84 97A**

Result Flame Spread Index 0 Smoke Index 300 (Terminated at 3 mins 32 secs)
Laboratory Celotex Corporation, 10301 Ninth Street, North St Petersburg, Florida
Date 28/4/98
Reference Job 258389I Metro-Dade CAE 98025

5. Test Rate of burning of plastic connector material ASTM D635
Result Average burning rate 1.43 cm/min
Laboratory Celotex Corporation, 10301 Ninth Street, North St Petersburg, Florida
Date 3/3/98
Reference Job 258389H Metro-Dade CAE 98024

6. Test Field Sound Transmission Loss Measurements (FSTC)

Result Based on the following field tests by Palmer Acoustics (Aust) Pty Ltd, ECO 280 (152 mm concrete core) has a predicted airborne sound transmission reduction in excess of $R_w + C_{tr}$ (airborne) of 50.

Airborne Sound Transmission Field Test Results			
System	FSTC	$D_{nt,w}$	C_{tr}
Test No 1 ECO 280 (152 mm concrete core) 19 Beale Street, Southport Qld	54	56	-4
Test No 2 ECO 280 (152 mm concrete core) 19 Beale Street, Southport Qld	54	56	-5

Laboratory Palmer Acoustics (Aust) Pty Ltd
Date 14/10/04
Reference 2107

7. Construction Opinion ECO 280 (152 mm concrete core)
Based upon our understanding of the system, experience with wall impact noise in many high rise residential buildings and as a practicing Acoustic Engineer (RPEQ, CPEng, NPER 3) I certify that the proposed system meets the BCA requirement to be sufficient to prevent illness or loss of amenity to the occupants, with regard to the isolation of impact noise. In this application the two 65mm thick polystyrene formwork panels serve to act as impact isolation elements serving to sufficiently decouple impact noise across the wall.

Laboratory Palmer Acoustics (Aust) Pty Ltd
Date 22/11/04
Reference Letter of Opinion, R Palmer

Declaration

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance, which I regard as relevant, have to my knowledge been withheld.



Rodney Kentwell Johnston

Appendix 1

Background to BCA CodeMark Certification

Performance Requirements, Deemed-to-Satisfy & Alternative Solutions

The following section describes the various means employed within the building design and construction industry to satisfy the performance requirements of the BCA.

All building design must comply with the relevant State Building Regulations, which are set out in the BCA Vol 1 and BCA Vol 2. The BCA defines the performance requirements, generally in very broad terms, and the means of compliance through:

- Deemed-to-Satisfy Provisions, which may include:
 - Acceptable Construction Manuals (e.g. nominated Australian Standards)
 - Acceptable Construction Practice (e.g. forms of construction reproduced in the BCA itself)
- Alternative Solutions (e.g. Designs based on test results and engineering principles).

Each of these paths to compliance has equal status under the BCA.

Definitions

The following definitions are taken from the BCA Volume 2 (Building Code of Australia)

Objective

... means a statement contained in the BCA which is considered to reflect community expectations.

Functional Statement (See Note below)

... means a statement which describes how buildings and building elements achieve the Objectives.

Performance Requirement (See Note below)

... means a requirement which states a level of performance which a Building Solution must meet.

Deemed-to-Satisfy Provisions (See Note below)

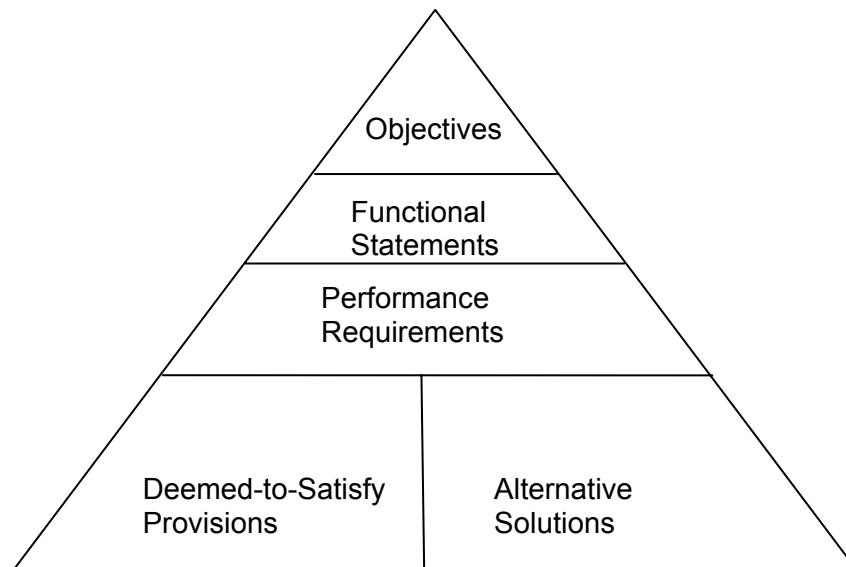
...means the provisions contained in Section 3 which are deemed to comply with the Performance Requirements.

Alternative Solution

... means a Building Solution which complies with the Performance Requirements other than by reason of complying with the Deemed-to-Satisfy Provisions.

Note:

Some of the definitions of in BCA Vol 1 have slightly different wording from those in BCA Vol 2.



CodeMark Certification

The intention of the CodeMark Certification is to give confidence that the particular product, when installed in the building, will satisfy the requirements of the BCA. Although CodeMark Certification is generally sought by building product manufacturers, there are actually three related considerations in the process:

- Design (including product selection)
- Manufacture and supply
- Construction

Design (including product selection)

Responsibility

The design process must encompass the selection of the appropriate product for the particular design application. The Architect and Engineer for any building project share responsibility (and authority) to determine and communicate the design (within the constraints of building regulations) to the builders. They are required to consider all relevant matters affecting the building and its components, and determine their designs drawing on professional training, experience, peer practices, ethics, client requirements, published standards, research and the like. CodeMark certifications and BCA DTS (Deemed-to-Satisfy) provisions play an important part in this decision making (and in many cases will be adopted by the Engineer or Architect), although there are also many cases where the Engineer or Architect may specify details that are different from these. This information is communicated to builders by Drawings and Specifications. It is essential that the authority of the Architect and Engineer to exercise and communicate their professional judgment via drawings and specifications should not be undermined by Builders and/or Certifiers assuming that the CodeMark conditions and/or BCA DTS overrides the design.

CodeMark Used to Build Confidence in the Design Process

The designer may be assisted by the manufacturer's literature, but the responsibility for the correct determination of the product appropriate to the application remains with the Architect or Engineer.

Confidence in the design and product selection process may be boosted by making the following clause a condition of the CodeMark certification.

Product selection, and incorporation into the building design, shall be made by a professional Architect or Engineer (as appropriate) who:

- *Has qualifications and experience acceptable to the relevant approval authorities;*
- *Has received training in the use, application and technical aspects of the product;*
and
- *Has ready access to all to the relevant technical information and test reports related to the product use.*

Manufacture and supply

It is commonly manufacturers (or suppliers) who seek CodeMark certification, to boost the acceptability of their products in the market place.

There are two principal requirements of the CodeMark Product Certification process for manufacturers.

- Ensure that the Company has a properly functioning Management System, capable of delivering consistent product and service to predetermined specifications. Substantial compliance with the provision of AS/NZS ISO 9001 is considered to be an indicator of such a properly functioning system.
- Ensure that the nominated products satisfy the requirements of nominated BCA clauses.

Construction

Responsibility

The construction process must faithfully ensure that the design expectations have been met, and that the product has been installed in accordance with the manufacturer's instructions. However, the Builder and the Contractors must assume responsibility for the quality of the construction work.

CodeMark Used to Build Confidence in the Construction Process

The installer (Builder, Contractor etc) may be assisted by the manufacturer's literature, but the responsibility for the correct installation of the product remains their responsibility.

Confidence in the product installation process may be boosted by making the following clause a condition of the CodeMark certification.

Product installation, shall be carried out by a competent tradesman under the direction of a Builder, both of whom:

- *Have qualifications and experience acceptable to the relevant approval authorities;*
- *Have received training in the use, application and technical aspects of the product;*
and
- *Have ready access to all to the relevant technical information and test reports related to the product use.*

Simple Case – Product satisfies identifiable Deemed-to-Satisfy Requirements

The most simple cases for CodeMark certification are those where there is an easily identifiable DTS (Deemed-to-Satisfy) requirements referenced in the BCA. This may include an Australian Standard or a particular BCA DTS clause. In this case, consistent and reproducible compliance with the referenced standard, together with the above-mentioned provision for design and construction, will be sufficient to permit CodeMark certification to the nominated DTS standard.

Example

Steel lintels selected, manufactured and installed to either BCA-2006 Vol 2 Fig 3.3.3.5 or AS 3700 Table 12.8 would be acceptable for CodeMark certification, even though the two referenced documents provide different design solutions.

Complex Case – Product does not satisfy easily identified Deemed-to-Satisfy Requirements

There are many building elements (e.g. parts of the building structure), which must be selected and installed in the context of the overall building design. The performance of these elements can only be assessed in the context of their contribution to the performance of the structure as a whole.

Examples

Steel bracing and precast concrete panels are designed into a structure in accordance with AS 4100, AS 3600 and the like, but there is no simple identifiable isolated DTS rules that can be used to describe their design, manufacture and installation.

Because of a general lack of appropriate DTS rules specifically covering the details of this type of product, they are often treated as parts of Alternative Solutions. These products must be considered in the context of their contribution to meeting their overall performance requirements for the building. For example, BCA Vol 1 Clauses BP 1.1 to BP1.3 for structural actions; and CP1 to CP9 for fire performance etc.

Incomplete Compliance with DTS

One critical question is; "How do you certify a product that does not mimic all of the Deemed-to-Satisfy properties?".

In these circumstances, an assessment of the deviations (shortfalls?) should be made, and expert judgment under BCA Vol 1 A2.2 (a) (iii) or BVA Vol 2 1.2.2 (a) (iii) provided to determine whether such deviations are significant. For example, issues related to branding are not a significant issue, provided a combination of "identification" and "manufacturer's instructions" are provided.

Appendix 2

General BCA Clauses Establishing the Certification Options

The following clauses of BCA Volume 1 and BCA Volume 2 provide the criteria upon which the CodeMark certification process may proceed.

BCA Vol 1 Class 2 – 9 Buildings

Clause A0.4 Compliance with the Building Code of Australia

Requirement

A Building Solution will comply with the Building Code of Australia if it satisfies the Performance Requirements

Application

In this case, the opinion is based on complying with this clause.

Clause A0.5 Meeting the Performance Requirements

Requirement

Compliance with the Performance Requirements can only be achieved by-

- (a) *complying with the Deemed-to-Satisfy Provisions; or*
- (b) *formulating an Alternative Solution, which:*
 - (i) *complies with the Performance requirements; or*
 - (ii) *is shown to be at least equivalent to the Deemed-to-Satisfy Provisions; or*
- (c) *a combination of (a) and (b)*

Application

In this case, the opinion is based on:

- (a) *complying with the Deemed-to-Satisfy Provisions for structural and fire considerations; and*
- (b) *formulating an Alternative Solution, which:*
 - (i) *complies with the Performance requirements; or*
 - (ii) *is shown to be at least equivalent to the Deemed-to-Satisfy Provisions; for energy efficiency and weatherproofing*

Clause A0.8 Meeting the Performance Requirement

Requirement

- (a) *An Alternative Solution must be assessed according to one or more of the Assessment Methods.*
- (b) *An Alternative Solution will only comply with the Building Code of Australia if the Assessment Methods used to determine compliance with the Performance Requirements have been satisfied.*
- (c) *The Performance Requirements relevant to an Alternative Solution must be determined in accordance with A0.10.*

Application

In this case, the opinion is based on the Alternate Solutions complying fully with this clause.

Clause A0.9 Assessment Methods

Requirement

The following Assessment Methods, or any combination of them, can be used to determine that a Building Solution complies with the Performance Requirements:

- (a) *Evidence to support that the use of a material, form of construction or design meets a Performance Requirement or a Deemed-to-Satisfy Provision as described in A2.2.*
- (b) *Verification Methods such as—*
 - (i) *the Verification Methods in the Building Code of Australia; or*
 - (ii) *such other Verification Methods as the appropriate authority accepts for determining compliance with the Performance Requirements.*
- (c) *Comparison with the Deemed-to-Satisfy Provisions.*
- (d) *Expert Judgment.*

Application

In this case, the opinion is based on compliance with paragraphs:

- (a) *Evidence to support that the use of a material, form of construction or design meets a Performance Requirement or a Deemed-to-Satisfy Provision as described in A2.2.*
- (b) *Verification Methods such as—*
 - (i) *the Verification Methods in the Building Code of Australia; or*
 - (ii) *such other Verification Methods as the appropriate authority accepts for determining compliance with the Performance Requirements.*
- (c) *Comparison with the Deemed-to-Satisfy Provisions.*

Clause A0.10 Relevant Performance Requirements

Requirement

In order to comply with the provisions of A1.5 (to comply with Sections A to J inclusive) the following method must be used to determine the Performance Requirement or Performance Requirements relevant to the Alternative Solution:

- (a) *Identify the relevant Deemed-to-Satisfy Provision of each Section or Part that is to be the subject of the Alternative Solution.*
- (b) *Identify the Performance Requirements from the same Sections or Parts that are relevant to the identified Deemed-to-Satisfy Provisions.*
- (c) *Identify Performance Requirements from other Sections and Parts that are relevant to any aspects of the Alternative Solution proposed or that are affected by the application of the Deemed-to-Satisfy Provisions, that are the subject of the Alternative Solution.*

Application

In this case, the opinion is based on full compliance with this paragraph.

Clause A2.1 Suitability of materials

Requirement

Every part of a building must be constructed in an appropriate manner to achieve the requirements of the Building Code of Australia, using materials that are fit for purpose for which they are intended.

Application

In this case, the opinion is based on calculation that the Eco-Block Wall System satisfies this criterion.

Clause A2.2 Evidence of suitability

Requirement

- (a) *Subject to A2.3 and A2.4, evidence to support that the use of a material, form of construction or design meets a Performance Requirement or Deemed-to-Satisfy Provision may be in the form of one or a combination of the following:*
 - (i) *A report issued by a Registered Testing Authority, showing that the material or form of construction has been submitted to the tests listed in the report, and setting out the results of those tests and any other relevant information that demonstrates its suitability for use in the building.....*
 - (iii) *A certificate from a professional engineer or other appropriately qualified person which-*
 - (A) *certifies that a material, design or form of construction complies with the requirements of the Building Code of Australia; and*
 - (B) *sets out the basis on which it is given and the extent to which relevant specification, rules, codes of practice or other publication have been relied upon.*

- (iv) *A current certificate issued by a product certification body that has been accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ).....*

Application

In this case, the opinion is based on (a) (i), (iii) and (iv).

Specification A1.3 Documents Adopted by Reference

Table 1 Schedule of Referenced Documents

Application

The following referenced documents, called up in Building Code of Australia Vol 1-2007 Table 1, provide the source documents used to: *Identify the relevant Deemed-to-Satisfy Provision, Identify the Performance Requirements and Identify Performance Requirements from other Sections and Parts that are affected by the application of the Deemed-to-Satisfy Provisions*

AS 3600

BCA Vol 2 Class 1 & 10 Buildings

Clause 1.0.4 Compliance with the Building Code of Australia

Requirement

A Building Solution will comply with the Building Code of Australia if it satisfies the Performance Requirements

Application

In this case, the opinion is based on complying with this clause.

Clause 1.0.5 Meeting the Performance Requirements

Requirement

Compliance with the Performance Requirements can only be achieved by-

- (a) complying with the Deemed-to-Satisfy Provisions; or*
- (b) formulating an Alternative Solution, which:
 - (i) complies with the Performance requirements; or*
 - (ii) is shown to be at least equivalent to the Deemed-to-Satisfy Provisions; or**
- (c) a combination of (a) and (b)*

Application

In this case, the opinion is based on:

- (b) formulating an Alternative Solution, which:
 - (i) complies with the Performance requirements; or*
 - (ii) is shown to be at least equivalent to the Deemed-to-Satisfy Provisions; or**

Clause 1.0.8 Meeting the Performance Requirements

Requirement

- (a) An Alternative Solution must be assessed according to one or more of the Assessment Methods.*
- (b) An Alternative Solution will only comply with the Building Code of Australia if the Assessment Methods used to determine compliance with the Performance Requirements have been satisfied.*
- (c) The Performance Requirements relevant to an Alternative Solution must be determined in accordance with 1.0.10.*

Application

In this case, the opinion is based on the Alternate Solutions complying fully with this clause.

Clause 1.0.9 Assessment Methods

Requirement

The following Assessment Methods, or any combination of them, can be used to determine that a Building Solution complies with the Performance Requirements:

- (a) Evidence to support that the use of a material, form of construction or design meets a Performance Requirement or a Deemed-to-Satisfy Provision as described in 1.2.2.*
- (b) Verification Methods such as—
 - (i) the Verification Methods in the Building Code of Australia; or*
 - (ii) such other Verification Methods as the appropriate authority accepts for determining compliance with the Performance Requirements.**
- (c) Comparison with the Deemed-to-Satisfy Provisions.*
- (d) Expert Judgment.*

Application

In this case, the opinion is based on compliance with paragraphs:

- (a) *Evidence to support that the use of a material, form of construction or design meets a Performance Requirement or a Deemed-to-Satisfy Provision as described in A2.2.*
- (b) *Verification Methods such as—
 - (i) the Verification Methods in the Building Code of Australia; or
 - (ii) such other Verification Methods as the appropriate authority accepts for determining compliance with the Performance Requirements.*
- (c) *Comparison with the Deemed-to-Satisfy Provisions.*

Clause 1.0.10 Relevant Performance Requirements

Requirement

The following method must be used to determine the Performance Requirement or Performance Requirements relevant to the Alternative Solution:

- (a) *Identify the relevant Deemed-to-Satisfy Provision of Section 3 that is to be the subject of the Alternative Solution.*
- (b) *Identify the Performance Requirements from Section 2 that are relevant to the identified Deemed-to-Satisfy Provisions.*
- (c) *Identify Performance Requirements from Section 2 that are relevant to any aspects of the Alternative Solution proposed or that are affected by the application of the Deemed-to-Satisfy Provisions, that are the subject of the Alternative Solution.*

Application

In this case, the opinion is based on full compliance with this paragraph.

Clause 1.2.1 Suitability of materials

Requirement

Every part of a building must be constructed in an appropriate manner to achieve the requirements of the Housing Provisions, using materials that are fit for purpose for which they are intended.

Application

In this case, the opinion is based on calculation that the Eco-Block Wall System satisfies this criterion.

Clause 1.2.2 Evidence of suitability

Requirement

- (a) *Subject to 1.2.3 and 1.2.4, evidence to support that the use of a material, form of construction or design meets a Performance Requirement or Deemed-to-Satisfy Provision may be in the form of one or a combination of the following:
 - (i) *A report issued by a Registered Testing Authority, showing that the material or form of construction has been submitted to the tests listed in the report, and setting out the results of those tests and any other relevant information that demonstrates its suitability for use in the building.....*
 - (iii) *A certificate from a professional engineer or other appropriately qualified person which-
 - (A) *certifies that a material, design or form of construction complies with the requirements of the Building Code of Australia; and*
 - (B) *sets out the basis on which it is given and the extent to which relevant specification, rules, codes of practice or other publication have been relied upon.**
 - (iv) *A current certificate issued by a product certification body that has been accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ).....**

- (b) *Any copy of documentary evidence submitted, must be a complete copy of the original report or document.*

Application

In this case, the opinion is based on the following:

- Reference to reports issued by a registered testing authority as per paragraph (i). The reports shall be checked to ensure that they are complete, as per paragraph (b).

Specification 1.4.1

Table 1.4.1 Schedule of Referenced Documents

Application

The following referenced documents, called up in Building Code of Australia Vol 2 Table 1.4.1, provide the source documents used to: *Identify the relevant Deemed-to-Satisfy Provision, Identify the Performance Requirements and Identify Performance Requirements from other Sections and Parts that are affected by the application of the Deemed-to-Satisfy Provisions ...*

AS 3700-2001 Including Amendments 1, 2 and 3.

Part 2

Technical Assessment against Specific BCA Clauses

The following clauses of BCA Volume 1 and BCA Volume 2 provide the criteria upon which the specific CodeMark certification has been based.

BCA Vol 1 Class 2 – 9 Buildings

Section B - Structure

Performance Requirement

BP1.1

- (a) *A building or structure, to the degree necessary, must—*
- (i) *remain stable and not collapse; and*
 - (ii) *prevent progressive collapse; and*
 - (iii) *minimise local damage and loss of amenity through excessive deformation, vibration or degradation; and*
 - (iv) *avoid causing damage to other properties, by resisting the actions to which it may reasonably be subjected.*

BP1.2

The structural resistance of materials and forms of construction must be determined using five percentile characteristic material properties with appropriate allowance for—

- (a) *known construction activities; and*
- (b) *type of material; and*
- (c) *characteristics of the site; and*
- (d) *the degree of accuracy inherent in the methods used to assess the structural behaviour; and*
- (e) *action effects arising from the differential settlement of foundations, and from restrained dimensional changes due to temperature moisture, shrinkage, creep and similar effects.*

State Variations

Nil

Compliance

Compliance with these performance requirements is set out in Section 3 and Appendix C of this manual, based on AS 3600.

Section C - Fire Resistance

Performance Requirement

CP1

A building must have elements which will, to the degree necessary, maintain structural stability during a fire appropriate to—

- (a) *the function or use of the building; and*
- (b) *the fire load; and*
- (c) *the potential fire intensity; and*
- (d) *the fire hazard; and*
- (e) *the height of the building; and*
- (f) *its proximity to other property; and*
- (g) *any active fire safety systems installed in the building; and*
- (h) *the size of any fire compartment; and*
- (i) *fire brigade intervention; and*
- (j) *other elements they support; and*
- (k) *the evacuation time.*

CP2

- (a) *A building must have elements which will, to the degree necessary, avoid the spread of fire—*
- (i) *to exits; and*
 - (ii) *to sole-occupancy units and public corridors; and*
Application:
CP2(a)(ii) only applies to a Class 2 or 3 building or Class 4 part.
 - (iii) *between buildings; and*
 - (iv) *in a building.*

- (b) *Avoidance of the spread of fire referred to in (a) must be appropriate to—*
- (i) *the function or use of the building; and*

- (ii) the fire load; and
- (iii) the potential fire intensity; and
- (iv) the fire hazard; and
- (v) the number of storeys in the building, and
- (vi) its proximity to other property; and
- (vii) any active fire safety systems installed in the building; and
- (viii) the size of any fire compartment; and
- (ix) fire brigade intervention; and
- (x) other elements they support; and
- (xi) the evacuation time.

CP3

A building must be protected from the spread of fire and smoke to allow sufficient time for orderly evacuation of the building in an emergency.

Application:

CP3 only applies to-

- (a) a patient care area of a Class 9a health-care building; and
- (b) a Class 9c aged care building.

CP4

A material and an assembly must, to the degree necessary, resist the spread of fire to limit the generation of smoke and heat, and any toxic gases likely to be produced, appropriate to—

- (a) the evacuation time; and
- (b) the number, mobility and other characteristics of occupants; and
- (c) the function or use of the building; and
- (d) any active fire safety systems installed in the building.

CP5

a concrete external wall that could collapse as a complete panel (e.g. tilt-up and pre-cast concrete) must be designed so that in the event of fire within the building the likelihood of outward collapse is avoided.

Limitation:

CP5 does not apply to a building having more than two storeys above ground level.

CP6

A building must have elements, which will, to the degree necessary~ avoid the spread of fire from service equipment having—

- (a) a high fire hazard; or
- (b) a potential for explosion resulting from a high fire hazard.

CP7

A building must have elements, which will, to the degree necessary, avoid the spread of fire so that emergency equipment provided in a building will continue to operate for a period of time necessary to ensure that the intended function, of the equipment is maintained during a fire.

State Variations

Nil

Compliance

Compliance with these performance requirements is set out in Section 4 and Appendix D of this manual, which incorporate the findings of BRANZ report and consideration of AS 3600.

Section F - Health and Amenity – Damp and Weatherproofing

Performance Requirement

FP1.4

A roof and external wall (including openings around windows and doors) must prevent the penetration of water that could cause—

- (a) unhealthy or dangerous conditions, or loss of amenity for occupants; and*
- (b) undue dampness or deterioration of building elements.*

Limitation: FP1.4 does not apply to-

- (a) Class 7 or 8 buildings where in the particular case there is no necessity for compliance; or*
- (b) a garage, tool shed, sanitary compartment or the like, forming a building used for other purposes; or*
- (c) an open spectator stand or open-deck carpark.*

State Variations

Nil

Compliance

Compliance with these performance requirements is set out in Section 7 and Appendix G of this manual.

Section F - Health and Amenity (Sound)

Performance Requirement

FP5.2

Walls separating sole-occupancy units or a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby, or the like, or parts of a different classification, must provide insulation against the transmission of—

- (a) airborne sound; and*
- (b) impact generated sound, if the wall is separating a bathroom, sanitary compartment, laundry or kitchen in one sole-occupancy unit from a habitable room (other than a kitchen) in an adjoining unit, sufficient to prevent illness or loss of amenity to the occupants.*

Application:

FP5.2 only, applies to a Class 2 or 3 building.

FP5.5

Walls separating sole-occupancy units, or a sole-occupancy unit from a kitchen bathroom, sanitary compartment (not being an associated ensuite), laundry, plant room or utilities room, must provide insulation against the transmission of—

- (a) airborne sound; and*
- (b) impact generated sound, if the wall separates a sole-occupancy unit from a kitchen or laundry, sufficient to prevent illness or loss of amenity to the occupants.*

Application

FP5.5 only applies to a Class 9c aged care building.

State Variations

Nil

Compliance

Compliance with these performance requirements is set out in Section 5 and Appendix E of this manual.

Section J Energy and Efficiency

Requirement

J1.5 (a) Walls

Deemed-to-Satisfy Provisions from BCA Vol 1 J1.3.(a)

State Variations

In New South Wales BCA Volume 1 Section J is replaced by NSW Section J.

- *For Class 2 and Class 4 buildings, NSW BASIX applies in accordance with NSW Subsection JA.*
- *For Class 3, 5, 6, 7a, 7b, 9a, 9b and 9c buildings, BCA Volume 1 Section J, in accordance with NSW Subsection JB.*

In Northern Territory, BCA Volume 1 Section J does not apply.

In Victoria, there is a variation of the star requirements for JV1.

Compliance

Compliance with these performance requirements is set out in Section 6 and Appendix F of this manual.

BCA Vol 2 Class 1 & 10 Buildings

Part P2.1 Structure

Performance Requirement

- (a) *A building or structure, to the degree necessary, must—*
- (i) *remain stable and not collapse; and*
 - (ii) *prevent progressive collapse; and*
 - (iii) *minimise local damage and loss of amenity through excessive deformation, vibration or degradation; and*
 - (iv) *avoid causing damage to other properties, by resisting the actions to which it may reasonably be subjected.*
- (c) *The structural resistance of materials and forms of construction must be determined using five percentile characteristic material properties with appropriate allowance for—*
- (i) *known construction activities; and*
 - (ii) *type of material; and*
 - (iii) *characteristics of the site; and*
 - (iv) *the degree of accuracy inherent in the methods used to assess the structural behaviour; and*
 - (v) *action effects arising from the differential settlement of foundations, and from restrained dimensional changes due to temperature moisture, shrinkage, creep and similar effects.*

State Variations

Nil

Compliance

Compliance with these performance requirements is set out in Section 3 and Appendix C of this manual, and consideration of AS 3700-2001.

Part 2.2.2 Weatherproofing and Part 2.2.3 Dampness

Performance Requirement

P2.2.2 Weatherproofing

A roof and external wall (including openings around windows and doors) must prevent the penetration of water that could cause—

- (a) *unhealthy or dangerous conditions, or loss of amenity for occupants; and*
- (b) *undue dampness or deterioration of building elements.*

Limitation: P2.2.2(a) does not apply to Class 10 building except where its construction contributes to the weatherproofing of the Class 1 building

State Variations

Nil

Compliance

Compliance with these performance requirements is set out in Section 6 and Appendix G of this manual.

P2.4.6 Sound insulation

Performance Requirement

- (a) *Walls separating dwellings must provide insulation against the transmission of airborne sound sufficient to prevent illness or loss of amenity to the occupants.*

State Variations

In Northern Territory P2A.6 is replaced with the following:

P2.4.6 Sound insulation

- (a) *Walls separating dwellings must provide insulation against the transmission of airborne and impact generated sound sufficient to prevent illness or loss of amenity to the occupants.*

Compliance

Compliance with these performance requirements is set out in Section 5 and Appendix E of this manual,

3.12 Energy Efficiency

Acceptable construction practice

Deemed-to-Satisfy Provisions from BCA Vol 2 3.12.

State variations

In New South Wales BCA Volume 1 Section J is replaced by NSW Section J.

- For Class 2 and Class 4 buildings, NSW BASIX applies in accordance with NSW Subsection JA.
- For Class 3, 5, 6, 7a, 7b, 9a, 9b and 9c buildings, BCA Volume 1 Section J, in accordance with NSW Subsection JB.

In Northern Territory, BCA Volume 1 Section J does not apply.

Compliance

Compliance with these performance requirements is set out in Section 6 and Appendix F of this manual.

Appendix 3

Rod Johnston – Qualifications and Experience

Name Rodney Kentwell Johnston
Address 80A The Scenic Road, Killcare Heights NSW 2257, Australia

Tertiary Qualifications

Master of Engineering Science (Structural & Foundation Engineering)
Master of International and Community Development
Bachelor of Technology (Civil Engineering)

Building, Trade and Other Qualifications

Qualified Building Supervisor (NSW 18087-S)
Apprenticeship in Boilermaking
Train the Trainer (University short course)

Professional Associations

Member, Institution of Engineers, Australia
Chartered Professional Engineer
National Professional Engineers Register, NPER Membership No 377019
Registered Professional Engineer, Queensland
Member, Association of Consulting Structural Engineers

Company and Association Boards

Quasar Management Services Pty Ltd
Chairman (1990 – Current)

Consulting structural and civil engineer, specialising in design of concrete, masonry and steel structures, including residential buildings and retaining walls, preparation of design manuals and design aids, technical problem solving and expert witness.

Design Detail Deliver Pty Ltd (Trading as Electronic Blueprint)
Chairman (2000 – Current)

Company providing design and construction specification, detailing, software, education, training for residential building design and construction.

Partner Housing Australasia (Building) Inc

Previously Trading as Habitat for Humanity Western Sydney Inc.
Chairman (2002-Current)

Charitable home builder organization providing professional design and construction services for affordable housing in Australia and the Asia-Pacific region.

Association of Consulting Structural Engineers (NSW)
Director (2004 – Current)

Previous Board and Similar Positions

Habitat for Humanity Australia Inc - Director 2003-2005

Hornsby Shire Council

Councillor from 1987 to 1991. Deputy President 1990-1991
Local authority (Area 510 sq. km, approximate population 120,000, northern Sydney)

Engineering and Building Experience

Since May, 1990 to the current date, Rod Johnston has been the chairman/managing director of Quasar Management Services Pty Ltd, a consulting structural and civil engineer, specialising in design of concrete, masonry and steel structures, including residential buildings and retaining walls, preparation of design manuals and design aids, technical problem solving and expert witness. He is also chairman of Electronic Blueprint (Design Detail & Deliver Pty Ltd) , a company specialising in design and construction software, education, training and specialised building products for residential building.

Previous experience since from 1974 to 1990 includes building and construction industries in Australia, United Kingdom and Zambia in roles which included structural design engineer, draftsman, registered builder, contract controller, estimator and tradesman. For nine years he was employed by Amatek Limited (formerly Monier Limited and now part of Rocla) as Project Manager, Manager Engineering and Construction and Technical Marketing Manager in the Masonry Division.

Australian Building Codes Board

Rod Johnston represents the Association of Consulting Engineers Australia (ACEA) on the Building Codes Committee (BCC), the peak technical advisory committee to the Australian Building Codes Board, which prepares the Building Code of Australia (BCA). He therefore has an intimate knowledge of the BCA and its requirements.

He has served on the following committees and working groups, assisting the Australia Building Codes Board to prepare amendments to the Building Code of Australia for energy saving.

- Technical Committee (Residential)
- Technical Committee (Commercial)
- Building Fabric (Housing) WGH 5 - Chairman
- Building Fabric (Commercial Buildings) WGC 2

Australian Standards Technical Committees

Active member of Standards Australia Technical Committees, preparing the following standards:

AS/NZS 1170 Loading codes
AS 2870 Residential slabs and footings
AS 4678 Earth retaining structures
AS 3700 Masonry structures
AS 4773 Draft standard for masonry in small buildings
AS/NZS 4455 Masonry units and segmental pavers
AS/NZS 4456 Masonry units and segmental pavers - Methods of test
AS 2904 Damp proof courses and flashings
AS 2701 Sampling and testing mortar
AS/NZS 2699 Built in components for masonry construction
AS 3727 Guide to residential pavements
AS/NZS 4586 Slip resistance classification of new pedestrian surfaces
AS/NZS 4663 Slip resistance classification of existing pedestrian surfaces
AS/NZS 4960 Draft standard for segmental pavements (currently being prepared)
HB 197 An introductory guide to the slip resistance of pedestrian surface materials
AS 2627.1 Thermal insulation of dwellings - Thermal insulation roofs and walls

- Chairman of Standards Australia Committee BD/26 for masonry units and test methods.
- Chairman of Standards Australia Committee BD/97 for residential masonry construction.

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