Government of **Western Australia**
Department of **Mines, Industry Regulation and Safety**
Building and Energy

A General Inspection (Investigation) Report Eight

Barriers (balustrades)

May 2023

Contents

Glossary of terms, acronyms and abbreviations

Term / Acronym	Definition
Applicable building standards	In general, the applicable building standards for proposed building work is the BCA.
Barrier	An obstacle i.e. balustrade, to prevent falls from one to another
Barrier Supplier	For the purpose of this report, a barrier supplier is a company/person who supplies barrier components i.e. fixings and frames and/or complete barrier systems.
Barrier Systems	A system that comprises of posts, top and bottom rail, infill such as balusters or glass, base plates and hardware necessary to secure the system to the substrate.
BCA	Building Code of Australia (volumes 1 and 2 of the National Construction Code).
Building Act	Building Act 2011 (WA)
Building Services Acts	A suite of laws governing building control.
Building Permit	Permission granted by the permit authority for building work to be carried out.
Building Regulations	Building Regulations 2012 (WA)
Building Surveyor Contractor	Registered individuals, partnerships, or companies that carry out building surveying work and issue approved certificates.
Building Surveyor Practitioner	Registered individuals that carry out building surveying work. They cannot issue a certificate but can be a nominated supervisor for a building surveyor contractor.
CDC	Certificate of Design Compliance
Compliance Inspections	Inspections undertaken to monitor the work and conduct of registered builders and building surveying contractors to determine whether all the requirements for registration are being met.
Deemed-to-Satisfy (DTS)	Provisions that are deemed to satisfy the Performance Requirements of the BCA of Australia.
Design Criteria	Information documenting the barriers resistance to actions appropriate for the use and location of the building in accordance with the AS/NZS 1170 series.

Design Documentation	Drawings, specifications, and technical documents referenced on a certificate of design compliance that demonstrates compliance with the building standards.
DMIRS	Department of Mines, Industry Regulation and Safety
General Inspections	Inspections undertaken to monitor how well the Building Service Acts are operating and how well the applicable building standards are being applied.
NCC	National Construction Code
Permit Authority	Unless otherwise prescribed, this is usually the local government that has responsibility for the area in which a building or incidental structure is (or is proposed to be) located.
Serviceability limit state (SLS)	State that correspond to conditions beyond which specified service criteria for a structure or structural element are no longer met.
Ultimate Limit State (ULS)	State that correspond to conditions beyond which collapse, or other similar forms of structural failure.
WA	Western Australia

1. Executive Summary

The Department of Mines, Industry Regulation and Safety - Building and Energy Division (Building and Energy) undertakes general inspections to monitor how well building standards are being applied. Our *Audit Priorities Statement 2021-22* (Audit Priorities) set out the areas of focus for the forthcoming year based on construction practices that posed the most significant risks.[1]

Barriers, also known as balustrades, are installed on buildings to protect edges of balconies and raised levels. Barrier products and installations represent a significant potential for harm if they are not fit for purpose or are installed incorrectly.

Building and Energy undertook a general inspection into barriers consistent with its *Building Compliance Audit Strategy 2021-24* (Audit Strategy). The aim of the exercise was to gather information about products and practices to inform and educate the Building Industry and to improve compliance levels.[2]

As a first step, Building and Energy often undertakes a 'snapshot' inspection of a small sample of buildings to inform itself and industry on an emerging issue. In this general inspection, it was decided an investigation into existing barriers that have failed would be more prudent.

This report, *General Inspection (Investigation) Report Eight (GIR8)* details the findings of Building and Energy's investigation into how building standards are applied from the approval process, through procurement, manufacturing and installation of barrier products.

As part of its investigation, Building and Energy interviewed industry members associated with barriers including all those involved from the design through the whole supply chain, to installation. This helped to build an understanding of existing practices within the barrier industry and the building approval process and to gain insight into the procurement process of barrier systems and the relationship between the following parties:-

- the builder and the barrier supplier/installer;
- the barrier supplier/installer and the structural engineer;
- the builder and the building surveyor; and
- the building surveyor and the barrier supplier/installer.

The investigation found that the most common areas requiring improvement were related to design documentation; the application of engineering requirements; and on-site installation experiences. The findings were:-

Design documentation:

- Limited information provided for the proposed barrier systems design, including the fixing/connection points, when certifying documentation to obtain a building permit.
- Lack of awareness of the applicable National Construction Code (NCC) series and referenced Australian Standards, i.e. the use of the correct NCC edition.

[1] Building and Energy – Audit Priorities Statement 2021-22. https://www.commerce.wa.gov.au/publications/building-and-energy-audit-priorities-statement-2021-22
[2] Building and Energy – Building Compliance Audit Strategy 2021-24. https://www.commerce.wa.gov.au/publications/building-and-energy-building-compliance-audit-strategy-2021-24

- The reliance on pre-designed engineering for barrier systems and lack of evidence of suitability of those systems for specific building types and locations.

Application of engineering requirements:

- Understanding of the engineering requirements and crucial design parameters specified in the relevant Australian Standards being omitted from a barrier system design.
- Lack of design coordination to ensure that the barrier system is fit for purpose to the building it is to be fitted to.
- Physical testing of barrier systems carried out with loads being applied in positions easiest for the barrier to resist rather than being positioned for the most adverse effect resulting in testing outcomes not being appropriate for the actual use.

On-site installation experiences:

- Conflict arising between proposed engineering fixing details and the onsite substrate, for example, reinforcement located in a slab where anchors for the barrier system are intended.
- The suitability of the barrier system and fixing materials in close to, or in coastal environments.
- Use of undersized fixings which are expected to resist the minimum engineering loading requirements.

Building and Energy has published information regarding barrier design and installation responsibilities and provide further education and training to the building industry regarding barrier requirements. Current building industry reforms being led by Building and Energy in response to the Building Confidence Report[3] will also consider minimum levels of documentation for barriers. Further information on the WA building industry reforms can be viewed at:

https://www.commerce.wa.gov.au/building-and-energy/building-industry-reforms-our-work-national-building-confidence-report

Consideration will also be given to the inclusion of a second phase of the investigation to determine if the identified actions have been effective in improving compliance relating to the design and installation of barrier systems.

[3] Shergold, P and Weir B (2018). Building Confidence – *Improving the effectiveness of compliance and enforcement systems for the building and construction industry across Australia*. www.industry.gov.au

2. Background

In July 2021, Building and Energy published its *2021-24 Audit Strategy.* The Audit Strategy takes a risk-based approach to minimising harm and the Audit Priorities detail the compliance activities Building and Energy intends to undertake in a given period in response to areas of construction that have been assessed to pose the greatest risk to public safety.

Barriers was identified in its Audit Priorities when a number of barrier installations failed in the months preceding its investigation (refer to Section 2.1). As these failures can pose a life safety risk to people in and around the building, GIR8 was undertaken to inform Building and Energy on whether a problem exists, its size and scale, and whether a more comprehensive general inspection is required.

GIR8 assessed how building standards were being applied through the design, procurement, manufacture and installation of barrier products. Its aim was to communicate the learnings identified during this investigation to relevant professions in the building industry to improve compliance and safety. Building and Energy also intends to use the findings detailed in GIR8 to suggest improvements in demonstrating and meeting the applicable building standards to ensure the safety of users of a building with barriers.

2.1 Previous research and inspections

From 2019 to 2022, Building and Energy received several complaints relating to installed barrier systems. The following defect types were noted:

- non-compliance with the NCC;
- faulty workmanship; and
- defective fixings to the substrate.

In 2019, Building and Energy investigated an incident where a steel-framed barrier system with glass in-fill panels fell from the balcony of a unit located on the ninth level of a 25-storey apartment building. The inspection found the strength of the existing barrier system was inadequate due to undersized (insufficient wall thickness) stanchions when compared to the requirements of the applicable building standards. Barriers to other levels of the building were also identified to have excessive movement when pressure was applied by hand to the top edge of the barrier.

Instances where barrier installations have failed represent a significant potential for harm to people falling as well as falling object hazards. In 2020, Building and Energy inspected a coastal 3-storey apartment building where barriers and privacy screens had detached from the substrate. The design of this barrier failed to meet the requirements of applicable building standards with the design and installation of the fixings being of most concern.

In each case, the relevant permit authority (local government) investigated the situation and took appropriate enforcement action, including the issue of a building order for one apartment building.

2.2 Working Group Collaboration

Building and Energy has worked collaboratively with other Australian building regulators via the Building Regulators' Forum (BRF) on matters relating to barriers. The BRF provides a platform for each state building regulator to share information on emerging risks within the Australian building and construction industry.

In response to the emerging risk around barriers the BRF established a working group to look into the issues at a national level with a view to providing advice to Standards Australia on safety and compliance issues. This enabled Building and Energy to also consider findings and outcomes from other jurisdictions' audits on the subject matter.

The working group identified the main issues that were consistent across all jurisdictions. These included problems associated with the design and construction of barrier products and the adequacy and understanding of the current requirements under the NCC. The information gained from the research undertaken as part of the GIR8 was likewise able to assist the BRF in forming its recommendations to be considered within each member's jurisdiction and the ability to make improvements to existing legislation relating to glass barrier systems.

3. Objectives and Scope

The objective of GIR8 is to document observations on how the applicable building standards are being applied to the design and construction of barrier systems, in consultation with the Western Australian barrier industry. Building and Energy also sought insight into procurement processes behind barrier systems and the relationship between the following parties:-

- the builder and the barrier supplier/installer;
- the barrier supplier/installer and the structural engineer;
- the builder and the building surveyor; and
- the building surveyor and the barrier supplier/installer.

Building and Energy conducted meetings with parties involved in the barrier procurement chain. When meeting with barrier suppliers/installers, each company was asked the same questions to gauge common findings from each response provided. The questions posed related to the following areas:-

- the process, from project engagement to supply and installation of barrier systems;
- the provision of design documentation for the building approval process; and
- reliance on structural engineer's certification.

As a result of these consultations, Building and Energy was able to gain a good insight into:-

- the industry procurement processes of barrier systems;
- what is considered 'industry practice' applied in the design, manufacturing, and installation of barrier systems;
- the design process of barrier systems and whether it demonstrates compliance with the applicable building standards and is appropriately documented; and
- the manufacturing and installation of barrier systems undertaken to withstand the required structural design actions.

The scope of GIR8 did not limit any barrier types. However, the investigation predominately focused on processes relating to the manufacture and installation of aluminium, stainless steel and glass barriers (framed, semi-framed, and frameless).

4. Methodology

In October 2021, Building and Energy issued an electronic notification to inform building industry stakeholders of the barrier investigation and its intention to consult with relevant parties. As a result, six suppliers/installers, four associations and one engineer were interviewed. Each entity was asked the same questions.

The sample size was small but took into account good representation between those that were considered to be major suppliers/installers and those to be considered niche suppliers. The major installers supplied and installed barriers to a large section of the market. The sample size also ensured that the investigation captured both residential and commercial building industry practices that pose the most risks to public health and safety.

The responses were analysed to establish an understanding of the procurement of barrier systems in stages, commencing from design through to manufacturing and installation on-site within Western Australia.

GIR8 also collected insights from parties associated with the design, procurement, manufacturing and installation of barriers including the structural engineer, building surveyors and relevant associations. The interviews were recorded and reviewed to establish how building standards are applied to barrier systems.

4.1 Limitations

GIR8 did not include the physical inspection of barrier systems under construction nor a review of design certification documentation. Any reference within this report of barrier systems inspected by Building and Energy refers to systems observed for faults and failures brought to Building and Energy's attention by a permit authority or a consumer. This investigation focused on the barrier system and excluded the procurement of the glass in-fill.

As GIR8 was conducted as an investigation, statistical validity cannot be verified and it cannot be stated or assumed that there are systemic issues concerning barriers. However, the findings of GIR8 are indicative of inadequate industry practices and it is vital that the industry and associated professions take action to bring about improvements that increase confidence that barriers are designed, manufactured and installed to meet the applicable building standards.

5. Findings

As a result of the investigation, three themes became evident. The themes related to:-

- insufficient design documentation i.e. lacking design connection details;
- application of engineering requirements i.e. inadequate evidence of engineering requirements; and
- on-site installation experiences i.e. deficient onsite installations.

GIR8 found the parties involved in manufacturing and installing barriers are seeking consistency across their field regarding the application of the applicable building standards in both design and construction.

Some barrier suppliers/installers communicated that the application of building standards is inconsistent across the barrier industry and this was in part due to the lack of information regarding specific design criteria.

The feedback was that it does not promote ‘a level playing field’ to allow the correct application of building standards and engineering details to be incorporated in the design and manufacture of the barriers by any barrier company.

5.1 Design Documentation

The investigation found that in a majority of building projects, both residential and commercial, the barrier supplier/installer was engaged during the tender process, an approach that places reliance on the supplier/installer for the design.

Building and Energy observed that any reference to compliance of a barrier system is commonly demonstrated on architectural drawings with the notations ‘balustrades to be in accordance with the NCC’ or ‘balustrade system specified in the specification’. The specifications typically then referred to the finish of the posts and infill only. This process impacts the details provided in certified documentation, often demonstrating that the documentation lacks details of structural members and fixing connections. The lack of detail increases the risk to the barrier system itself or the way in which it is fixed.

In designing the barrier only, current industry practice results in limited checking of how the barrier interacts with other structural elements in the building. The process inhibits the ability for design coordination to ensure compatibility of the barrier system and fixing points into the substrate. This is particularly important for post-tensioned concrete slabs due to the risks associated with compromised tensioned cables.

Effective communication between the barrier supplier/installer and the building structural engineer is essential to ensure the final barrier system is safe, coordinated and functional.

Builders are relying on barrier suppliers/installers to design and install barriers according to the applicable building standards. It became evident during the investigation that there was a heavy reliance on the barrier supplier/installer to design, manufacture and install barrier systems and minimal opportunity for quality assurance or compliance checks undertaken from either a building surveyor, project structural engineer or builder.

This is of concern as the majority of the barrier suppliers/installers interviewed for the GIR8 revealed the following:

- They would rely on builders to notify them of any legislation updates. I.e. awareness of new editions of the NCC and Australian Standards is brought to the company's attention when a builder requests that design/construction certification documents be amended to reflect the current Australian Standard referenced in the NCC.
- They were not using the relevant edition of the NCC; nor were they aware of how to gain access to information relating to the NCC and Australian Standards updates.
- Some companies work from pre-designed (standard) tables prepared by structural engineers. Pre-designed tables are not suitable for all building locations and buildings due to higher wind pressures that may apply to the building and its barrier system. This also does not encourage design coordination to account for requirements specific to a building.

5.2 Engineering requirements

Through discussions with engineers, the complexities of designing fit-for-purpose barriers was highlighted. A number of Australian Standards (both as a primary referenced document in the NCC, or other documents which are referenced by primary or subsequent reference documents) require the knowledge of an experienced structural engineer to ensure the design considers aspects of durability, geometry, occupancy, strength and amenity.

It became apparent when interviewing the barrier supplier/installer as part of the GIR8 that industry's understanding of engineering requirements for a barrier system was inconsistent and, in many cases, inadequate. Crucial design parameters were commonly omitted. The correct parts of the Australian Standards were not considered when designing for loads.

The NCC mandates that barriers are to be designed to withstand loading scenarios in accordance with Australian Standard AS/NZS 1170.1 and, by extension AS/NZS 1170.0 and AS/NZS 1170.2. Together, these Standards cover loading scenarios and combinations, including imposed loading (such as leaning on a barrier) and wind loading, requiring all barrier systems to resist loads to specific serviceability and ultimate limit state conditions. Wind loading and ultimate limit state requirements were the crucial design parameters most commonly omitted based on discussions with barrier industry participants.

Serviceability limit state (SLS) and ultimate limit state (ULS) are two loading criteria commonly used in engineering design. They are adopted in the AS/NZS 1170 series. SLS requires barriers to be serviceable and exhibit limited deflection and normal operation under its SLS loading state. ULS requires barriers to not experience structural failure of any of its components under its ULS loading state. In some instances, engineering design for barriers did not consider its ULS scenario, meaning they were designed to limit the barrier's deflection rather than designed to prevent structural failure.

The investigation found an absence of any consideration for wind loading by both the engineer and the barrier supplier. Wind loading generally imposes less load on barrier systems than other loading scenarios for low-rise buildings. And therefore, it is not often considered in the design. However, if barriers are installed on a medium/high-rise building, or if a building is in an area prone to strong winds, the wind loading can become critical and must be considered in the design. Of the documents reviewed, the distinction is not always made with pre-calculated tables and specifications for low wind/low rise buildings being used on any building located in any area. Furthermore, considerations are required for barriers on the edges of a building's face. In accordance with AS 1170.2, wind loading is up to 3 times as severe on the edges of buildings compared to other areas.

Testing barrier systems seemed to be a common method of certifying designs. In some cases, the tests are preferred to and even considered to supersede theoretical engineering calculations. The main concern found with this approach is the conditions in which barrier systems were tested and the number of tests completed.

Two important considerations when physically testing a barrier system are to construct and install the system as it would be on-site; and test both the loads and the location of the loads for the worst-case scenario. This was not always done. For example, barriers may be tested by being fixed directly to a concrete slab. On-site, it may be installed on tiling which is much weaker. Building and Energy reviewed load test reports which documented testing being carried out with loads applied in positions that were easiest for the barrier to resist rather than being positioned for the most adverse effect.

A further issue with physical tests is the number of tests conducted. It appeared typical for one test to be sufficient for satisfying the barrier supplier/installer, when installing to an entire building. Even if adequately set up, one barrier passing the test does not mean the subsequent barriers installed on a high-rise building would also have passed due to variability in manufacturing and installation. Physical testing of barriers should be carried out in accordance with the direction provided in AS 1170.0:2002, Appendix B.

5.3 On-site installation experiences

This investigation observed limited design coordination and compliance reviews for a barrier system by a building surveyor and builder when the design documentation for a barrier system is provided after a building permit has been granted. As a result, there becomes a far greater reliance on a barrier system to demonstrate compliance without appropriate verification once installed.

Building and Energy found that, at this final stage of construction, in most cases a building surveyor and builder will request a statement from the barrier supplier/installer to validate the completed works. The written statements observed by Building and Energy typically included this generic sentence (or similar): 'Balustrade installed is in accordance with the NCC and relevant Australian Standards'. This simple statement effectively endorses the barrier system and affirms that it is structurally capable of withstanding forces that would cause the barrier to not fail and thereby prevent injury or death to a person.

This investigation concludes that a number of installation issues commonly experienced onsite may amalgamate to compromise the credibility of the installer's compliance statement accepted by the building surveyor or builder. Where the barrier is installed using inadequate design detail or the installation deviates from the applicable building standards, there is an increased risk of barrier failure and potential for harm.

The most common onsite installation issues as recorded by barrier suppliers/installers, as well as observations obtained from Building and Energy's complaint investigation system are:-

1. **The conflict between engineered fixing details and installation:**

    a) Where a structural engineer had designed for barrier posts to be directly fixed into a concrete slab when in reality, the fixings were installed through a tiled substrate. This practice can reduce the bearing capacity for the barrier system. When failure occurs, this will also have implications on the waterproofing membrane beneath the tiles.

    b) Design coordination between the building and barrier system is vital to ensure the building incorporates the necessary elements for the barrier system to fix to, e.g. extra noggings required for the wall of a timber-framed constructed building. Insufficient design coordination can result in construction delays.

2. **Cutting of steel slab reinforcement:**

    When the coordination of barrier fixings and the steel slab reinforcement locations are not considered at the design and tender stage, the reinforcement may be drilled through or cut to suit the location of the fixing points.

This typically occurs with a core hole drilled for spigots. This is an issue if reinforcement is cored and drilled through for base plate hold-down bolts or a tensioned cable is cut in a post-tensioned slab and can compromise the structural integrity of the slab

3. **Use of undersized fixings**:

   The use of 10 millimetre holding down anchor fixings are, in most instances, considered inadequate to provide sufficient capacity to resist the minimum loading required for a barrier. The investigation found that the use of undersized fixings were a result of years of installation practises which were sustained despite having become redundant.
   All barrier fixings should be engineered to suit the building they are being fitted to. This practice is a concern to Building and Energy, particularly in high-rise buildings.

4. **Installation of Fixings:**

   a) Poor quality tiling has been identified as an issue where a barrier system has been incorrectly installed on top of tiles. If the tile substrate contains air pockets or has not achieved adequate bonding, movement in the barrier may occur. Fixing over tiles can also reduce the embedment depth of anchors.

   b) When chemical anchors are used, the dust must be blown out and cleaned after drilling. On occasions where this has not occurred, the layer of dust between the adhesive and the concrete compromises the strength of the barrier fixing. In the case of drill hole fixing, the chemical epoxy bond strength in the hole holds the barrier fixing in place.

   c) In some cases where the fixing was not embedded enough into the post to be effective, screw fixings had pulled out of the post itself and failed. Visual inspection of the fixing failure is limited as the post encases the fixing.

   d) The fixing can be undersized and not engaged with the screw flute, which forms part of the post. Alternatively, the fixing can be oversized and crack the screw flute. The lack of connection to the screw flute reduces the capacity of the fixing strength or can cause the post to fail.

5. **Environmental Exposures:**
   The barrier system frame and fixings should be compatible with the surrounding environment. E.g. consider a coastal environment and the risk of corrosion and rust.

6. **Proof Testing Reports:**
   Building and Energy observed test reports and certificates, completed for barrier systems that only tested for serviceability limit state and not ultimate limit state according to AS/NZS 1170.0. Other reports have not applied correct loads when undertaking the testing. This results in barrier systems testing and performing to a reduced percentage of the required design action that the barrier system is required to withstand.

6. Actions

Action 1: Building and Energy has produced an Industry Bulletin to provide an overview of information required for the design and construction of barriers and to highlight the responsibilities of those parties contributing to the required information. The industry bulletin will assist in providing greater assurance that the applicable building standards have been demonstrated in order to satisfy the building surveyor that the evidence of suitability requirements of the BCA have been met for the proposed work.

Action 2: Building and Energy will continue to work with key stakeholders in the building and construction industry, including the Australian Institute of Building Surveyors, the Housing Industry Association, Master Builders Association and the Institution of Engineers Australia, along with permit authorities, to provide further information, education and training based on the findings of this investigation.

Action 3: Building and Energy will consider undertaking a second phase of the investigation into barriers to determine if the action items above have been effective in improving compliance relating to the design and installation of barrier systems.

7. Appendices

A. Role and Powers of Building and Energy

Western Australia has a suite of laws governing building control, including the *Building Act 2011* (the Building Act), the *Building Services (Complaint Resolution and Administration) Act 2011* (the BSCRA Act), and the *Building Services (Registration) Act 2011* (the Registration Act).

The BSCRA Act empowers the Building Commissioner to monitor any building or building service in WA to verify how building services have been or are being carried out, and how building standards have been or are being applied.

The Building Commissioner is able to designate Building and Energy officers to review approval documentation and to inspect buildings during construction and after the completion of building works.

The Registration Act provides a framework for registering building surveyors and builders and includes disciplinary provisions to manage sub-standard work and conduct by a registered building service provider.

For a new building of any classification that requires a building permit, the Building Act requires a registered building surveyor to sign a certificate of design compliance (CDC) for the building design. The CDC contains a statement to the affect that if the building is completed in accordance with the plans and specifications that are referenced in the certificate the building will comply with each applicable building standard.

Additionally for new Class 2-9 buildings that require a building permit, the Building Act requires a registered building surveyor to sign a certificate of construction compliance (CCC) for the completed building. The CCC contains a statement to the affect that the building has been completed in accordance with the plans and specifications that were referenced in the CDC, and as such the building complies with each applicable building standard.

Further information about the role of Building and Energy is available on its website:

www.dmirs.wa.gov.au/building-and-energy

B. Building Approvals

The building approval process for WA is legislated under the Building Act and associated Building Regulations. This legislation controls the application of building standards for the design and construction of buildings and incidental structures and sets out when a building permit is needed for building work.

The Building Act generally requires a building permit for the construction of a new building and an occupancy permit to allow a building to be occupied (applies to class 2-9 only). As part of the process for getting a building permit, a building surveyor needs to sign a certificate of design compliance (CDC) stating that if the building is completed in accordance with the plans and specifications, the building will comply with each applicable building standard that applies to it. For an occupancy permit a building surveyor needs to sign a certificate of construction compliance (CCC) stating the building has been completed in accordance with the plans and specification specified in the CDC.

The permit authority (usually the local government in whose district the dwelling will be built) can grant building permits and occupancy permits if satisfied that the application for a permit addresses the requirements of the Building Act 2011 and Building Regulations 2012. The permit authority can request further information to assist it in considering an application (if there is an error) and impose conditions on the grant of a building permit if necessary.

The builder named on the building permit is responsible for ensuring that the building is constructed in accordance with the building permit (including any conditions) and the applicable building standards.

Building Surveyors must be satisfied that the building has been constructed in accordance with the approval documentation prior to signing a Certificate of Construction Compliance.

The Building Act gives the permit authority powers to monitor and inspect building work to ensure compliance with these requirements. The Building Act also provides permit authorities with the power to issue building orders to remedy or stop building work, and to prosecute builders and owners for non-compliance.

Further information about the Permit Process is available on the DMIRS website.

C. Building Standards

The Building Regulations 2012 (WA) (the Building Regulations), made under the Building Act, set out a general position as to applicable building standards, as well as a series of qualifications for particular circumstances and types of building. The general position is that the applicable building standards are those set out as the Performance Requirements in the BCA in effect at the time the building application is made or were in effect 12 months before the building permit application was made.

The BCA is a comprehensive set of building standards that is the product of a series of efforts by the commonwealth, state and territory governments during the 1960s, 70s and 80s to develop a uniform national position on building standards.

The BCA was first published in 1988 and has been revised several times. In 2008 the Council of Australian Governments agreed to develop a national code covering building plumbing, electrical, and telecommunications standards. The National Construction Code (the NCC) was published in 2011. To date the NCC only encompasses building and plumbing standards.

The NCC consists of three volumes. Volume One of the NCC deals with building standards for Class 2 to Class 9 buildings (multi-residential, commercial, industrial and public buildings); Volume Two deals with building standards for Class 1 and Class 10 buildings (residential and non-habitable buildings and structures); and Volume Three deals with plumbing standards. The term BCA refers to volumes one and two of the NCC.

The BCA sets out minimum Performance Requirements that buildings must achieve. A Performance Requirement can be satisfied through the use of a deemed-to-satisfy (DTS) solution, a performance solution (previously known as an alternative solution) or a combination of DTS and performance solutions.

A DTS solution is one that follows the prescriptive DTS requirements contained in the BCA. These requirements may cover materials, components and/or construction methods that are to be used and design factors that are to be considered.

A performance solution is any solution other than a DTS solution that satisfies the stated Performance Requirement. Deemed-to-satisfy solutions are typically the ‘time proven’ methods of construction that are known to produce an acceptable outcome. Such methods may however prove to be inefficient or come with other intrinsic limitations. Performance solutions by contrast are flexible and allow for the development of innovative construction methods and products.

For a DTS solution these assessment methods are:

Compliance with the DTS provisions of the BCA.

For a performance solution these assessment methods are:

• provision of certain types of documentary evidence;

• verification through the conduct of tests, inspections, calculations;

• expert judgement; and

• comparison with the DTS requirements.

Part A2 of the BCA Volume One contains the acceptance of design and construction provisions. This part outlines the options that can be used as evidence to support that the use of materials, products or forms of construction meet the NCC requirements.

7.1 Additional Resources

https://www.commerce.wa.gov.au/sites/default/files/atoms/files/ib_144_-_technical_documents.pdf

7.2 Feedback

Feedback on the content of this report can be submitted via be.info@dmirs.wa.gov.au

Department of Mines, Industry Regulation and Safety
Building and Energy

Office: Level 1, 303 Sevenoaks Street, Cannington WA 6107
Post: Locked Bag 100 EAST PERTH WA 68

Phone: 1300 489 099 Fax: (08) 6251 1501

bcinfo@dmirs.wa.gov.au

www.dmirs.wa.og.au

National Relay Service: 13 36 77

Quality of service feedback line: 1800 304

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