MULTIPLEX

CONSTRUCTION HANDBOOK - GENERAL

Version 01

Print Copy

Disclaimer

This is a print version whereas the structure of the construction handbook may have been adapted for ease of reference.

The handbook app should take precedence in case of any ambiguity.

Multiplex Constructions Pty Limited

multiplex.global

CONTENTS

1. General

1.1 Introduction

Scope and Purpose

This handbook applies to the planning, construction and commissioning phases of Multiplex projects across Australia and its purpose is to:

- Describe our approach to quality, and the management of high risk activities in order to minimise defects.
- Provide guidance on quality assurance and quality control.

References

The word:

- '**Must'** means mandatory
- '**Should**' means recommended.

Warning & Disclaimer

Nothing in this handbook is intended to or must remove or otherwise modify, replace or remove the obligations of designers or subcontractors.

This handbook is not intended to replace any code, standard or other regulatory document, or manufacturer's recommendations. Neither is it intended to be a means to ensure compliance.

The technical details and recommendations in this handbook are provided for information purposes only and the user is responsible for ensuring that the designs, the products selected and systems used are in compliance with the relevant contractual requirements, building regulations, the National Construction Code, relevant Australian Standards and are fit for the intended purpose.

Our Strategy

Multiplex continuously seeks to improve culture and standards across its business and the broader industry. Multiplex works collaboratively with our clients, industry peers, suppliers and contractors to establish and integrate effective controls at the earliest opportunity. Our strategy is founded on embedding quality in business processes and decision making, and is underpinned by four key themes:

Management System Framework

Multiplex has a management system framework that is applied throughout the business and on all projects we undertake. The structure of the management framework is described in Table 1 and must be read in conjunction with this manual.

Element	Content
Internal Controls Framework	An Internal Controls Framework based on the Committee of Sponsoring Organizations of the Treadway Commission (COSO) model of internal control has been established which sets out the framework for all levels of the organisation in implementing effective internal controls to achieve its mission and accomplish its goals and objectives.
Policies	Health, Safety, Environmental and Quality
Integrated Operational Procedures	Responsibility & accountability Risk and opportunity management Planning and performance measurement Communication and consultation Contractor management Inspection, testing and monitoring Control of non-conformances Design management Document and records management Emergency management Incident management Training and competency Internal and external auditing Reporting Completion and handover Management review
Project Management Plans	Project Management Plan Construction Management Plan Design Management Plan Quality Management Plan Commissioning and Testing Management Plan Completion and Handover Management Plan
Quality Management	Project, Design and Trade Risk Workshops Prototypes, Samples and Mockups Construction Handbook (procedures and standards) Audits and Inspections (on-site and off-site) Inspection and Test Plans Completion Documents and Reviews Documents and Forms Training Action Plans - Management and Trade
Multiplex Guides	Guide for Seismic Restraint of Non Structural Items Guide to Concrete Construction Guides to Facade Guides to Masonry Guide to Metal Roof and Wall Cladding Guide to Passive Fire Safety Measures Guide to Managing Compliance of External Walls Cladding and Attachments Guide to Waterproofing Guide to Precast Concrete

Document Control
These procedures and standards will be monitored and necessary changes will be identified in the respective section and communicated to all relevant personnel

Policy and Procedures
Safety, Health, Environmental and Quality Policy Statement
Integrated Operational Procedures

1.2 Legislation

Introduction

What is the National Construction Code (NCC)?

The NCC provides the minimum necessary requirements for safety, health, amenity and sustainability in the design and construction of new buildings (and new building work in existing buildings) throughout Australia. It is a uniform set of technical provisions for building work and plumbing and drainage installations throughout Australia whilst allowing for variations in climate and geological or geographic conditions.

The NCC is an initiative of the Council of Australian Governments (COAG) developed to incorporate all on-site construction requirements into a single code. The NCC is comprised of the Building Code of Australia (BCA), Volume One and Two; and the Plumbing Code of Australia (PCA), Volume Three.

NCC Volume One primarily applies to Class 2 to 9 (multi-residential, commercial, industrial and public) buildings and structures.

NCC Volume Two primarily applies to Class 1 (residential) and 10 (non-habitable).

NCC Volume Three applies to plumbing and drainage for all classes of buildings.

How it works

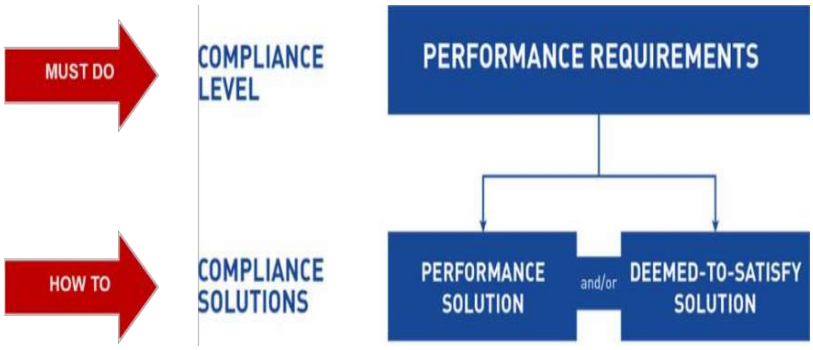
The National Construction Code (NCC) is a performance-based code containing all Performance Requirements for the construction of buildings. It is built around a hierarchy of guidance and code compliance levels, with the Performance Requirements being the minimum level that buildings, building elements, and plumbing and drainage systems must meet. A building, plumbing or drainage solution will comply with the NCC if it satisfies the Performance Requirements, which are the mandatory requirements of the NCC.

The Performance Requirements are also supported by General Requirements, which cover other aspects of applying the NCC including its interpretation, reference documents, the acceptance of design and construction (including related evidence of suitability/documentation) and the classification of buildings within the NCC.

The key to the performance-based NCC is that there is no obligation to adopt any particular material, component, design factor or construction method. This provides for a choice of compliance pathways. The Performance Requirements can be met using either a Performance Solution (Alternative Solution) or using a Deemed-to-Satisfy (DTS) Solution.

Performance Solution

A Performance Solution is unique for each individual situation. These solutions are often flexible in achieving the outcomes and encouraging innovative design and technology use. A Performance Solution directly addresses the Performance Requirements by using one or more of the Assessment Methods available in the NCC.**Deemed-to-Satisfy Solution**



A DTS Solution follows a set recipe of what, when and how to do something. It uses the DTS Solutions from the NCC, which include materials, components, design factors, and construction methods that, if used, are deemed to meet the Performance Requirements.

Code Compliance

The NCC Performance Hierarchy shows that a Building or Plumbing and Drainage Solution can achieve compliance with the Performance Requirements by using an Performance Solution (Alternative Solution) or a Deemed-to-Satisfy (DTS) Solution.

Assessment Methods, which are located within the General Requirements of the NCC are used to determine whether a solution complies with the relevant NCC Performance Requirements.

Assessment Methods

The NCC contains four Assessment Methods. Any combination of them can be used to determine that a Building or Plumbing and Drainage Solution complies with the Performance Requirements.

1. Evidence of Suitability requires evidence, as described in , to support claims that a material, form of construction or design meets the Performance Requirements or DTS Provisions.
2. Verification Methods are tests, inspections, calculations or other methods, which determine whether a proposed Building or Plumbing and Drainage Solution complies with the relevant Performance Requirements. Verification Methods are not limited to using those in the NCC. Another Verification Method may be used if the appropriate authority is satisfied that it establishes compliance with the NCC. However, in making a decision, the appropriate authority may have regard to the relevant Verification Methods or DTS Provisions provided within the NCC.
3. Comparison with the DTS Provisions allows a comparison between the DTS Provision and a proposed Building or Plumbing and Drainage Solution. If it can be demonstrated to the appropriate authority that the Solution complies in an equivalent or superior way to the DTS Provisions, then it can be deemed to meet the relevant Performance Requirements.
4. Expert Judgement is the judgement of a person who has the qualifications and experience necessary to determine whether a Building or Plumbing and Drainage Solution complies with the Performance Requirements. Where physical criteria are unable to be tested or modelled by calculation, the opinion of a technical expert may be accepted.

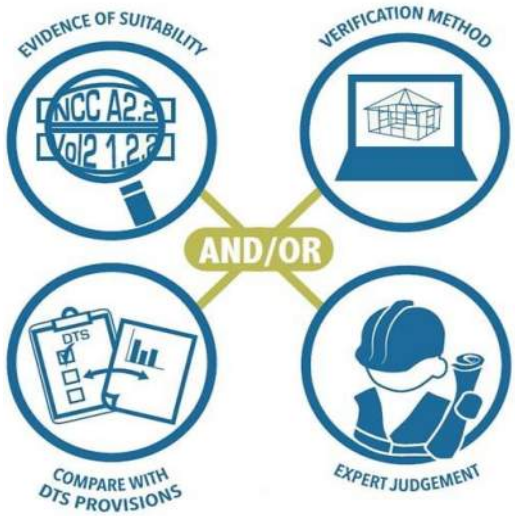


Figure 3: Assessment Method (Source: https://ncc.abcb.gov.au/ncc-online/How-it-works/Code-Compliance)

Compliance with the NCC

The infographic outlines the three options to compliance when using the NCC: a Performance Solution, a Deemed-to-Satisfy Solution or a combination of both. It also links the relevant Assessment Methods to each of these compliance solutions.

NCC compliance flow chart is accessible from BCA website, link:

https://www.abcb.gov.au/Resources/Publications/Education-Training/Compliance-with-the-NCC)

Regulatory Framework

The diagram outlines the regularly framework for buildings in Australia to be fully compliant with National Construction Code.

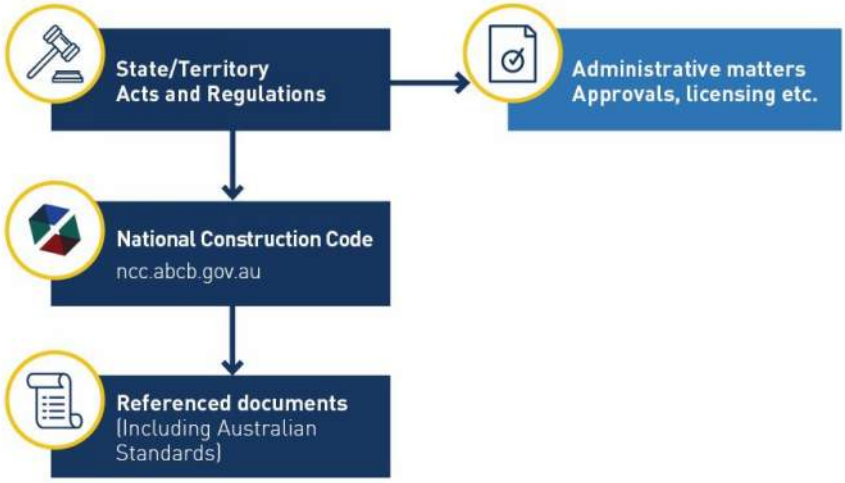


Figure 1: Regulatory Framework (Source: https://ncc.abcb.gov.au/ncc-online/Regulatory-Framework)

National Construction Code (NCC)

The NCC is given legal effect by relevant legislation in each State and Territory. This legislation prescribes or "calls up" the NCC to fulfil any technical requirements that are required to be satisfied when undertaking building work or plumbing and drainage installations.

Each State and Territory's legislation consists of an Act of Parliament and subordinate legislation which empowers the regulation of certain aspects of building work or plumbing and drainage installations, and contains the administrative provisions necessary to give effect to the legislation.

Administrative Provisions

Administration provisions typically covered in the enabling or subordinate legislation include:

- Plan submission and approval procedures
- Issue of permits
- Inspections and audits
- Provision of evidentiary certificates
- Issue of certificates
- Review and enforcement of standards
- Fees and charges

1.2.1 Codes and standards

Fire Resistant

- National Construction Code (Building Code of Australia - Volume 1)
- C3.15 of the Building Code of Australia (BCA)
- Specification C3.15
- AS 1530.1 - Part 1: Combustibility test for materials
- AS 1530.2 - Part 2: Test for flammability of materials
- AS 1530.3 - Part 3: Simultaneous determination of ignitability, flame propagation, heat release and smoke release
- AS 1530.4 - Part 4: Fire-resistance test of elements of construction
- AS 4072.1 - Components for the protection of openings in fire-resistant separating elements (Service penetrations and control joints).

Waterproofing

- National Construction Code, BCA Volume 1
- Performance Requirements
    - BP1.1, BP1.2, FP1.6, FP1.7
- Deemed-to-Satisfy Requirements
    - B1.1, B1.2, B1.4, F1.0, F1.4, F1.7, F1.11
- AS 3740:2010 “Waterproofing of wet areas in residential buildings”
- AS 4858:2004 “Wet Area Membranes”
- AS 4654:2012 Part 1 “Waterproofing membranes for external above-ground use-Materials.”
- AS 4654:2012 Part 2 “Waterproofing membranes for external above-ground use-Design and installation.

Tiling

- National Construction Code (Building Code of Australia) - Volume 1 - Performance Requirements
    - Performance requirements that must be achieved are:
        - BP1.1, BP1.2, FP1.6, FP1.7, FP5.2, FP5.3, FP5.4, FP5.5, FP5.6 (Class9C only)
- Deemed to satisfy requirements that may be used are:
    - There is no deemed to satisfy for stone or tiling
- AS 3958 Part 1 Guide to the installation of ceramic tiles
- AS 3958 Part 2: Guide to the selection of ceramic tiling system
- ISO 13007 Part 1: Terms, definitions and specifications for adhesives
- ISO 13007 Part 2: Test methods for adhesives - Grouts and adhesives
- ISO 13007 Part 3: Terms, definitions and specifications for grouts
- ISO 13007 Part 4: Test for grouts
- ISO 13006 Ceramic tiles - Definitions, classification, characteristics and marking
- Australian Stone Advisory Association "Natural Stone Design Manual".

Masonry

- National Construction Code (Building Code of Australia - Volume 1)
- AS 2700 Masonry Structures
- AS 1170 Parts 0 to 4
- Smaller structures may use AS 4773 (parts 1 & 2, if applicable)

Metal Roof

- National Construction Code (Building Code of Australia - Volumes 1 & 3)
- AS/NZS 1170 Structural design actions
- 1170.0 Part 0: General principles
- 1170.1 Part 1: Permanent, imposed and other actions
- 1170.2 Part 2: Wind actions
- 1170.3 Part 3: Snow and ice actions

- AS 1562.1 Design and installation of sheet roof and wall cladding – Metal
- AS/NZS 3500.0:2003: Plumbing and drainage - Glossary of terms
- AS/NZS3500.3 Plumbing and drainage - Stormwater drainage
- AS 3566 Self-drilling screws for the building and construction industries
- 3566.1 Part 1: General requirements and mechanical properties
- AS/NZS 4284:2008 : Testing of building facades
- AS/NZS 2904:1995 : Damp-proof courses and flashings
- AS/NZS 2179.1:2014 : Specifications for rainwater goods, accessories and fasteners - Metal shape or sheet rainwater goods, and metal accessories and fasteners.
- SA HB 39– 2015, Installation Code for metal roofing and wall cladding
- ISO 3506 Mechanical properties of corrosion-resistant stainless steel fasteners (series)
- ISO 9223 Corrosion of metals and alloys - Corrosivity of atmospheres - Classification, determination and estimation.

Concrete

- National Construction Code (Building Code of Australia - Volume 1)
- AS 3600 Concrete Structures

Shotcrete

- AS1170.0:2002, Structural design actions - General principals,
- AS1170.1:2002, Structural design actions – Permanent, imposed and other actions,
- AS3500.3:2015, Plumbing and drainage, Part 3: Stormwater drainage.
- AS3600:2009, Concrete structures,
- AS3735:2001, “Concrete structures for retaining liquids”.
- AS4678:2002, Earth retaining structures,
- Concrete Institute of Australia, CIA Z5-2010 Recommended Practice, Shotcreting in Australia,

https://ncc.abcb.gov.au/ncc-online/NCC

https://www.saiglobal.com/online/ - Click this link . Scroll down to 'Standards Online' and click item 3 to access username and password (for internal use only).

1.2.2 Evidence and Suitability

Evidence of Suitability & Manufacturer's Installation Recommendations

- Subcontractors must provide evidence of suitability for approval during the design coordination stage. This will be as specified by the NCC and may include copies of test certificate, regulatory information report or assessment report, etc. Seek advice from your Project Certifier or Approving Authority if in doubt as to what is required.
- In addition to the requirements of the NCC, subcontractors must also provide the Manufacturer’s installation manual for the materials/systems being proposed. These documents are written based upon the specimens that the manufacturer has had tested/assessed, and sound engineering principals. Installation is to be identical to the manufacturers’ written installation details.

Figure 2.1 NCC evidence of suitability framework

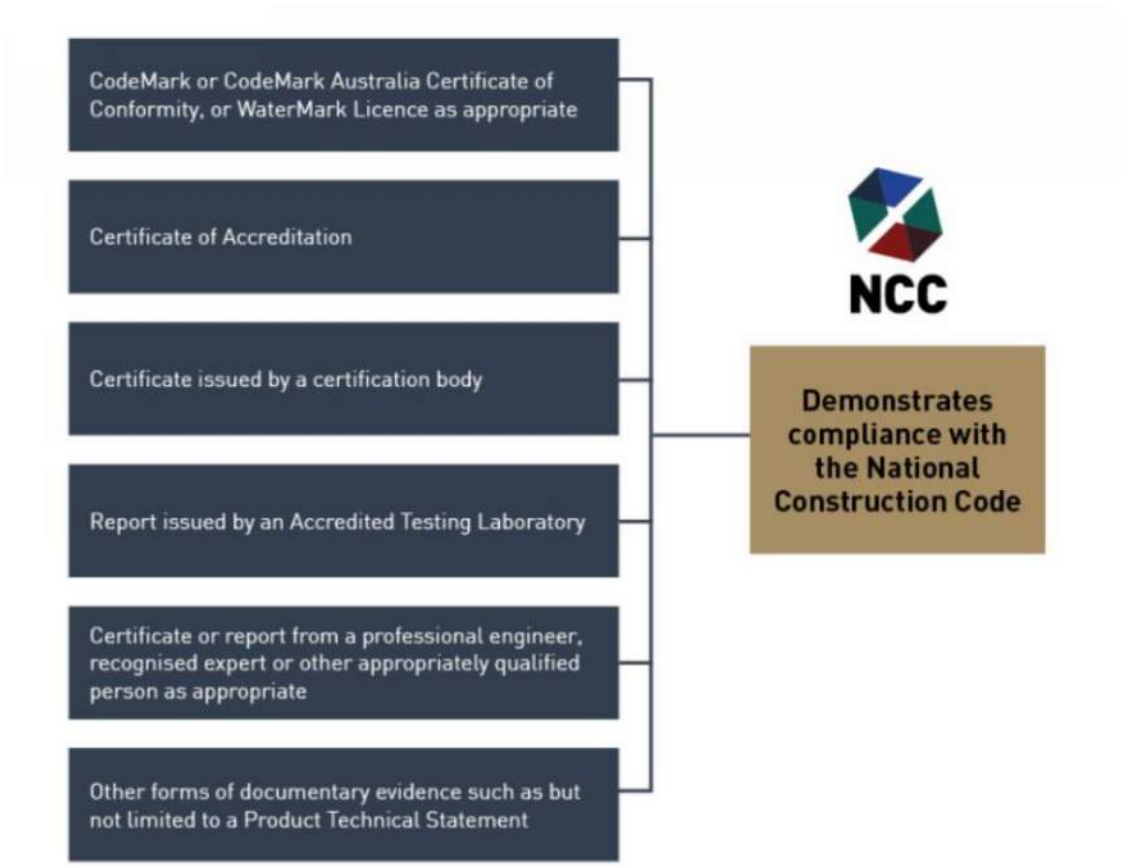


Figure: NCC Evidence of Suitability Framework (Source: https://www.abcb.gov.au/Resources/Publications/Education-Training/Evidence-of-Suitability)
NCC Evidence of Suitability Handbook is accessible from this link for further reading.

NCC Evidence of Suitability Framework

The most appropriate form of evidence of suitability to be used will vary depending on the specific circumstance. The forms of evidence have been arranged in a framework below to reflect a hierarchy of rigour, with the options listed higher providing stronger forms of evidence.