Designing Resilient Facades for New Zealand Conditions

New Zealand Building Code performance requirements are interconnected and cannot be addressed in isolation.

INTRODUCTION

New Zealand presents a demanding context for facade design, where environmental exposure and natural hazards must be addressed alongside an evolving regulatory landscape. High rainfall and wind exposure place sustained pressure on weatherproofing, while seismic activity requires facade systems to accommodate movement without loss of performance. These conditions are being intensified by more frequent extreme weather events across the country.[1]

The consequences of inadequate facade performance in New Zealand are well established. The leaky building crisis exposed systemic failures in detailing, material compatibility and accountability, resulting in remediation costs estimated in the tens of billions. The Canterbury earthquakes further demonstrated the scale of risk, with losses estimated between NZ$45 billion and NZ$50 billion.[2] Recent building tower fires, including the Lacrosse building fire in Melbourne and the Grenfell Tower fire in London, have heightened scrutiny of facade systems, particularly regarding combustibility, vertical fire spread and regulatory control.

Together, these events have driven a shift toward system-based design, where facade performance is understood as the outcome of coordinated assemblies, verified testing and robust detailing.

This paper outlines how the performance intent of the New Zealand Building Code (NZBC) can be translated into practical facade design and specification strategies. It examines the relationship between regulatory requirements and key decisions around material selection, detailing, fire performance and seismic movement.

NZBC FRAMEWORK

The NZBC is structured as a performance-based framework that defines objectives, functional requirements and performance criteria rather than prescribing specific construction methods. This approach allows multiple pathways to compliance,[3] including Acceptable Solutions (AS), which provide deemed-to-comply provisions; Verification Methods (VM), which demonstrate compliance through prescribed testing or calculation; and Alternative Solutions, where project-specific evidence is used to justify performance.

Within this framework, facade design requires a thorough understanding of all the relevant performance requirements and how they apply in practice.

CLAUSE B1 STRUCTURAL

Clause B1 of the NZBC requires buildings to withstand loads and deformations without loss of stability. External walls are generally comprised of non-structural elements supported by the primary frame, but must accommodate wind loads and seismic-induced building drift. Inter-storey movement during earthquakes can impose significant displacement on external walls, requiring facade systems to deform without failure or loss of performance.

Cladding and fixing systems must allow controlled movement, while joints, interfaces and penetrations must remain weathertight under deformation. Rigid connections can lead to cracking, joint failure or water ingress. For buildings above 25 metres, facade framing type also influences vertical fire spread risk, requiring coordination with fire performance strategies. Where steel framing is used, thermal breaks are typically required to manage thermal bridging.

Structural design is informed by NZS 1170.0 (general principles) and NZS 1170.5 (earthquake actions), which define the loading and deformation conditions facade systems must accommodate.

CLAUSE B2 DURABILITY

Clause B2 of the NZBC requires building materials, components and construction methods to maintain performance over time so that the building continues to meet requirements without major repair or replacement. It establishes minimum durability periods of 50 years for primary structural elements, 15 years for external claddings and replaceable components, and 5 years for easily replaceable elements, assuming normal maintenance.

For facade systems, this places emphasis on predictable, long-term performance in service. Selection must respond to environmental exposure, including coastal and high-moisture conditions, where corrosion, UV degradation and material breakdown can be accelerated. Compliance pathways are set out in B2/AS1 and B2/VM1, which reference relevant standards and acceptable durability evidence.

Exposure zone classification becomes critical in determining appropriate finishes and substrates. Access for inspection, maintenance and replacement must be considered at the design stage.

CLAUSE E2 EXTERNAL MOISTURE

Clause E2 requires external walls to be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside. Facade systems must manage wind-driven rain, recognising that water may bypass the outer cladding layer and must be controlled within the wall assembly.

Low-rise residential pathways (E2/AS1, E2/VM1)

For low-rise buildings (generally ≤10 m in height with timber framing), E2/AS1 and E2/VM1 provide compliance pathways for meeting the weathertightness performance requirements. Wall systems are commonly designed to NZS 3604, with drained and ventilated cavities used where required by the weathertightness risk matrix. A secondary line of defence is provided through flexible wall underlays or rigid air barriers installed behind the cladding.

Relevant standards include NZS 3604 for timber-framed construction, AS/NZS 4200.1 and 4200.2 for wall underlays and their installation, and applicable industry systems such as NASH or proprietary steel framing solutions. These documents define material performance, installation requirements and system behaviour under moisture exposure.

Buildings outside E2/AS1 scope

For taller, more exposed or complex buildings, compliance is typically achieved through Alternative Solutions, supported by engineering assessment, manufacturer evidence, facade testing (e.g. AS/NZS 4284) and Producer Statements. NZBC Verification Methods (e.g., E2/VM2 for buildings up to 25m in height) may be used to demonstrate performance for some building types.

Wind actions determined in accordance with AS/NZS 1170.2 inform the design pressures and testing criteria applied to the facade system. Higher wind pressures, increased exposure to wind-driven rain, reduced shelter and complex facade geometry all drive the need for more robust design strategies. Rainscreen principles are typically adopted, incorporating ventilated cavities, effective drainage paths and careful detailing of joints, interfaces and penetrations. For large or tall buildings, the facade is treated as an engineered system, with performance verification undertaken prior to consent to ensure long-term weathertightness.

External walls should be considered as integrated, multi-layered assemblies rather than discrete materials.

CLAUSE H1 ENERGY EFFICIENCY

Clause H1 establishes minimum requirements for energy efficiency and is increasingly focused on the performance of the building envelope as a whole system. Recent updates introduce stronger alignment with climate zones and place greater emphasis on how walls, roofs, floors and glazing interact to influence overall thermal performance. This shift requires consideration of thermal bridging, condensation risk and dew point location within facade assemblies, particularly in lightweight and steel-framed construction.

Compliance pathways

With the removal of the Schedule Method from H1/AS1 Sixth Edition, compliance is now demonstrated using performance-based pathways. The Calculation Method (H1/AS1, H1/AS2) assesses total heat loss across the building envelope relative to a reference building, allowing trade-offs between elements. The Modelling Method (H1/VM1, H1/VM2) uses energy simulation to evaluate annual heating and cooling demand. These approaches require earlier design coordination and more detailed performance inputs at the specification stage.

Architectural implications and tools

Clause H1 extends beyond insulation selection to include continuity of the thermal envelope, junction detailing and management of thermal bridges. Material selection must balance thermal performance with moisture control to avoid unintended condensation risks.

A range of tools are available to support the design process, including Building Research Association of New Zealand (BRANZ) and New Zealand Green Building Council (NZGBC) H1 calculators, as well as manufacturer resources such as CSR thermal design tools and system guides. These tools assist in modelling and specification but should be used with reference to the NZBC.

Useful links

- BRANZ H1 Calculation method tool (BRANZ)
  branz.co.nz/energy-efficiency/h1-calculation-method-tool
- Building Code: H1 calculator (NZBC)
  nzgbc.org.nz/building-code-h1-calculator
- CSR Thermal Calculator
  apps.csr.com.au/thermalcalculator

CLAUSES C1 TO C6 FIRE PERFORMANCE

Clauses C1 to C6 address fire safety, including preventing fires from occurring, limiting fire spread, ensuring occupants have the ability to move to places of safety and enabling safe firefighting operations. For facades, the focus is on controlling external fire spread and ensuring wall systems do not contribute to vertical fire propagation.

Some key requirements include, Clause C3.5, which limits vertical fire spread over external walls to 3.5 m in multi-level buildings, and Clause C3.7, which provides that walls near boundary must be non-combustible or meet ignition resistance criteria depending on building importance level.

The Building Product Specifications document specifies methods for determining whether a material is combustible. Refer to the excerpt below:

Part 8. Fire characteristics of building products

8.1 Properties of materials

8.1.1 Combustibility

8.1.1.1 This specification includes methods for determining whether a material is non-combustible, limited combustible, or combustible.

8.1.1.2 Non-combustible materials include those that are:

a) composed entirely of glass, concrete, steel, brick/block, ceramic tile, or aluminium; or

b) non-combustible when tested to NZS/AS 1530.1:1.994; or

c) non-combustible when tested to AS 1530.1:1994; or

d) classified as A1 in accordance with BS EN 13501-1:2018; or

e) tested to ISO.1.182:2020, BS.EN.ISO.1.182:2020, or JSQ..1.182:20.10, and achieve:

i) AT (rise in temperature of the furnace) of ≤ 30°C, and

ii) Am (mass loss of the specimen) of ≤ 50%, and

iii) t. (time of sustained flaming) of Os.

8.1.1.3 Limited combustible materials include those that are classified as A2 in accordance with BS.EN.13501-1:2018.

8.1.1.4 Combustible materials are those that do not meet any of the specifications for non-combustible or limited combustible.

Excerpt from Building Product Specifications, available at https://www.building.govt.nz/building-code-compliance/building-product-specifications.

Where the risk of vertical fire spread is elevated, facade systems must be assessed as complete assemblies rather than as individual components.[4] Large- and intermediate-scale tests such as BS 8414, NFPA 285 and AS 5113 evaluate fire propagation across the full wall system, including cladding, insulation, framing and cavities. Cavity design is a critical factor, as vertical voids can significantly increase flame height and accelerate concealed fire spread. Cavity barriers, often required to achieve fire-resistance performance within assemblies, are used to restrict concealed fire spread within cavities.

Compliance relies on alignment with tested system configurations, and any deviation from tested details generally requires a technical assessment by a suitably qualified expert.

From compliance to design strategy

The building envelope as a system

External walls should be considered as integrated, multi-layered assemblies rather than discrete materials. Typical control layers include structure, air control, water control, thermal insulation, drainage and ventilation cavity and external cladding. Performance depends on the continuity and coordination of these layers. Interfaces, junctions and penetrations present the highest risk, where discontinuities can compromise durability, weathertightness and fire performance.

System selection and coordination

Best practice relies on the use of tested assemblies, compatible components and manufacturer-supported systems. Mixing unverified products can introduce performance risks, particularly at interfaces. As facade complexity increases, there is growing reliance on facade engineering input to resolve movement, moisture and fire requirements in a coordinated manner.

Establishing evaluation criteria

NZBC performance requirements are interconnected and cannot be addressed in isolation. External wall systems should be assessed against consistent criteria, including durability and maintenance lifecycle (B2), moisture management capability (E2), fire performance (C clauses), seismic compatibility and weight (B1), and constructability. Suitability must also be considered in relation to building scale and exposure conditions. This has driven a shift toward performance verification, tested facade assemblies and systems supported by robust technical evidence.

Integrating tested facade systems with CSR

Translating NZBC requirements into buildable facade systems requires the integration of materials that perform reliably as part of a coordinated assembly. Systems such as Hebel AAC panels, Cemintel fibre cement cladding, PGH masonry and other cladding approaches demonstrate how different facade typologies can address durability, moisture, fire and structural requirements when specified holistically.

Hebel AAC panels are commonly used as non-loadbearing external wall systems within framed construction. Their non-combustible composition supports NZBC fire performance requirements, while their low weight helps reduce seismic loads and supports compliance with Clause B1. Installed within a drained and ventilated facade, they also contribute to thermal and acoustic performance.

Cemintel fibre cement systems offer a lightweight alternative compatible with timber and steel framing, combining non-combustibility with exceptional durability. When paired with rigid air barrier systems, they provide a continuous secondary line of defence against air and moisture ingress.

PGH masonry systems provide a more traditional solution, where fired clay delivers inherent durability, high weather resistance and long service life. As a primary weather barrier, masonry can simplify facade layering while offering thermal mass benefits and reduced maintenance over time.

Open cladding strategies, such as the use of **Monier tiles** as a ventilated outer layer, further reinforce the shift toward rainscreen design. In these systems, the outer cladding acts as a first line of defence, while a rigid air barrier and wall underlay behind manage air and water control. This layered approach aligns closely with weatherproofing requirements, particularly in exposed conditions where wind-driven rain must be carefully managed.

Across all systems, performance depends on the integration of supporting components. **Bradford stone wool insulation**, for example, can improve both thermal performance and fire resistance within the wall build-up, particularly where combustible risk must be managed. Intumescent cavity barriers, such as **Tenmat fire barrier systems**, help restrict concealed vertical fire spread while allowing airflow within drained cavities.

About CSR

CSR is a leading building materials manufacturer in Australia and New Zealand, with brands including Hebel, Cemintel and Bradford. Its portfolio spans facade, wall and insulation systems designed to support compliance across durability, moisture, fire and energy performance. These systems are supported by tested data, technical documentation and local manufacturing capability.

REFERENCES

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[2] New Zealand Treasury. "Lessons from the Treasury's Role in the Canterbury Earthquakes." New Zealand Treasury. https://www.treasury.govt.nz/sites/default/files/2025-03/oia-20250119.pdf (accessed 19 March 2026).

[3] New Zealand Government. "Acceptable solutions and verification methods." Building Performance. https://www.building.govt.nz/building-code-compliance/how-the-building-code-works/different-ways-to-comply/acceptable-solutions-and-verification-methods (accessed 19 March 2026).

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