

## *Determination 2005/78*

# *Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 68*

## **1 THE DISPUTE TO BE DETERMINED**

- 1.1 This is a determination of a dispute referred to the Chief Executive of the Department of Building and Housing (“the Chief Executive”) under section 17 of the Building Act 1991 (“the Act”) as amended by section 424 of the Building Act 2004. The applicant is the building owner acting through an agent (referred to throughout this determination as “the owner”), and the other party is the territorial authority. The application arises from the refusal by the territorial authority to issue a code compliance certificate for a 2-year old house unless changes are made to its monolithic cladding systems.
- 1.2 The question to be determined is whether on reasonable grounds the monolithic wall cladding as installed to the timber-framed external walls and columns of the house (“the cladding”), complies with the building code (see sections 18 and 20 of the Act). By “the monolithic wall cladding as installed” I mean the components of the system (such as the backing sheets, the flashings, the joints and the plaster and/or the coatings) as well as the way the components have been installed and work together.
- 1.3 This determination is made under the Building Act 1991, subject to section 424 of the Building Act 2004. That section came into force (“commenced”) on 30 November 2004, and its relevant provisions are:
- “ . . . on and after the commencement of this section,—
- “(a) a reference to the Authority in the Building Act 1991 must be read as a reference to the chief executive; and
  - “(b) the Building Act 1991 must be read with all necessary modifications to enable the chief executive to perform the functions and duties, and exercise the powers, of the Authority . . . ”

It should be noted that the new legislation does not amend the determination process set out under the 1991 Act, other than to transfer the power to make a determination from the Building Industry Authority (“the Authority”) to the Chief Executive.

- 1.4 This determination refers to the former Authority:
  - (a) When quoting from documents received in the course of the determination, and
  - (b) When referring to determinations made by the Authority before section 424 came into force.
- 1.5 In making my decision, I have not considered any other aspects of the Act or the building code.
- 1.6 The house itself is described in paragraphs 2.1 to 2.4, and paragraph 8 sets out my decision.

## **2 PROCEDURE**

### **The building**

- 2.1 The building is a two-storey detached house situated on an excavated sloping site in a very high wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The external walls of the house are of conventional light timber frame construction built on concrete block foundation and retaining walls and sheathed with monolithic cladding. The house is of a very simple shape, with the butyl rubber over plywood substrate low pitch roof surrounded with parapet walls and drained by integral internal gutters. The internal faces of the parapet walls are also monolithic clad and the top of the parapet is finished with a metal capping. The upper storey projects from the lower floor wall line by 1300mm along the majority of one elevation and the projection is supported on a steel portal frame or timber posts, with the column surrounds framed up in timber and lined with monolithic cladding. The upper kitchen area also has one cantilevered section, which I note is situated on a different elevation than that shown on the consented plans. A flat butyl rubber clad roof is constructed over this projection.
- 2.2 A timber-framed enclosed balcony is constructed partly over a habitable space at the first floor level adjacent to the family/dining room and bedroom 1. This has a tiled deck over a flexible membrane and timber-framed balustrades that are monolithic clad on both faces and have a metal capping to the top. The main entry is accessed by a set of tiled steps and a landing, and a flight of timber stairs with a timber balustrade leads from the landing up to the upper floor. One string of the stairs is attached to the cladding.
- 2.3 The specification calls for all interior unexposed timber to be TPA H1 treated. After an investigation, the expert commissioned by the Authority concluded that the bottom plates of the external wall framing are H3 treated, and that the remainder of the external wall framing members are a mixture of untreated or H1 Boron treated timbers.

- 2.4 The walls of the building are clad with what is described as monolithic cladding. The cladding is a particular proprietary product, installed in accordance with the manufacturer's instructions, which include details of the heads, jambs, sills, trims and corners. As detailed in that manufacturer's instructions ("the instructions"), it incorporates 7.5 mm fibre cement backing sheets fixed through building wrap directly to framing timbers, and finished with a proprietary textured coating system, followed by an appropriate painting system. The systems have been subject to an appraisal by an independent testing organisation.

### **Sequence of events**

- 2.5 The territorial authority issued a building consent on 29 January 2003. The "conditions/endorsements" attached to the consent included references to window and door flashings, and to flashings and membranes.
- 2.6 The territorial authority carried out inspections during the course of construction, and passed the preline inspection on 30 June 2003, and the plastering check, which included flashings and ground clearance, was passed on 6 June 2003. A comment on the territorial authority's notes relating to the latter inspection noted that "one window to be flashed (upstairs master bedroom) to be checked". The postline check was passed on 15 July 2003. The territorial authority undertook final inspections on 18 and 27 November 2003. It would appear from the territorial authority's note of 27 November 2003, that all outstanding items previously noted by the territorial authority after the 18 November 2003 inspection had been checked and ticked off.
- 2.7 The territorial authority wrote to the owner on 27 January 2004 describing the inspections that had taken place and noting that further investigation was required to ensure that the house complied with the code. The territorial authority also noted that following the receipt of data from the Weathertight Homes Resolution Service, changes had been made to its inspection regime in respect of monolithic claddings.
- 2.8 On 12 February 2004, in a letter to the territorial authority, the legal advisor to the original owner gave the opinion that the original owner had complied with all the requirements of the consent. The legal advisor went on to say that the points raised in the territorial authority's letter of 27 January 2004 were insufficient to "retrospectively withhold a code compliance (*sic*) for a building that had been fully inspected and passed.
- 2.9 On 29 April 2004 the territorial authority informed the owner that, as the house was monolithic clad and lacked a ventilated cavity, the territorial authority would review the consent plans and would arrange a follow-up site inspection.
- 2.10 The territorial authority carried out a further site inspection, and in a letter to the owner dated 2 July 2004, regretted that the building may not comply with the building code in a number of respects. The territorial authority attached a Notice to Rectify also dated 2 July 2004 to this letter, together with a set of photographs illustrating items of non-compliance. The "Particulars of Contravention" attached to the Notice to Rectify noted:

A site inspection of the above property carried out on the 21 May 2004 revealed that the exterior cladding of the new building constructed at the

above address is a block work base and monolithic cladding system [Named system] with no provision for ventilation of the wall space. Furthermore the exterior claddings have been installed otherwise than in accordance with, the manufacturer's specifications, the acceptable solutions of the building code and accepted trade practices as detailed below.

1. The following have not been installed per the manufacturer's specifications
  - Control joints at a maximum of 5.4 [M] centres and at floor joist level horizontally are required. Control joints have not been installed vertically, and confirmation is required that horizontal control [joints] have been installed
  - A 6mm gap (horizontally) is required between the back of the cladding and the basement block wall. This has not been achieved
  - Inseal strips are to be installed within the 6mm gap between the back of the cladding and the basement blockwall. An inseal strip has not been installed
  - Horizontal surfaces are to be formed with sufficient fall to prevent water from ponding on them. The deck barriers have flat horizontal surfaces.
  - The junction between the window head flashing and bottom edge of the cladding is to be either
    - Left unsealed with a 5mm gap or
    - If sealed, the bottom edge sheet must be back-sealed. A continuous 6mm x 10mm inseal strip must also be used to seal the back edge of the sheet

As the junction has been sealed, council must satisfy itself that the above-mentioned seals have been installed

- The junction between the bottom edge of the window joinery and the wall cladding is to have a sill flashing installed and the junction is to remain open. This junction has been sealed and no sill flashing appears to have been installed.
  - The bottom edge of the cladding system is to finish a minimum 100mm above paved surfaces and 175mm above unpaved surfaces. The cladding has been taken closer than these measurements on the eastern side of the building.
  - The minimum finished floor level to finished ground level is 150mm to paved surfaces, and 225mm to unprotected ground. These clearances have not been achieved outside the foyer and bedroom 2.
2. The following items have not been installed per the acceptable solutions of the building code, (no alternative solutions have been applied for)
    - Buildings shall have claddings that are waterproof, there are some sheet joint movements developing within the cladding system.

- The distance between finished floor level and finished paving of 150mm has not been achieved in the area outside the foyer and bedroom 2.
  - Two outlets are required to internal gutters/decks. The cross-sectional area of the outlets shall be no less than the cross-sectional area of the downpipes serving the gutter/deck. The minimum internal diameter permitted is 63mm. The overflow outlet for the deck off the lounge is less than permitted.
3. The following items have not been installed per accepted trade practice
- At the junction between horizontal surfaces (i.e. top of barrier) and a vertical surface (i.e. house wall) flashings are required. I am unable to determine if flashings have been installed.
  - Penetrations through the cladding system shall be as waterproof as the cladding itself. There are a number of penetrations through the cladding that should be protected with rubber flanges and silicon[e], and in the case of light fittings and extractor fan flashings have not been installed. The downpipe brackets and tv aerial fixings have not been sealed behind.
  - Decking and the like are to remain clear (horizontally) 10mm of the cladding. The rear deck and stairs have been installed against the cladding.
  - Decking stringers and the top of stair hand rail have been attached directly through the cladding system.
  - All flashings are to be installed in such a way as to direct water away from the building, and prevent ingress of moisture. The garage door opening has no head flashing fitted. The joinery installed around the lounge deck have (sic) no head flashing fitted.
4. Ventilated cavity system
- The Council has recently received information which shows that monolithic cladding systems without a drainage plane/cavity, provision for adequate ventilation, drainage and vapour dissipation will, in the likelihood of leakage and/or the effects of residual moisture, cause irrevocable damage to the structural elements of the building.

The Council cannot be satisfied that the above building meets the performance requirements of Clauses B1 Structure, B2 Durability, E2 External Moisture, E3 Internal Moisture, G4 Ventilation and H1 Energy Efficiency Provisions of the Building Code...This is in breach of Sections 7(1), of the Building Act 1991...

Also that the owner was required to:

1. Provide adequate ventilation to the monolithic cladding and into the wall frame space by means of either a ventilated cavity or alternative approved system, and ensuring all issues related to the above are resolved.
2. Lodge with the council an application, within 28 days from the date of this notice, for an amended building consent, and provide all necessary

information that may be requested to allow this consent application to be processed, alternatively.

- 3 Confirm to council, within 28 days from the date of this notice, your intention to apply to the Building Industry Authority for a determination in accordance with the Building Act 1991

- 2.11 The territorial authority wrote to the original owner's legal representative on 11 August 2004 explaining the territorial authority's position with regards to the notice to rectify. The territorial authority also noted that following the receipt of new information it had changed its assessment of monolithic clad buildings. The territorial authority also provided information regarding the 6mm gap required at the base of the cladding, and stated that it could not place notations or limitations on a code compliance certificate.
- 2.12 The owner applied for a determination on 16 September 2004.

### **3 THE SUBMISSIONS**

- 3.1 The owner listed in chronological order the sequence of events leading up to the refusal of the territorial authority to issue a code compliance certificate. The owner also queried the statement made by the territorial authority that the final inspection identified the cladding as requiring further investigation. The owner was of the opinion that neither the territorial authority nor its inspector had raised any issues of concern.

- 3.2 The owner also provided copies of:

- The building plans and part specification;
- The consent documentation;
- The Notice to Rectify;
- The inspection records from the territorial authority;
- The correspondence with the territorial authority; and
- Some manufacturer's recommendations.

- 3.3 In a covering letter to the Authority dated 28 October 2004, the territorial authority noted:

*Particulars of Contravention*

As detailed in the NTR the areas of contravention relate to six clauses of the Building Code, namely:

- B1 structure,
- B2 durability,

- E2 external moisture,
- H3 internal moisture,
- G3 ventilation, and
- H1 energy efficiency.

Specific construction defects may be grouped into the following areas:

- Ground clearances
- Control joints
- Flashings
- Provision of outlets
- Decking stringers and hand rails attached directly through the cladding system
- Horizontal surface fall requirements, and
- Insufficient means for dissipation of water where the water passes through the exterior cladding.

3.4 The territorial authority also forwarded copies of:

- The plans and specifications;
- The consent documentation;
- The Notice to Rectify;
- The inspection check lists; and
- The correspondence with the owner.

3.5 Copies of the submissions and other evidence were provided to each of the parties.

## **4 THE RELEVANT PROVISIONS OF THE BUILDING CODE**

4.1 The dispute for determination is whether the territorial authority's decision to refuse to issue a code compliance certificate because it was not satisfied that the cladding complied with clauses B2.3.1 and E2.3.2 of the building code (First Schedule, Building Regulations 1992) is correct. The relevant provisions of the building code say:

### **Clause B2—DURABILITY**

**B2.3.1** Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building, if stated, or:

- (a) The life of the building, being not less than 50 years, if:
- (i) Those building elements (including floors, walls, and fixings) provide structural stability to the building, or
  - (ii) Those building elements are difficult to access or replace, or
  - (iii) Failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.
- (b) 15 years if:
- (i) Those building elements (including the building envelope, exposed plumbing in the subfloor space, and in-built chimneys and flues) are moderately difficult to access or replace, or
  - (ii) Failure of those building elements to comply with the building code would go undetected during normal use of the building, but would be easily detected during normal maintenance.

**Clause E2—EXTERNAL MOISTURE**

**E2.1** The objective of this provision is to safeguard people from illness or injury, which could result from external moisture entering the building.

**E2.2** Buildings shall be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.

**E2.3.2** Roofs and exterior walls shall prevent the penetration of water that could cause undue dampness, or damage to building elements.

4.2 There are no Acceptable Solutions that have been approved under section 49 of the Act that cover this cladding. The cladding is not accredited under section 59 of the Act. I am therefore of the opinion that the cladding system as installed can be considered to be an alternative solution.

4.3 In several previous determinations, the Authority has made the following general observations, which in my view remain valid in this case, about acceptable solutions and alternative solutions:

- Some acceptable solutions cover the worst case, so that in less extreme cases they may be modified and the resulting alternative solution will still comply with the building code.
- Usually, when there is non-compliance with one provision of an acceptable solution, it will be necessary to add some other provision to compensate for that in order to comply with the building code.



## **5 THE EXPERT'S REPORT**

5.1 The Department commissioned an independent expert ("the expert") to inspect and report on the cladding. The expert inspected the building and furnished a report that was completed on 1 March 2005. The expert noted the house had a very "poor appearance" The expert removed a small section of the plaster around one window to examine the flashings and also a section from one of the balustrades. I accept that these exposed details are likely to be representative of the remainder of the relevant house details. The expert's report made the following specific comments on the cladding:

- There is excessive "pouting" in the cladding on all elevations, which the expert attributes to thermal movement and moisture expansion;
- There is an absence of both horizontal and vertical control joints;
- There is poor jointing application;
- There is no gap, nor any in-seal strip, to the back of the cladding where it oversails the blockwork foundation walls;
- The paint finish is easy to remove from the textured surface. In addition, the paint finish appears to be too dark, and this could consequently create a heat build-up in the backing sheets;
- There are locations where there is insufficient clearance between the base of the cladding and the ground or paving;
- There is no sealant or foam strip to the jambs of the external windows and doors, nor are any jamb or sill flashings installed;
- The paint finishes hard onto the head flashing of the external windows and doors, and this is restricting cladding drainage;
- The decking and stair stringers, and the stair handrail are fixed directly to the cladding;
- The metal cappings to the parapets and balustrades, in the expert's opinion, have inadequate downturns onto the cladding, and the parapet cappings lack cross-falls;
- There are no saddle flashings installed where the balustrades adjoin the wall cladding;
- The fall to the deck of the balcony is insufficient;
- The overflow to the balcony gutter is undersized;
- Some penetrations through the cladding lack rubber flanges and adequate sealing, and the downpipe bracket and TV aerial fixings are not sealed; and

- The external light fittings and the extractor fan lack flashings.
- 5.2 The expert noted that the main roof membrane is under stress in many locations, the pitch of the roof was less than the minimum of 1.5 degrees, and there is a lack of roof ventilation. As the membrane is under stress at the plywood substrate joints, the expert is of the opinion that expansion joints are not installed, or are installed incorrectly.
- 5.3 The expert carried out a series of non-invasive moisture tests at the interior and exterior of the external walls. Further invasive readings were made and the following higher moisture readings were recorded:
- 30% and 40%(2) at the north elevation;
  - 22%, 23%, and 40%(2) at the south elevation;
  - 22%, 32% and 40%(2) at the east elevation;
  - 32% at the west elevation parapet; and
  - 21% and 22% at the hallway ceiling and wall respectively.

Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure.

- 5.4 Copies of the expert's report were provided to each of the parties and both accepted the report.

## **6 DISCUSSION**

### **General**

- 6.1 I have considered the submissions of the parties, the expert's report and the other evidence in this matter. The approach in determining whether building work complies with clauses B2.3.1 and E2.3.2, is to examine the design of the building, the surrounding environment, the design features that are intended to prevent the penetration of water, the cladding system, its installation, and the moisture tolerance of the external framing.

### **Weathertightness risk**

- 6.2 Recent research and experience, both internationally and locally, indicates that the impact of weathertightness problems in monolithic clad houses can be minimised if good and effective design and construction practices are followed.
- 6.3 The installation of exterior cladding to manufacturer's specifications and to accepted good trade practice is an important but not the only requirement to ensure good weathertightness performance.

6.4 The next priority is to reduce the ability of moisture to get through the cladding by using design measures that minimise the effects of the rain impacting on the walls:

6.5 I consider that the important matters for consideration are:

- Data show a strong relationship between the width of the eaves and the incidence of wall leaks. An effective deflection mechanism, such as eaves greater than 600 mm wide, has been shown by Canadian data to manage more than 90% of rain incidence;
- While most reported leaks are substantially caused by defects in the cladding that require little or no wind pressure differential, it is believed that buildings in high and very high wind zones (as defined by NZS 3604) are likely to experience wind pressure differentials and thus a higher risk of water ingress;
- Taller buildings result in an effective increase in the catchment area of the wall. Available data suggest a clear correlation between higher number of storeys and an increased incidence of leaking;
- Complex roofs and overall envelope shapes where the roofs frequently intersect with the walls on upper floors create opportunities for leaks into the wall; and
- Recent data also shows that decks and balconies that are exposed in plan and/or cantilevered from the external walls are the most frequent location for water leaks.

6.6 Any likely penetration of moisture through the cladding can then be countered by a combination of effective drainage, ventilation of the drainage cavity and moisture tolerance in the external wall framing timber. In particular:

- The structure should allow water that has penetrated the cladding to drain out as quickly as possible. It is believed that generally a drainage cavity should be provided behind the outer cladding barrier in monolithic construction;
- The design of the outer walls should allow walls to dry to the outside once moisture penetrates the cladding and the moisture barrier. If walls do not dry, decay fungi can become established in as little as 3 months. Until scientific data on the optimum depth and configuration of the ventilation mechanism in New Zealand conditions is available, I consider that the drainage cavity should be not less than 20 mm deep; and
- The external walls should have some degree of decay resistance or moisture tolerance to allow for situations when moisture circumvents the cladding and moisture barriers and moisture levels in the timber rise to more than 18%.

6.7 In relation to these characteristics I find that the house:

- Has no eaves and verge projections that could provide some protection to the lower cladding;

- Is built in a very high wind zone;
- Is two storeys high;
- Is relatively simple on plan;
- Has a balcony at the first level that is partially constructed over a habitable space;
- Has unflushed or inappropriately sealed external windows and door jambs and sills; and
- Has external wall framing that is partially constructed with timbers that are unlikely to resist the onset of decay if they absorb and retain moisture.

### **Weathertightness performance**

- 6.8 I find that the monolithic cladding in general does not appear to have been installed according to good trade practice. As a result, there are a number of identified defects, set out in paragraph 5.1 and in the expert's report, which have contributed to the levels of moisture penetration already evident in many locations in the external walls of the house. The main areas of concern are the lack of control joints and capillary gaps, the evidence of "pouting", insufficient ground clearance, concerns with the balustrade and parapet cappings, the lack of in-seal or flashings to the jambs and sills of the external windows and doors, and the quality and colour of the paintwork. In addition, some of the external wall framing timber is in all likelihood not treated, and thus unable to delay the onset of decay if it gets wet. As reported by the expert, there is already visible evidence of very high moisture contents in many wall framing locations.
- 6.9 In addition, the expert has noted various defects in the main roof as outlined in paragraph 5.2.
- 6.10 The expert has noted that at the time the external windows and doors were installed, the manufacturer only recommended that flashings be installed to the jambs and sills. However based on the lack of adequate seals and the high moisture contents in the framing adjacent to these units, it is clear that the flashing system is not working. I would recommend that the parties consider the question of installing flashings.
- 6.11 I note that all elevations of the buildings demonstrate a high weathertightness risk rating when calculated by the E2/AS1 risk matrix. The matrix is an assessment tool that is intended to be used at the time of application for consent, before the building work has begun and, consequently, before any assessment of the quality of the building work can be made. Poorly executed building work introduces a risk that cannot be taken into account in the consent stage, but must be taken into account when the building as actually built is assessed for the purposes of issuing a code compliance certificate.

## **7 CONCLUSION**

- 7.1 I am satisfied that the performance of the monolithic cladding is inadequate because it has not been installed according to good trade practice. In particular, it demonstrates the key defects listed in paragraphs 5.1 and 5.2. I have also identified the presence of some known weathertightness risk factors in this design. The presence of the risk factors on their own is not necessarily a concern, but they have to be considered in combination with the significant faults identified in the cladding system. It is that combination of risk factors and faults that indicate that the structure does not have sufficient provisions that would compensate for the lack of a ventilated cavity. Consequently, I am not satisfied that the cladding system as installed complies with clause E2 of the building code.
- 7.2 In addition, the building is also required to comply with the durability requirements of clause B2. Clause B2 requires that a building continues to satisfy all the objectives of the building code throughout its effective life, and that includes the requirement for the house to remain weathertight. Because the cladding faults in the house are allowing the ingress of moisture, the house does not comply with the durability requirements of clause B2.
- 7.3 I find that because of the apparent complexity of the faults that have been identified with this cladding, I am unable to conclude, with the information available to me, that remediation of the identified faults, as opposed to partial or full recladding, could result in compliance with clauses B2 and E2. I consider that any final decisions on whether code compliance can be achieved by either remediation or recladding, or a combination of both, can only be made after a more thorough investigation of the cladding. This will require a careful analysis by an appropriately qualified expert as to the correct remedial option to be followed. Once that decision has been made, it should be submitted to the territorial authority for its comment and approval. If the territorial authority chooses to reject the proposal, then the owner is entitled to seek a further determination that will rule on whether the proposed remedial work will comply with the requirements of clauses E2 and B2.
- 7.4 I note that effective maintenance of monolithic claddings is important to ensure ongoing compliance with clause B2 of the building code. That maintenance is the responsibility of the building owner. The code assumes that the normal maintenance necessary to ensure the durability of the cladding is carried out. For that reason clause B2.3.1 of the building code requires that the cladding be subject to “normal maintenance”. That term is not defined and I take the view that it must be given its ordinary and natural meaning in context. In other words, normal maintenance of the cladding means inspections and activities such as regular cleaning, re-painting, replacing sealants, and so on.
- 7.5 In the circumstances, I decline to incorporate any waiver or modification of the building code in its determination.

**8 THE DECISION**

- 8.1 In accordance with section 20 of the Act, I hereby determine that the monolithic cladding system as installed does not comply with clauses B2 and E2 of the building code and accordingly confirm the decision of the territorial authority to refuse to issue a code compliance certificate.
- 8.2 I note that the territorial authority has issued a Notice to Rectify requiring provision for adequate ventilation, drainage and vapour dissipation. Under the Act, a Notice to Rectify can require the owner to bring the house into compliance with the building code. The Authority has already found in a previous determination (2000/1) that the Notice to Rectify cannot specify how that compliance can be achieved. A new Notice should be issued that requires the owner to bring the cladding into compliance with the building code, without specifying the features that are required to be incorporated. It is not for me to dictate how the defects described in paragraphs 5.1 and 5.2 are to be remedied. How that is done is a matter for the owner to propose and for the territorial authority to accept or reject, with either of the parties entitled to submit doubts or disputes to the Chief Executive for another determination.
- 8.3 Finally, I consider that continuing maintenance of the cladding will be required to ensure its continuing building code compliance.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 26 May 2005.

John Gardiner  
**Determinations Manager**