

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 46

1 THE DISPUTE TO BE DETERMINED

- 1.1 This is a determination by the Building Industry Authority (“the Authority”) of a dispute referred to it under section 17 of the Building Act 1991 (“the Act”). The applicants are the owners of the property (referred to throughout this document 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 7-year old house unless changes are made to its monolithic cladding system.
- 1.2 The Authority’s task in this determination is to consider whether it is satisfied on reasonable grounds that the external monolithic wall cladding as installed (“the cladding”), to the walls of this house, complies with the building code (see sections 18 and 20 of the Act). By “external monolithic wall cladding as installed” we 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 In making its decision, the Authority has not considered any other aspects of the Building Act or the building code.
- 1.4 The house itself is described in paragraphs 2.1 to 2.3, and paragraph 8 sets out the Authority’s final decision.

2 PROCEDURE

The building

- 2.1 The building is a two-storey house with a single storey attached garage situated on a sloping excavated site in a low wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house, which is of conventional light timber frame construction on a concrete block foundation wall, is of a relatively simple shape, with roofs at two main levels. A narrow membrane lined flat roof extends along the rear elevation, and there is a flat roof extension over the main entry supported on beams and a corner column. The external framing is sheathed in monolithic cladding and there are several roof/wall intersections. There is a small cantilevered balcony at the upper level, partially constructed over a living space. The balcony has a membrane deck cladding that is overlaid with tiles, and has a balustrade to the front and both ends, which is timber framed and lined on both faces and the top with the cladding. A glass block panel is set into the front wall of the balustrade. Two gap-boarded timber decks have been constructed to two full elevations of the house at the lower level. Apart from one side elevation, which has a 150mm

projection, the eaves have 250mm wide projections. All eaves have attached gutters that extend a further 125mm. The gables have 170mm wide projections.

- 2.2 There has been no evidence provided on the treatment, if any, of the framing timbers used in the external walls. The drawings only indicate H1 treatment, and accordingly, the Authority takes the view that the timber in the exterior walls is treated to a H1 LOSP level, which will not significantly delay the onset of decay.
- 2.3 The cladding system is what is described as monolithic cladding. As specified in its manufacturer's July 1995 technical information manual ("the manufacturer's instructions"), it incorporates fibre-cement backing sheets fixed through the building wrap directly to the framing timbers and finished with a choice of joint and coating systems. The manufacturer's instructions include details for flashings at various junctions (but not all of the junctions actually present in the house). For the purposes of this determination, the manufacturer of the fibre-cement sheets and the flashing kit is regarded as the manufacturer of the system, despite the fact that each of the joint and coating systems is itself proprietary to one of other manufacturers. The manufacturer's instructions identify the joint and coating systems by reference to an independent appraisal but give no other information about them. No evidence has been provided to show whether the sealing, or the textured coating, or the painting was one of those systems nominated by the manufacturer.

Sequence of events

- 2.4 The territorial authority issued a building consent on 14 May 1997.
- 2.5 The territorial authority made various inspections during the course of construction, and passed the pre-line building inspection on 29 October 1998.
- 2.6 In a letter to the owner, dated 6 November 1998, the territorial authority listed 4 items that required attention before the "file can be finalised". None of these items referred to the cladding
- 2.7 A final code compliance certificate inspection was made on 10 December 2003 and the notation on the territorial authority's "Field Sheet" against this inspection states:

Monolithic cladding: hold. Check re control joints and horizontal joint between floor.

The territorial authority made further final code compliance certificate inspections on 23 April 2004 and 12 May 2004, but did not sign off the building as being code compliant

- 2.8 The territorial authority wrote to the owner on 23 December 2003, stating that based on recent information and a recent adjudication, "that it is not possible to be satisfied on reasonable grounds, that a monolithic cladding without a cavity behind will perform satisfactorily for the intended life of the building".
- 2.9 The territorial authority issued a Notice to Rectify, dated 20 May 2004, and the "Particulars of Contravention" were:

Monolithic cladding systems without a 20 mm cavity, provision for adequate ventilation, drainage, and vapour dissipation will, in the event of leakage and/or the effect of residual moisture, cause irrecoverable damage to the structural elements of the building

You are 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; or
2. Remove the monolithic cladding and replace with an approved cladding system and;
3. Lodge with Council an application for an amended building consent and provide all necessary information that may be requested to allow this consent application to proceed.
4. Install horizontal & vertical control joints as per manufacturer's instructions.
5. Verify type of cladding substrate used.
6. Repair and reseal all cracks in cladding plaster.
7. Remove plaster from direct contact with deck tiles.
8. Provide kick out flashings to roof/wall junctions as required.
9. Seal plaster behind gutter ends & gable end at rear of garage.

2.10 The owner applied for a determination on 16 February 2004.

3 THE SUBMISSIONS

3.1 The owner in a covering letter dated 8 June 2004, stated:

The key reasons why we believe our house should be signed off are as follows:

- [The house] has stood the test of time being over 6 years old and no problems with cladding and leaks.
- The house has Eve's (*sic*) which I am led to believe isn't the case with most buildings experiencing leaks.
- Council approved the plans and in the first and final inspection didn't raise the cladding as an issue and therefore don't think that a contradictory & retrospective decision is appropriate.

During the last final inspection Council has identified issues that weren't identified during the first final inspection and as we purchased the house based on the first final inspection if remedial work is required who should pay for the work to be done?

3.2 The owner provided copies of:

- The building plans; and
- Correspondence with the territorial authority; and

- 3.3 The owner also supplied a copy of a report from a consultant engaged by the owner, dated 18 April 2004, which is summarised as follows:
- The external joinery units have head flashings, but there are no jamb flashings, and resealing the jambs with a flexible sealant is an option;
 - The eaves provide some protection but the soffit lining and moulding need painting;
 - The cladding overhangs and ground clearances are adequate;
 - The wall junctions appear to be constructed as per the plans and are watertight;
 - The balcony has been constructed as per the plans and the handrail [balustrade] joints are tight and there is no cracking in its cladding;
 - Some of the pipe penetrations need to be sealed; and
 - There has been some movement in the cladding that has caused cracking, especially over the windows. These areas need resealing and a flexible membrane paint applied.
- 3.4 The territorial authority made a submission in the form of a letter, dated 28 June 2004, which confirmed that a building consent had been issued for the cladding and also stated:
- Construction of the cladding was not the subject of the changed inspection procedures implemented by the Council as a consequence of a [Named] adjudication.
- In the absence of the additional inspections implemented as a consequence of those changed inspection procedures, and in the absence of a cavity as a first line of defence, the Council does not believe it is able to be satisfied on reasonable grounds, that the cladding applied to this dwelling will achieve the functional requirements of Clause E2.2, or the performance requirements of E2.3.2, of the Building Code.
- 3.5 The territorial authority also attached copies of:
- The Notice to Rectify; and
 - The territorial authority's inspection records.
- 3.6 The 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 B.2.3.1 and E2.3.2 of the building code (First Schedule, Building Regulations 1992) is correct. Those provisions of the building code provide:

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. The Authority is, 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 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, however, 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 Because the information provided by the parties contained insufficient detail on how the building had been constructed, the Authority commissioned an independent expert (“the expert”) to inspect and report on the cladding. The expert inspected the building and furnished a report. It noted that, apart from hairline cracking and some unfinished areas, the textured coating appears to be satisfactory. The coating has a good paint covering,

which is commensurate with the age of the building. The expert cut away a section of the cladding around a window head in order to check the flashings. The expert's report made the following specific comments on the cladding:

- Based on the destructive investigation, there are aluminium head flashings to the exterior windows that are incorrectly installed against the outer face of the building paper;
- The vertical and horizontal relief joints as required by the manufacturer's recommendations have not been installed;
- There is hairline cracking to four main locations on the north and west elevations;
- There are straight vertical cracks to two wall elevations suggesting that the sheet joints coincide with the window openings;
- The textured coating does not extend behind the gutter on the east elevation and to a section of wall on the west elevation;
- The appropriate ground clearances to the base of the cladding have not been achieved at two main wall locations;
- There are no kick-outs to the ends of the apron flashings;
- The decking is fitted hard against the cladding, and accordingly, the required cladding clearances have not been achieved. However, the report indicates that the cladding and its coating is continuous behind the decking. In this respect, the Authority notes that the decking is gap-boarded, thus limiting the amount of water held against the cladding;
- The balcony balustrade cladding is fixed hard onto the tiling below, the balustrade top is flat and does not have a cap flashing and it is not known how the glass brick panel is jointed to the balcony cladding; and
- The drain outlet from the balcony has been poorly flashed.

5.2 The expert took moisture readings from the interior throughout the house around all openings and at skirting level of external walls, using a non-intrusive meter. No raised moisture levels were recorded and no signs of leaks were identified. The expert also took 14 further readings with an intrusive meter, and five of these were over 18 %. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. The readings above 18 % were:

- 19 % at the east overflow from the balcony;
- 22% at the base of the right-hand window on the north elevation;
- 22% at the base of the right-hand doors on the west elevation;
- 34.2% at the northeast bottom corner of the balcony; and
- 60% at the northwest bottom corner of the balcony.

- 5.3 The expert also commented on aspects of the territorial authority's Notice to Rectify. The expert was unable to comment on items 1-3, referred back to the report for items 4, 6, 7 and 8, and identified the cladding in response to item 5. The expert could not confirm the territorial authority's concern about the gable end set out in item 9.
- 5.4 Copies of the expert's report were provided to each of the parties and there was no response from the parties

6 THE AUTHORITY'S VIEW

General

- 6.1 The Authority has considered the submissions of the parties, the expert's report and the other evidence in this matter. The Authority's approach in determining whether building work complies with clauses B2/AS1 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 New Zealand data and experience 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 Important matters for consideration are:
- Data shows 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, the Authority believes that homes 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 suggests 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 to directly penetrate 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. The Authority believes 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, the Authority believes 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, the Authority finds that this house:
- Has 375mm wide total eaves projections, apart from one elevation that has 275mm wide eaves projections. There are 170mm wide gable projections that provide only nominal protection to the cladding;
 - Is in a low wind zone;
 - Is two storey;
 - Has flashings to the heads, and sealant to the jambs and sills of the exterior joinery units,
 - Has an overall envelope that is relatively simple on plan;
 - Has some roof/cladding junctions;
 - Has an upper-level cantilevered balcony, partly constructed over a living space;
 - Has two gap-boarded lower-level decks which are attached through the cladding; and
 - Has external walls that are constructed with timber treated to a H1 LOSP level, which is not effective in delaying the onset of decay.

Weathertightness performance

- 6.8 The Authority finds that the cladding in general does not appear to have been installed according to good trade practice and to the manufacturer's instructions. As a result, there are a number of identified defects, which are set out in paragraph 5.1, which have contributed to the penetration of the moisture already evident in several areas.

- 6.9 The Authority notes that all elevations of the building demonstrate a medium weathertightness risk rating as calculated using the E2/AS1 risk matrix. The matrix is an assessment tool that is intended to be used at the time of application for consent, but must be supplemented at the time of issuing a code compliance certificate by careful inspection of the building as actually built.
- 6.10 The Authority 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 the Authority takes 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. The Authority recognises that a territorial authority does not have any statutory responsibility for the ongoing maintenance of a building. However, the maintenance programme adopted by the owner could be undertaken after consultation with the territorial authority, bearing in mind that any comments or advice provided by the territorial authority to the owner are likely to be accompanied by appropriate disclaimers.
- 6.11 The Authority has previously issued a public warning about the dangers presented by balconies that had been affected by timber decay. The concerns identified by the expert concerning the cantilevered balcony, including the balustrades, the cladding junctions with the tiled floors of balconies, and the jointing of the glass block inset panel, are all matters that might affect the performance of timber used in the balcony structures. The glass block panel in the balustrade must also be able to support design handrail loads. Although this aspect of the balustrade detail is not the subject of this Determination, and the Authority, therefore, cannot make a decision on this issue, it is concerned that the handrail may not have adequate strength. The Authority therefore strongly recommends that the territorial authority uses the powers available to it under section 65 of the Act to ensure no safety hazard is presented by the balustrades. The expert has recommended that the balcony be demolished, but the Authority considers that the extent of remediation is for the territorial authority to decide.

7 CONCLUSION

- 7.1 The Authority is satisfied that the performance of the cladding is inadequate because it has not been installed according to good trade practice, and also because it demonstrates the key defects listed in paragraph 5.1. The Authority has 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 drained and ventilated cavity. Consequently, the Authority is not satisfied that the cladding system as installed complies with clause E2. of the building code.
- 7.2 The Authority finds that because of the apparent complexity of the faults that have been identified with this cladding, it is unable to conclude, with the information available to it, that remediation of the identified faults, as opposed to partial or full recladding, could result in compliance with clause E2.

- 7.3 The Authority observes that the plans submitted by the owner are not of a high standard and lack comprehensive detailing. The Authority would be concerned if these were copies of the same plans that were submitted to the territorial authority at the building consent stage as they leave the interpretation of critical issues entirely over to the builder.
- 7.4 In the circumstances, the Authority declines to incorporate any waiver or modification of the building code in its determination.

8 THE AUTHORITY'S DECISION

- 8.1 In accordance with section 20 of the Building Act 1991 the Authority hereby determines that the cladding system as installed does not comply with clause E2.3.1 of the building code and accordingly confirms the decision of the territorial authority decision to refuse to issue a code compliance certificate.
- 8.2 The territorial authority has issued a Notice to Rectify requiring a ventilated cavity or an alternative approved system. 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 the Authority to dictate how the defects listed in paragraph 5.1 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 Authority for another determination.
- 8.3 The cladding has now been in place for 7 years, and its 15-year durability performance requirement will start once the code compliance certificate is issued. Continuing maintenance of the cladding will therefore be required to ensure its continuing building code compliance.

Signed for and on behalf of the **Building Industry Authority** on 1 November 2004.



John Ryan

Chief Executive