

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 45

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 applicant is the owner of the property 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 new 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 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 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 9 sets out the Authority’s final decision.

2 PROCEDURE

The building:

- 2.1 The building is a two storey detached house with a part basement under, situated on a partly excavated sloping site, which, according to the expert appointed by the Authority, is in a low wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house is of conventional light timber frame construction generally on a concrete slab but also partly on a piled timber floor. The external framing is sheathed in a monolithic cladding. There are superimposed polystyrene surrounds to the external joinery. It is of a fairly complex shape resulting in a roof with numerous intersections and there are several roof/cladding junctions. The house has two raised decks located at two different levels, the highest one of these is constructed over a living space. The decks have outer edges supported on beams fixed to 300 mm diameter plastered polystyrene clad columns with timber post cores, and the inner edges are attached to the house. The decks are covered with a synthetic rubber membrane finishing to a timber upstand at the exterior perimeters. There is a two-storey high portico at the main entry with an intermediate level balcony and a roof with a semi-circular fascia, both supported on two 500 mm diameter plastered polystyrene columns

with timber post cores. Three upper floor windows, including one under the portico roof, have semi-circular heads. Generally, the eaves have 300 mm wide projections.

- 2.2 The framing in external walls is specified to be H1 treated timber.
- 2.3 The cladding system is what is described as monolithic cladding. As specified in its manufacturer's 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 those other manufacturers and their system brands but give no other information about them. The Authority has not received any confirmation as to whether the jointing or coating systems applied to this house are any of those identified in the manufacturer's instructions.

Sequence of events:

- 2.4 The territorial authority issued a building consent on 9 August 2001
- 2.5 The territorial authority made various inspections during the course of construction from 19 July 2001. Two "Plaster Exterior Cladding" inspections failed the cladding due to the territorial authority's concerns about control joints. From 22 August 2003, four final inspections, which included the cladding were carried out and the cladding failed the inspection in each instance. However, a "Plaster Exterior Cladding" inspection on 30 January 2004 passed the work and it was noted, "control joints sighted ok ...".
- 2.6 On the "Field Sheet" for this building, the entry for the last Final code compliance certificate inspection, dated 11 February 2004, recorded:

ALL HAS PASSED EXCEPT MONOLITHIC CLADDING...

- 2.7 On 12 February 2004, the territorial authority issued "Notice to Rectify Building Work No: RG 11/2/04", which had attached a "Particulars of Contravention" that stated:

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:

- 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
- Remove the monolithic cladding and replace with an approved cladding system and;
- Lodge with Council an application for and amended building consent and provide all necessary information that may be requested to allow this consent application to proceed."

- 2.8 The Authority received the application for determination on 13 April 2004.

3 THE SUBMISSIONS

- 3.1 The owner wrote to the Authority on 7 April 2004 in support of their submission and stated that:

To the best of our knowledge we are confident in that we have fulfilled all Council requirements as per the Building Act and as per Plans and Specifications that has (*sic*) been approved by the Council (Building Consent [No]).

A final inspection carried out on 11/2/04 has been passed by [the territorial authority]. Further more under "PARTICULARS OF CONTRAVENTION" we have provided adequate ventilation to the monolithic cladding.

- 3.2 The owner also provided copies of:

- Drawings and specifications; and
- The Notice to Rectify.

- 3.3 The territorial authority wrote a letter to the Authority on 19 April 2004. This stated;

In the absence of the additional inspections implemented as a consequence of [the] changed inspection procedures, and in the absence of a cavity as a first line of defence, the Council does not believe that it is able to be satisfied on reasonable grounds that the cladding applied to this dwelling will achieve the functional requirements of Clause E.2.2, or the performance requirements of Clause E2.3.2, of the Building Code.

- 3.4 The territorial authority also provided copies of:

- The consent documentation; and
- The "Field Sheets" detailing the inspections that were carried out.

- 3.5 The copies of the submissions and other evidence were provided to each of the parties. The applicant responded with a short submission regarding liability for remediation. The Council did not respond.

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 clause E2.3.2 of the building code (First Schedule, Building Regulations 1992) is correct. Those provisions of the building code provide:

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 territorial authority's inspection reports did not provide sufficient information on the condition of the cladding and the way it had been installed, the Authority commissioned an independent expert ("the expert") to inspect and report on the cladding. The expert inspected the building and furnished a report, which noted that the workmanship regarding the installation and finishing of the cladding is of a "lesser quality" and as a consequence, moisture had penetrated the wall cavities. The expert exposed two areas of cladding. One exposed area revealed the inter-storey join on the north or northwestern elevation and the other revealed the jamb and sill junction of the dining room window. The expert also removed a section of plasterboard from the dining room eastern wall. The expert's report made the following specific comments on the cladding:

- Minor cracking is visible in the cladding surface;
- The patio decking is too high, and completely blocks the weep holes to some external joinery units;
- There is no provision for drainage or movement control in the horizontal reveal control joint
- The polystyrene facings to the exterior joinery are breaking down;
- The roof to wall junctions are inadequately sealed;
- Some metal fascias are buried into the plaster;
- There is no flashing or control joint where the base of the cladding adjoins the basement;
- There is inadequate ground clearance to areas of the cladding; and
- Based on the intrusive inspection, there are no jamb or sill flashings to the external joinery units, nor is there any flexible sealant or sealing strip between the joinery flange and the exterior face of the fibre cement sheet.

5.2 The expert took moisture readings at the exterior surfaces of the cladding using a moisture meter in capacitance mode to identify any areas where the moisture content was excessive. Using the meter in resistance mode, the expert then carried out tests to both the interior and the exterior of the perimeter walls. The internal readings ranged from 17% to 60%, averaging 22.3% over 20 locations. The external readings ranged from 21.2% to 36.6%, averaging 25.8% over 7 locations. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure.

- 5.3 The expert noted that when the section of cladding was removed adjacent to the dining room window, a considerable amount of water ran out from under the polystyrene facing and the facing was beginning to deteriorate. In addition, although there was no visual evidence of fungal growth on the framing where the interior dining room lining had been removed, the framing's 57% moisture content was high enough to initiate fungal mould and fungal growth. The expert also noted that there is damage to the eaves soffits due to water ingress.
- 5.4 Copies of the expert's report were provided to each of 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 clause 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 that:
- 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 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 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:
- Generally has 300 mm wide eaves that are only marginally effective in protecting the cladding;
 - Is in a low wind zone;
 - Is two storey, with a partial basement under;
 - Has several wall/roof intersections;
 - Has an overall envelope that is of a fairly complex shape;
 - Has two elevated decks and a two-storey high portico;
 - Has no drainage cavity where the cladding is face fixed; and
 - Has external walls that are specified to be framed up in H1 treated timber, which does not provide initial protection from decay.
- 6.8 The Authority notes that there was no reference to vertical control joints in the expert's report, although the report did note the presence of minor cracking in the exterior coating of the cladding. However, the Authority has recognised that the territorial authority specifically inspected the joints and signed them off after subsequent rectification as being in order.

Weathertightness performance

- 6.9 The Authority finds that the cladding in general does not appear to have been installed according to good trade practice or to the manufacturer's instructions. As a result, there are numerous defects as set out in the expert's report, and summarised in paragraph 5.1, that have contributed to the penetration of water.

7 CONCLUSION

- 7.1 The Authority is satisfied that the performance of the cladding system has been reduced because it has not been installed according to good trade practice and manufacturer's instructions. In addition, the Authority has identified the presence of a range of known weathertightness risk factors and the absence of design features that can reduce the risk of damage from water ingress. The presence of the risk factors on their own is not necessarily a concern. The Authority is concerned, however, when these risk factors are present in a cladding system not installed to good trade practice, and in an overall structure that does not exhibit good weathertightness design features. For the reasons set out above, therefore, the Authority is not satisfied that the cladding system as installed complies with clause E2.3.2 of the building code.
- 7.2 In the circumstances, and taking account of the expert's indicative moisture content tests and the presence of water in the exterior walls, the Authority declines to incorporate any waiver or modification of the building code in its determination.

8 WHAT IS TO BE DONE?

- 8.1 It is not for the Authority to decide how the building is to be brought to compliance with the building code (subject to any waivers or modifications granted by the territorial authority). That 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.
- 8.2 Commonsense indicates that the high moisture levels should be investigated as soon as possible. The Authority suggests that the owner commission a more extensive investigation of the cladding that involves removal of sufficient panels to allow confirmation of moisture levels and the extent of any decay.
- 8.3 The Authority also suggests that the Council and the owner together examine options that could improve the performance of the cladding. Clearly the faults in the cladding will need to be fixed to maintain the weathertightness of the building. The owner may decide to remove and reinstate some or all of the exterior cladding, and reapply for a code compliance certificate. If the owner does not wish to apply for a code compliance certificate, we would strongly recommend that the faults be remedied and that an agreed regular monitoring and maintenance program be put in place to extend the life of the building by identifying and remedying new leaks before they cause other damage. If the territorial authority issues a notice to rectify that requires the cladding to be made compliant, the owner is required to rectify any building work that has not been carried out in accordance with the building code.

9 THE AUTHORITY'S DECISION

- 9.1 In accordance with section 20 of the Building Act, the Authority hereby determines that the cladding system as installed does not comply with clause E2.3.2 of the building code and accordingly confirms the territorial authority's decision to refuse to issue the code compliance certificate.

Signed for and on behalf of the **Building Industry Authority** on 27 October 2004.

A handwritten signature in black ink, appearing to read 'J. Ryan', with a large, sweeping loop at the bottom.

John Ryan
Chief Executive