

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 43

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, acting through the builder as their agent (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 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 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 single-storey detached house situated on a very slightly sloping 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 timber framed piled floor, is of a very simple rectangular shape. The external framing is sheathed in monolithic cladding. Two close-boarded timber decks have been constructed adjacent to the entrance and the living area. The Authority notes that the decks are not as extensive as the ones shown on the consent plans. The eaves, which are continuous around the building, have 590 mm wide projections plus a gutter, which adds a further 125mm projection. There is also a freestanding detached carport, which was included in the consent documentation, and this has a storage enclosure at one end clad with plywood linings on the exterior walls.
- 2.2 The builder informed the expert engaged by the Authority that the framing to the external walls was H2 treated and that the builder had never used kiln dried [untreated] timber. No

evidence by way of specification or invoices or supplier's information has been forwarded to the Authority as to what timber was actually used in the exterior wall construction. Accordingly, the Authority takes the view that the timber in the exterior walls is not treated to a level that will significantly delay the onset of decay

- 2.3 The cladding system is what is described as monolithic cladding. As specified in its manufacturer's June 1997 data sheets ("the manufacturer's instructions") and a subsequent independent appraisal, it incorporates 40 mm thick expanded polystyrene (EPS) backing sheets fixed through the building wrap directly to the framing timbers and finished with a multi-coat, plastic mesh reinforced polymer modified cement plaster system. Incorporated in the system are a series of purpose made plastic extrusions that reinforce and waterproof the corners, edges and joinery unit surrounds. No evidence has been produced as to who applied the plaster system.

Sequence of events:

- 2.4 The territorial authority issued a building consent on 20 October 2003. The "Conditions" attached to the consent noted that the "Plaster System is to be installed in strict accordance with the manufacturer's instructions".
- 2.5 The territorial authority made various inspections during the course of construction, and passed the pre-line building inspection on 11 December 2003. The notation on the territorial authority's "Field Sheet" against this inspection states:

[Cladding System] house. Informed builder about Council policy re monolithic cladding. He said owner knows already but still wants to use cladding.

- 2.6 According to the "Field Sheet", the territorial authority did not pass the various plaster cladding inspections, nor the final inspections for the house. The grounds for failure were the lack of a cavity behind the monolithic cladding. The last of these inspections took place on 23 April 2004.
- 2.7 The territorial authority issued a Notice to Rectify, dated 25 March 2004, and the "Particulars of Convention" 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:

- 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 owner applied for a determination on 29 March 2004.

3 THE SUBMISSIONS

3.1 The owner under the “Matter of Doubt or Dispute” in their application stated:

No 20mm cavity on [Product] clad building (dwelling). Council approved without cavity and conforming with all specifications.

The owner also provided copies of:

- The building plans and the specifications (less the Carpenter and Joiner section);
- The consent documentation;
- The Notice to Rectify;
- The territorial authority’s “Field Inspection Record”; and
- The manufacturer's data sheets.

3.2 The territorial authority made a submission in the form of a letter, dated 30 August 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.

The territorial authority also attached copies of the “Field Sheets”.

3.3 The copies of the submissions and other evidence were provided to each of the parties. The territorial authority did not make any further comment. The owner in a letter to the Authority, dated 7 October 2004, stated that the territorial authority had issued a consent for the house and had carried out 9 inspections during its construction. The owner also noted that the cladding manufacturer had made amendments to its profiles over the past few years.

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.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 the house is a low-risk building and appears to have been well constructed. The cladding is well finished, there are no cracks in the cladding and there are no high-risk features. The expert cut away a section of the cladding at a window sill/jamb junction in order to check the flashings and associated framing. The expert’s report made the following specific comments on the cladding:

- There are coated metal head flashings to the exterior windows ;
- The jamb and sill pvc extrusions are correctly installed, but are constructed from smooth and not ribbed pvc, and there is no rib upstand on the sill extrusion. The expert considered that the smooth surface would not produce as good a bond as a ribbed surface;
- The electricity meter board was not sealed to the cladding; and
- The downpipe bracket fixing screws have not been sealed.

- 5.2 The expert took moisture readings throughout the house at the interior linings of the external walls using a non-intrusive meter. Readings in the “borderline” range were generally recorded at the framing around doors and windows. The expert also took 21 further readings with an intrusive meter, and only one of these was over 18 %. This was a reading of 19.1% in bedroom 1. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. However, the expert found that a freestanding, and therefore unflued, gas heater was in constant use in the fully sealed living space and this was causing a considerable amount of condensation to form on the windows. The expert was of the opinion that the operations of this heater caused high humidity, which in turn could affect the drying out of the building, and allow condensation in the framing adjoining the aluminium joinery. The condensation could also find its way from the joinery condensation channels and into the framing. The higher moisture readings could, therefore, be attributed to the heater rather than the ingress of external moisture. This was borne out by the low moisture reading of the framing where the internal lining had been cut away adjacent to a window.
- 5.3 Copies of the expert’s report were provided to each of the parties and there was no response from the territorial authority. The owner responded in letter, dated 7 October 2004, and pointed out that there was no water penetration observed during the water test undertaken by the expert. Additional ventilation is to be provided to alleviate the internal condensation. The owner also noted that the concrete shed slab was 100mm above the paving level.

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 590mm wide eaves, which run continuously round the house, and with the additional 125mm spouting extension provide excellent protection to the cladding;

- Is in a low wind zone;
- Is single storey;
- Has flashings to the heads, sills and jambs of the exterior joinery units;
- Has an overall envelope that is very simple on plan;
- Has an close-boarded deck which is attached through the cladding; and
- Has external walls that are constructed with timber, which even if it is treated, is not significantly effective in delaying the onset of decay.

Weathertightness performance

- 6.8 Generally the cladding appears to have been installed according to good trade practice and to the manufacturer's instructions. Accepting the expert's opinion as to the effects of the gas heater, the Authority considers that the cladding has been effective to date in preventing the penetration of water. There are, however, two defective areas which if not remedied, will eventually allow the ingress of moisture behind the cladding. These are:
- The lack of a sealant between the electricity meter board housing; and
 - The lack of a seal to the downpipe bracket fixing screws.
- 6.9 The Authority accepts the expert's opinion that vertical and horizontal joints are not required in the cladding.
- 6.10 Notwithstanding the fact that the backing sheets are fixed directly to the timber framing, thus inhibiting drainage and ventilation behind the cladding sheets, the Authority finds that there are compensating factors that assist the performance of the cladding in this particular case. These are:
- Generally, the cladding appears to have been installed according to good trade practice and to manufacturer's specifications;
 - The house is a very simple structure with one roof and eaves projections on all sides; and
 - There is no moisture evident that can be attributed to external ingress at this time in the external wall cavities.
- 6.11 The Authority considers that these factors adequately compensate for the lack of a drainage and ventilation cavity and can allow the house to comply with the weathertightness and durability provisions of the building code.
- 6.12 The Authority finds that when assessed against the risk matrix incorporated in the Acceptable Solution E2/AS1, this house presents a risk of weathertightness failure that is very low on all elevations. 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.
- 6.13 Finally the Authority notes that, according to the expert's report, the plywood cladding to the storage enclosure of the carport has inadequate and non-conforming ground clearances.

Moisture readings of 18.25, 22.1%, and 28.6% were recorded at both high and low levels of the cladding. While the cladding to the carport storage area is not part of this Determination, the Authority finds that adequate ground level clearances should be established for the plywood to ensure its future durability.

7 CONCLUSION

- 7.1 The Authority accepts that the expert's report establishes that the cladding complies in most respects with the manufacturer's instructions. In addition, as there is no evidence of external moisture entering the building, the Authority finds that the cladding on this particular building complies with clause E2.
- 7.2 The cladding must also comply with clause B2 on durability. B2 requires that a building continue to satisfy all the objectives of the code throughout its effective life, and that includes the requirement for the building to remain weathertight. Because the cladding faults are likely to allow the ingress of moisture in the future, this house does not achieve the durability requirements of clause B2.
- 7.3 The Authority finds that because the two faults in this cladding occur in discrete areas, it is able to conclude that rectification of the two identified faults, is likely to bring the cladding into compliance with the code. Once these faults have been satisfactorily rectified, the house should be able to remain weathertight and will, therefore, comply with clauses E2 and B2. The Authority also finds that because of the compensating factors in this case, the lack of a ventilated cavity behind the cladding is not, on its own, sufficient grounds to withhold a code compliance certificate.
- 7.4 It is essential that the two items of rectification, which are detailed specifically in paragraph 6.8, be competently carried out to ensure such compliance.
- 7.5 The Authority notes the importance of the owner's responsibility for ongoing maintenance to the cladding. The code assumes that normal maintenance necessary to ensure the durability of the cladding, is carried out and thus clause B2.3.1 of the building code requires that the cladding be subject to "normal maintenance". That term is not defined, so that 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.
- 7.6 The Authority emphasises that each determination is conducted on a case-by case basis. Accordingly, the fact that a particular cladding system has been established as being code compliant in relation to a particular building does not necessarily mean that the same cladding system will be code compliant in another situation.
- 7.7 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, the Authority determines that the house is weathertight now and, therefore, the cladding complies with clause E2. However, as there are two items to be remedied to ensure it remains weathertight and thus meet the durability requirements of the code, the Authority finds that the house does not comply with clause B2. Accordingly, it confirms the territorial authority's decision to refuse to issue the code compliance certificate.
- 8.2 The Authority finds that once the items of non-compliance that are listed in paragraph 6.8 are rectified to the approval of the territorial authority, along with any other faults that may become apparent in the course of that work, the cladding as installed will comply with the building code, notwithstanding the lack of a ventilated cavity.
- 8.3 The Authority notes the territorial authority has issued a Notice to Rectify requiring the owner to reclad the house with cladding that incorporates a drained and ventilated cavity or alternative approved system. Under the Act, a Notice to Rectify can require that the owner bring the cladding into compliance with the code, but the Authority has already found in a previous determination (2000/1) that the Notice to Rectify cannot specify how that compliance is to be achieved. The Authority considers that this Notice to Rectify should therefore be put aside. A new Notice should be issued that requires the Owner to bring the cladding into compliance with the code without specifying the features that are required to be incorporated
- 8.4 However the cladding is to be brought into compliance with the building code 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. The Authority considers that the cladding on will require on-going maintenance to ensure its continuing code compliance.

Signed for and on behalf of the **Building Industry Authority** on 14 October 2004.



John Ryan
Chief Executive