

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 25

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 a lawyer acting on behalf of the four owners 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 the extension of the kitchen and dining room of an existing house (“the extension”) 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 monolithic wall cladding as installed on the external wall areas (“the cladding”) on the extension complies with the building code (see sections 18 and 20 of the Act). By “monolithic wall cladding as installed” we mean the components of the system (such as the backing sheets, the flashings, the joints and 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 extension 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 that has been extended is a single-storey detached house that is situated on a level section that has been described by the Authority’s expert as being in a medium/high wind zone but relatively well protected from extreme weather conditions. The extension is of conventional light timber frame construction and the external walls are sheathed in a monolithic cladding. The extension is of a very simple shape. The eaves are either 400 mm or 1200 mm wide.
- 2.2 There is no verification that the framing in the external walls has been treated.
- 2.3 The cladding is known as a monolithic cladding system. It incorporates 4.5 mm thick rigid backing sheets fixed through building wrap directly to framing timbers and finished with a solid plaster coating system applied in 2 coats over a continuous mesh reinforcing, spaced off the backing sheets.

Sequence of events:

- 2.4 The territorial authority issued a building consent on 26 May 1998.
- 2.5 The territorial authority made various inspections in the course of construction. A final inspection took place on 9 March 2004 and on the “Final Inspection” sheet, the E2 External Moisture clause of the building code was noted as “F”. Under the “Additional Notes” on the sheet, it was noted:
- Exterior cladding for addition is Monolithic. The addition has been completed and is in good condition however because of the cladding system a C-C-C cannot be issued. Failed inspection.
- 2.6 The territorial authority did not issue a Notice to Rectify as required by section 43(6).
- 2.7 The owner applied for this determination on 14 April 2004.

3 THE SUBMISSIONS

- 3.1 The owner did not make a detailed submission. However, under paragraph 3 of the Form D1, the owner stated:
- (1) June 1998 – No final inspection was requested so no code of compliance certificate (sic) issued at that time.
- (2) 9 March 2004 – Requested final inspection when omission was advised on LIM – failed – see inspectors report...
- 3.2 The owner also provided copies of:
- The consent drawing;
 - Some of the consent documentation;
 - The territorial authority’s inspection sheets; and
 - A set of 3 photographs of the extension.
- 3.3 The territorial authority did not make a submission.
- 3.4 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. 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 current Acceptable Solutions that have been approved under section 49 of the Act that cover this cladding. The current Acceptable Solution, E2/AS1, allows for rigid backing sheets, but requires that they be fixed on battens to create a 20mm cavity between the sheet and the framing. The previous acceptable solution E2/AS1, which was in force when this consent was issued, allowed for mesh reinforced solid plaster to be applied over a minimum 4.5 mm thick rigid backing that is face fixed to the framing. Both versions of E2/AS1 noted the importance of properly fixing the mesh to the backing sheets to counter the considerable weight of the plaster acting as a cantilever on the fixing. The cladding is not currently 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 The Authority commissioned an independent expert (“the expert”) to inspect and report on the cladding. The expert’s report stated that the cladding is generally in a sound condition, but some moderate cracking is evident. At present there is no evidence of

exterior moisture ingress or that cladding failure is occurring. The expert also removed an area of plaster to examine the cladding at the corner of the kitchen window. The expert's report made the following specific comments on the as-built cladding details:

- There are no jamb or sill flashings installed to the windows, as is required by the relevant standard;
 - Some random cracking is evident; and
 - The base of the cladding is buried beneath the ground.
- 5.2 The expert used a moisture meter with extended electrodes applied to pilot holes drilled through the plaster and backing sheets to access the framing. The three readings taken recorded moisture contents of 14.2%, 14.4%, and 15.1% respectively. The expert also took non-invasive readings throughout the interior of the exterior walls, and no elevated readings were recorded. Moisture levels above 18% recorded after the cladding is in place generally indicate that external moisture is entering the structure.
- 5.3 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 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 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 houses 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 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 400 or 1200 mm wide eaves that adequately protect the cladding;
- Is in a medium/high wind zone;
- Is single storey;
- Has head flashings, but no sill or jamb flashings to the exterior joinery units;
- Has a very simple overall envelope;
- Has no drainage cavity where the cladding is face fixed; and
- Has external walls with timber framing that is unlikely to be treated, and therefore, would be ineffective in delaying the onset of decay.

Weathertightness performance

6.8 Apart from the defects, which are set out in paragraph 5.1, and that are likely with time to allow the ingress of moisture behind the cladding, the cladding appears to have been installed according to good trade practice and to manufacturer's instructions. It can, therefore, be considered to be reasonably effective in preventing the penetration of water. Although the overall system is not a proprietary one, it does generally follow the details in the superseded E2/AS1 for solid plaster over a rigid backing sheet. The Authority lacks any knowledge of details of the fixing method used, the size of the mesh or the details of the slip layer. However, taking into account the expert's report, the Authority accepts that the mesh and the way it has been installed, and the presence of a slip layer, are in accordance with the details in the superseded acceptable solution.

- 6.9 Notwithstanding the fact that the backing sheets are fixed directly to the timber framing, thus inhibiting ventilation behind the cladding sheets, the Authority finds that there are compensating provisions that assist the performance of the cladding. These are:
- Apart from the faults identified by the expert, the cladding generally appears to have been installed according to good trade practice and to manufacturer's specifications;
 - The building does not display to any significant extent any of the weathertightness risk factors; and
 - The moisture level readings do not indicate any undue moisture ingress behind the cladding at this time.
- 6.10 The Authority considers that the design of this house presents a low risk of weathertightness failure. The simple single storey building envelope and roof design and the presence of eaves and head flashings to the exterior joinery units are such that face fixed cladding can meet the requirements of clauses B2 and E2 without requiring a cavity.

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. 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 While the building does not show any signs of water ingress at the present time, this building will also have to comply with the durability requirements of clause B2. 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 in this building are likely to allow the ingress of moisture in the future, the building does not achieve the durability requirements of clause B2.
- 7.3 The Authority also finds that when the cladding faults have been satisfactorily rectified this house should be able to remain weathertight and will thus comply with clause B2. It is essential that all the required items of rectification, which are detailed in paragraph 5.1, be competently carried out to ensure such compliance.
- 7.4 Clause B2.3.1 of the building code requires 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.
- 7.5 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.
- 7.6 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 dictate how the defects listed in paragraph 5.1 are to be remedied and the cladding brought to compliance with the building code. 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.

9 THE AUTHORITY'S DECISION

- 9.1 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 a number of 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.
- 9.2 The Authority finds that because of the compensating factors in this case, the lack of a drained cavity behind the cladding is not, on its own, sufficient grounds to withhold a code compliance certificate.
- 9.3 The Authority, therefore, finds that once the items of non-compliance that are listed in paragraph 5.1 are rectified to the approval of the territorial authority, together with any other instances of non-compliance that become apparent in the course of rectification, the cladding as installed on the house will comply with the building code, notwithstanding the lack of a drainage cavity.
- 9.4 The Authority considers that the cladding will require on-going maintenance to ensure its continuing code compliance, and that this maintenance programme should be undertaken after consultation with the territorial authority.

Signed for and on behalf of the **Building Industry Authority** on 5 August 2004

John Ryan
Chief Executive