

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 50

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 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”), and which is applied to four isolated areas of the walls and external columns 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 of a relatively simple shape situated on a level site in a high wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house is of conventional light timber frame construction on a concrete block foundation wall. The external framing is almost entirely sheathed in textured plywood with battens at 300 mm centres. There are 4 isolated areas of monolithic cladding, including the gable wall between two roof levels, which are the subject of this determination. There is a small pitched roof over the main entrance and large gap-boarded timber deck has been constructed adjacent to the kitchen and family room. The Authority notes that the deck was not shown on the consent plans. The eaves and gables over the cladding have 300 mm wide projections, with the exception of the 1200 mm projection at the laundry area and the porch that is protected by the pitched roof.

- 2.2 The framing in the external walls has been accepted by the Authority as being constructed in untreated timber.
- 2.3 The cladding system to the 4 separate areas as previously noted, is what is described as monolithic cladding. As specified in its manufacturer's June 1996 data sheets ("the manufacturer's instructions") and a subsequent independent appraisal, it incorporates expanded polystyrene (EPS) backing sheets fixed through the building wrap directly to the framing timbers and finished with textured sponge float plaster and paint systems. The backing sheets incorporate grooves cut into the back face of the sheets to allow drainage of moisture from behind the cladding. The manufacturer's instructions include details for flashings at various junctions and require PVC flashings to the jambs and sills of exterior joinery units. The coating system used in this instance is one of those systems referred to in the independent appraisal. The Authority notes that the expert appointed by the Authority states that thickness of the polystyrene used is 40 mm, and not the 60 mm thickness shown on the consent plans and the Producer Statement provided by the cladding installer.
- 2.4 The cladding installer issued a "Producer Statement" in respect of the cladding, but for a 60 mm backing sheet, and not the 40 mm thickness that the Authority's expert confirmed as being installed.

Sequence of events

- 2.5 The territorial authority issued a building consent on 10 July 2001.
- 2.6 The territorial authority made various inspections during the course of construction, and approved the plaster cladding building inspection on 6 November 2001 preline/insulation building inspection on 16 October 2001. The territorial authority carried out a final building inspection on 24 December 2004 and subsequent to this inspection, issued an "Interim Notice to Rectify" dated 24 February 2004. This certificate had a list of 12 items requiring rectification and completion, and 2 of these related to the cladding as follows:

Ground levels to be 150 below floor level to paved areas 225 to soil or gardens; and

Producer statements [required] from Plasterer for cladding...

The territorial authority carried out a further final inspection on 26 March 2004, and noted "Monolithic cladding does not comply".

- 2.7 The territorial authority did not issue a notice to rectify as required under section 43(6) of the Act.
- 2.8 The owner applied for a determination on 28 April 2004.

3 THE SUBMISSIONS

- 3.1 The owner under the "Matter of Doubt or Dispute" in their application stated:

[Approx 36 sq mtrs of [Named] (60 mm) cladding applied by a plaster systems approved Contractor to the requirements of [the territorial authority] as at 2001. [the territorial authority] .now say that it does not comply although they had inspected and past (*sic*) it in 2001, time of installation.

- 3.2 The owner wrote to the Authority on 19 August 2004, enclosing a copy of a moisture testing report from a consultant engaged by the owner. The report covered a series of eight “ground moisture probe inspections, each in a different room of the house. The readings ranged from 3% to 8%. As to the report, the owner wrote;

The report clearly shows that the home has been tested in every room, all areas were found to be extremely low in moisture well below the acceptable levels. The areas tested in the lounge [the Authority notes that a reading of 3% was recorded here] were right behind where the cracks had been pointed out by the council, as we already knew because we removed the gip, there is no leaking there.

The 8% reading in the laundry although extremely low, was as high as this because the washing machine had overflowed the very morning of the test.

The owner also provided copies of:

- The building plans; and
- The manufacturer's data sheets.

- 3.3 The territorial authority wrote a covering letter to some attachments dated 14 June 2004 to the Authority. The letter said:

The dwelling is partially clad in an EIFS material that has been fixed directly to the framing without a drainage cavity. A final inspection was carried out on 24th February 2004.

As a result of a [Named] adjudication the [territorial authority] has doubts as to the complying nature of the monolithic cladding that has been fixed to the dwelling— in particular, compliance with Building Clause E2 – External Moisture, and B2 Durability - to the extent that it believes it should not now issue the final code compliance certificate unless it is satisfied on reasonable grounds that it should do so.

The owners however, believe the monolithic cladding does comply, and that the [territorial authority] has a duty to issue the code compliance certificate forthwith.

The Authority notes that neither the letter nor the territorial authority's inspection records make any reference to the fact that the 40 mm thick cladding as installed, varied from the 60 mm thick cladding shown on the plans.

The attachments were copies of:

- The building consent documents and correspondence;
- The territorial authority's inspection records; and
- The Interim Notice to Rectify

- 3.4 The copies of the submissions and other evidence were provided to each of the parties. Neither the owner nor the territorial authority made any further submissions in response to the submissions of the other party.

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 sub floor 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, which noted that the plaster finish appeared to be evenly applied and there is no evidence of bare/over-applied patches. The quality of the finishing and paintwork to the cladding appears sound and evenly applied with no evidence of cracking, flaking, or staining. The expert removed a small section of plaster to a bottom corner of a window to confirm the finish between the window and the cladding. The expert also stated that in accordance with the manufacturer's instructions, no control joints were required in the cladding, based on the wall dimensions of this particular house. The expert's report made the following specific comments on the cladding:

- Based on the one area inspected, the PVC sill section to the exterior joinery units did not extend 20 mm past the side of the unit facing. However, as the junction was neatly finished and adequately sealed; the expert did not consider this junction to be compromised;
- There are no stop ends to the ends of the raking window head flashings;
- The ground clearance to the front entrance porch cladding is insufficient. However, as the area was sheltered the expert did not consider the cladding to be compromised; and
- The timber deck was at a relatively high level in relation to the internal floor level, but the gaps between the timber decking offers sufficient opportunity for water to quickly drain away. In addition, the decking had been fixed to the deck framing after the cladding had been textured, providing protection from moisture ingress.

5.2 The expert took two moisture readings of the external wall cavities using an intrusive meter with extended electrodes through the cladding under joinery units. These readings were 12.3% below the kitchen window and 13.2% below the raking loft window. Moisture levels above 18% recorded after 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 and neither party made further comment on the report.

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:

- Apart from the porch and the laundry wall, has 300 mm wide eaves that provide only minimal protection to the cladding;
- Is in a high wind zone;
- Is single storey;
- Has flashings to the heads and sills of the exterior joinery units;
- Has an overall envelope that is simple on plan;
- Has an open-boarded deck which is attached through the cladding;
- Has grooves in the back face of the cladding which will facilitate drainage from behind the cladding, even though the cladding is face fixed; and
- Has external walls constructed with untreated timber, which is ineffective 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. It has been effective to date in preventing the penetration of water. There are, however, defects as set out in paragraph 5.1, which if not remedied, will eventually allow the ingress of moisture behind the cladding. The remedial requirements being:

- Provide the required 20 mm overlap to the ends of the exterior joinery sill flashings past the jambs to meet the manufacturer's requirements;
- The junctions between the plywood and monolithic cladding at either side of the entrance canopy should be sealed or flashed to prevent possible moisture ingress.
- Provide stop ends to the head flashing over the raking windows; and
- Provide sufficient clearance between the paving and the cladding at the porch area. The Authority notes that there are minimal falls to the porch slab that prevents adequate drainage away from the embedded cladding.

6.9 The Authority accepts the expert's opinion that vertical and horizontal joints are not required in the cladding. The Authority notes that the manufacturer's instructions do not require joints in walls of the dimensions that are present in this house and considers that this EIFS cladding panel size will achieve the performance required by clause E2.

6.10 The Authority notes that the expert did not make any comment on the integrity of the seal along the vertical interface between the plywood and EIFS cladding, but acknowledges that moisture readings do not indicate that any moisture ingress is evident in these areas. Furthermore, the Authority has not been presented with any information on the detail, if any, used to seal the interface. The Authority therefore accepts the current detail where the junction is shielded by deep eaves. The Authority is not satisfied however that the detail will remain weathertight where it is not shielded by the eaves on either side of the entrance structure.

- 6.11 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 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 system of grooves in the back face of the cladding will allow moisture to drain away;
 - The building demonstrates a low weathertightness risk in terms of the E2/AS1 risk matrix; and
 - There is no moisture evident at this time in the external wall cavities.
- 6.12 The Authority considers that these other factors adequately compensate for the lack of a ventilation cavity and can allow the house to comply with the weathertightness and durability provisions of the building code.
- 6.13 The Authority believes that the grooves cut into the back of the backing panels could enable moisture that has come through the external cladding to drain away. The Authority, however, has not seen any evidence to conclude that the grooves provide adequate ventilation to allow the framing to dry out in all situations.
- 6.14 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 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.

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 faults in this cladding occur in discrete areas, it is able to conclude that rectification of the 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 all the required items of rectification, which are detailed specifically in paragraph 6.8, be competently carried out to ensure such compliance.
- 7.5 The Authority believes that the grooves cut into the back of these panels should be able to drain away moisture that has come through the external cladding. However it also concludes that there is no evidence that the grooves provide adequate ventilation to allow the framing to dry out in all situations. In this determination therefore the Authority has discounted the possibility of any viable ventilation mechanism operating as a result of the grooves in the cladding.
- 7.6 The Authority finds that because the timber deck is slatted and thus allows surface water to drain away underneath, and the plaster is continuous behind the deck timbers, the fact that the deck is at relatively high level in relation to the internal floor level is not, in itself, a reason for the cladding to be non compliant.
- 7.7 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.
- 7.8 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.
- 7.9 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 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.
- 8.2 The Authority finds that once the items of non-compliance that are listed in paragraph 5.1, and qualified 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 If the territorial authority chooses to issue a Notice to Rectify, the owner is obliged to bring the house into compliance with the building code. 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.
- 8.4 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 8 November 2004.

A handwritten signature in black ink, appearing to read 'J. Ryan', with a large, stylized flourish underneath.

John Ryan
Chief Executive