

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 13

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, who was also the builder, 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, which is one unit of a two-unit development, unless changes are made to its monolithic cladding system.
- 1.2 The ground floor walls are clad with a monolithic system and the upper floor walls are either faced with a brick veneer or are clad with a monolithic system. However, the Authority’s task in this determination is to consider whether it is satisfied on reasonable grounds that only the monolithic cladding as installed (“the cladding”) on this house complies with the building code (see sections 18 and 20 of the Act). By “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 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 on a steeply sloping site that is in a medium wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. It is of conventional light timber frame construction and is of a relatively simple shape. The house is generally clad with a monolithic system apart from two sides of the garage at the upper level that have a brick veneer. The ground floor is built partly as a concrete slab and partly as a suspended timber floor supported on bored timber piles within the building and a concrete masonry wall on the perimeter. The house has an upper floor balcony that is constructed over a living space. There is a deck at the lower floor level. The building generally has 450 mm wide eaves, with the exception of a length at the upper level south elevation that has no projection.
- 2.2 The framing in the external walls is untreated timber.
- 2.3 The cladding that is being considered in this determination is known as a monolithic cladding system. As specified in its manufacturer’s July 1998 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 the 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 owner advised that the polymer modified cement based applied to this building is one of those described in the instructions. The plaster coating is finished with a three-coat acrylic paint system.

Sequence of Events:

- 2.4 The territorial authority issued a building consent on 14 May 1997. A set of “Building Consent Conditions” was issued with the consent but none of these related to the cladding.
- 2.5 Building commenced in June 1997.
- 2.6 The fibre cement panels used on the house were not those specified in the building consent. The Authority notes that there appears to be no documentation recording any approval of this change and also that the territorial authority did not raise this issue during its inspection process.
- 2.7 The territorial authority made various inspections in the course of construction, including both building pre-line and post-line inspections. A final inspection was carried out on 13 October 1999 and again on 20 November 2003.
- 2.8 In a “Building Officers Field Memorandum”, dated 20 November 2003, the territorial authority stated:

Because of the age of this dwelling and because it is monolithic cladding a complete weathertightness investigation is to be carried out by a [Nominated] advisor and a report provided to Council...

Cladding to be clear of ground by 100 mm unpaved and 50 mm paved...

The Authority has not received any confirmation that these requests were complied with.
- 2.9 The territorial authority did not issue a Notice to Rectify as required under section 43 of the Act, and refused to issue the code compliance certificate.
- 2.10 The owner applied for this determination on 8 January 2004.

3 THE SUBMISSIONS

- 3.1 On 21 January 2004, the owner wrote to the Authority setting out his building experience, a description of the cladding used on the house, the important issues he considered when installing the cladding, and expressing his concern that the territorial authority was refusing to issue a code compliance certificate. In particular, the owner stated that:

There were inspections done at the time [by the territorial authority] of construction on window flashings as has always been the standard procedure, and a senior building inspector on the 20 November 2003 looked over the greater proportion of the cladding and commented on the apparent soundness of the cladding.

the result is a waterproof house that has shown no signs of leaking in the past 6 years. If this house had problems there would be visual signs of mould and gib cracking, and structural decay of which there are none.

- 3.2 The owner also provided:
- Copies of 2 house plans;
 - A copy of a partially completed territorial authority “Inspections Record”; and
 - Copies of the manufacturer’s instructions.
- 3.3 The territorial authority did not make a submission
- 3.4 The copies of the submissions and other evidence were provided to each of the parties. Neither the applicant 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 is correct to refuse to issue a code compliance certificate because it was not satisfied that the cladding complied with clauses E2 and B2 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 The Authority commissioned an independent expert ("the expert") to inspect and report on the cladding. The expert inspected the building and provided a report that stated that the exterior finish of the cladding is of good quality and that the plaster coating and painting is of good standard except where noted otherwise. There was no cracking evident in the cladding. The expert also referred to the following faults during the inspection:

- There is no sub floor ventilation on the northern and western walls;
- There are no vertical control joints where the cladding panels are more than the specified 5.4 metre minimum width. However, the expert noted the absence of cracking and movement and that part of the cladding was only part height;
- There is no clearance where the deck adjoins the cladding;
- There is no foam tape behind the sealant to the window jambs and there are no sill flashings to the sills;
- The plaster at the edge of some external joinery units has become brittle and should be removed and replaced with sealant;
- The underside of the cladding is not painted where it adjoins the roofing and balcony decking;
- The cladding on the southern wall has not been fully painted;
- There is inadequate clearance between the mid-floor cladding band and roof flashings on the upstands between the various roof levels;
- The top surface of the balcony parapet does not slope nor does it have a capping or saddle flashings;
- The privacy screen has been nailed directly to the cladding and this should be removed and refixed using neoprene flanges and silicon sealant;
- Pipe penetrations are badly constructed and the downpipe bracket fixing screws have not been properly sealed; and
- The second level deck was specified to be waterproofed by a butynol membrane, but a fibreglass membrane of unknown specification was used.

5.2 The expert initially used a non-invasive type moisture meter applied to the internal face of the external walls to detect areas of moisture ingress. The moisture readings varied between 12.9 percent and 25 percent, with the highest levels recorded on the balcony. The expert consequently checked those areas that had recorded the highest moisture levels by drilling holes in the cladding and using an invasive moisture meter

measurement. These readings were in the range 13.8 to 14.1 percent. Invasive moisture measurements are more reliable than non-invasive measurements, and the Authority takes the invasive measurements as being indicative of timber moisture levels in this case. Moisture levels above 18 percent recorded after cladding is in place generally indicate that external moisture is entering the structure and that there is a consequent risk of decay in the structural timbers. While a moisture reading of less than 18 percent does not of itself indicate that the cladding is code compliant, it is indicative of the efficiency of the cladding in preventing moisture ingress to date.

- 5.3 However, although the moisture levels at the balcony measured by the more reliable invasive method were acceptable, the expert made a special comment on the weathertightness risks presented by the flat balustrade to the balcony.
- 5.4 The Authority is concerned that the territorial authority did not discover these faults during its inspections while the building was being constructed. In the case of this house, the inspection regime could have been better implemented. In particular, the flat top of the balustrade and the lack of any flashings to the balustrade should have been identified in the final inspection report.
- 5.5 Copies of the expert's report were provided to each of the parties. There was no response from the territorial authority but the owner made several comments regarding the report. Those which the Authority consider relevant to its decision can be summarised as being:
- Jamb flashings are not a requirement of the manufacturer's instructions and the jambs had been sealed with a [Named] sealant;
 - No in-seal tape is required to the window jamb flashings; and
 - There is a cavity formed where the cladding adjoins the brickwork and any moisture entering the cavity is dispersed by constant ventilation.

The Authority accepts that a cavity at the cladding/brickwork junction would function as described by the owner. However, while flashings are not a manufacturer's requirement, the Authority is of the opinion that external flanges should be sealed to the cladding by the use of either a backing strip or sealant placed behind the flange to protect the sealant from exposure to the sun and thus maintain its durability.

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 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 a fundamental requirement to ensure good weathertightness performance.

- 6.4 The next priority is to reduce the ability of moisture to get through the cladding by utilising design measures that minimise the effects of the rain impacting on the walls.
- 6.5 The main areas 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 incidents;
 - 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 higher 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 out from the external walls are the most frequent location for water leaks.
- 6.6 Any penetration of moisture through the cladding can then be addressed by a combination of effective drainage, ventilation of the drainage cavity and moisture tolerance in the external wall framing timber. These factors being that:
- 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 three 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:
- With the exception of one minor length which does not have any projection, has eaves projections that are 450 mm wide, which are considered as being reasonably effective in shielding the cladding;
 - Is in a medium wind zone;
 - Is constructed to two levels;
 - Has wall/roof intersections at the change of levels;
 - Has an overall envelope that is relatively simple in plan;
 - Has an upper floor balcony that is constructed over a living space;

- Has flashings over the window heads;
- Has no drainage cavity where the cladding is face fixed; and
- Has external walls constructed from untreated timber, which is not 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 manufacturer's instructions. It has proven to be effective in preventing the penetration of water to date. There are, however, defects which have the potential to allow the ingress of moisture behind the cladding. They are:
- The balcony parapet which has a flat top and no cap or saddle flashing;
 - The jambs of the exterior joinery, which have not been sealed in a manner likely to remain weathertight, nor as detailed in the manufacturers instructions;
 - The brittle plaster at the edge of joinery units;
 - The lack of paint to the southern wall cladding and to the underside of the cladding;
 - The close proximity of the decking timbers to the cladding;
 - The lack of clearance at the mid-floor cladding band and where the deck and privacy screen adjoin the building; and
 - Faulty sealing around pipe penetrations and the downpipe bracket screws.

All these defects are required to be rectified to ensure ongoing weathertightness.

- 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 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 building is seven years old and the moisture level readings do not indicate any undue moisture ingress behind the cladding at this time;
 - With the exception of the balcony the building does not display to any significant extent any of the weathertightness risk factors;
 - The building has eaves that are generally 450mm wide, which offer reasonable protection to the building; and
 - The paint finish has been well maintained.

- 6.8.1 The Authority considers that these other provisions adequately compensate for the lack of a drainage cavity and can allow the house to comply with the weathertightness and durability provisions of the building code.

7. CONCLUSION

- 7.1 The Authority accepts that the expert's report establishes that the cladding on this particular building complies in most respects with the manufacturer's instructions. At the

time of this determination there is no evidence of external moisture entering the building and the Authority therefore considers that the cladding 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 continues to satisfy all the objectives of the code throughout its intended life, which includes the requirement for the building to remain weathertight. Because the faults in the cladding are likely to allow the ingress of moisture in the future, the building will not achieve the durability requirements of B2. However, 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. The Authority believes that while a drainage cavity is advisable, it is not necessary for code compliance in this instance.
- 7.3 The Authority also finds that this building will comply with the durability requirements of B2 when the cladding faults have been satisfactorily rectified. As the exterior framing is constructed in untreated timber, it is essential that all items of rectification are competently carried out to ensure such compliance. In addition, clause B2.3.1 of the building code requires “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 such inspections and activities such as regular cleaning, re-painting, replacing sealants, and so on.
- 7.4 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.
- 7.5.1 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 exactly how the cladding is to be 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 building is weathertight now and therefore 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 of the code. 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 ventilated 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 6.8 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 this maintenance programme should be undertaken after consultation with the territorial authority.

Signed for and on behalf of the **Building Industry Authority**
on 11 June 2004

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

John Ryan
Chief Executive