

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 27

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. 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, as it is not satisfied that the cladding as installed complies with the building code.
- 1.2 The Authority’s task in this determination is to consider whether it is satisfied on reasonable grounds that the external cladding as installed (“the cladding”) on this house complies with the building code (see sections 18 and 20 of the Act). By “the cladding” 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 house itself is described in paragraphs 2.1 to 2.6 and paragraph 9 sets out the Authority’s final decision.

2 PROCEDURE

The building.

- 2.1 The building is a detached house built on a partially sloping site. The house is of conventional light timber frame construction with external walls clad in a mix of weatherboards and monolithic cladding. The garage, constructed over a concrete slab is at the western end of the building. The remainder of that level (level2) is built over timber piles or over the level 1 framing. Level 1 is constructed over a concrete floor slab. Perimeter foundation beams and internal retaining walls are constructed from concrete masonry. Entry is gained to the house at level 2 via a slatted timber deck supported off the timber frame and free standing timber piles. It is constructed in a low wind zone in terms of NZS 3604:1999. Aside from the entry deck, it has no other decks or balconies. Apart from the eastern western wall of the garage, the building has eaves that are 500mm wide. The western wall of the garage terminates in a fascia board attached to the cladding, with no eave.

- 2.2 The conditions of consent issued by the territorial authority requires external frames to be treated to an H1+ level. No evidence was presented to support the fact that timber to this level of treatment was actually used.
- 2.3 Level 2 of the house (with the exception of one wall to the garage) is clad with timber weatherboards attached directly to the framing.
- 2.4 The west wall of the garage on level 2 is clad in fibre-cement backing sheets fixed through the building wrap directly to the framing timbers. The manufacturer's July 1998 technical information manual ("the manufacturer's instructions") details flashings at various junctions (but not all of the junctions actually present in the house). The fibre-cement sheets are coated with a textured spray finish. There has been no verification of the textured finish used over the fibre cement.
- 2.5 Level 1 of the house is clad in 40 mm thick expanded polystyrene (EPS) backing sheets fixed through building wrap directly to framing timbers. The manufacturer's instructions ("the instructions") require that the sheets are finished with a three-coat fibreglass mesh reinforced lime cement plaster. The instructions also refer to the requirement that flashings are required to heads, jambs and sills to openings. There has been no verification of what sealants or plaster and paint systems were used on this house.
- 2.6 The manufacturer of the EIFS cladding has issued a materials components guarantee that guarantees the components of the system for a period of 15 years and states that the plastering was applied by a Licensed Contractor. A producer statement supplied by the plaster applicator states that the plaster system was completed to the specifications of the manufacturer.

Sequence of events:

- 2.7 The territorial authority issued a building consent on 25 February 2003. The consent was subject to "Building Consent Requirements". These included the following:

Monolithic wall cladding systems

Installation of external cladding system shall comply with the manufacturer's/supplier's specifications, and recommendations including selection of materials, components and quality of workmanship. Manufacturer/Supplier shall be consulted for any technical advice at any stage of installation. Specific details issued by the designer during construction stage shall be approved by the manufacturer/supplier.

Licensed or trained installers shall be engaged for the installation of cladding system.

Applicators shall check and ensure substrate requirements for the coating system are satisfied prior to coating application. Manufacturer's recommendations shall be strictly followed during coating application.

Timber Treatment

H1 'PLUS' DRF treated timber shall be used for external frames as specified by the warranty provisions.

The consent issued by the territorial authority also specifically asked that it be given 7 days notice of the need to inspect monolithic wall claddings.

- 2.8 A building certifier carried out all of the inspections on the house while construction was in process, with the exception of the cladding inspection.

- 2.9 The territorial authority was not asked to make a cladding inspection until after the cladding was installed.
- 2.10 The territorial authority issued a letter in February 2004 stating that they were unable to issue a code compliance certificate for the house because they had been unable to inspect the framing, wrap, flashings and jointing, and because the cladding did not have a drainage and ventilation system.
- 2.11 The owner's application for determination was received on the 5 May 2004.

3 THE SUBMISSIONS

- 3.1 The owner provided a submission, which included:
- Correspondence from the territorial authority;
 - The building consent requirements, and consent plans; and
 - A workmanship, and a materials component, guarantee and a producer statement.
- 3.2 The territorial authority forwarded the following documentation in support of its decision not to issue a code compliance certificate. This included copies of:
- The specification;
 - The Building Consent requirements, and original building consent application;
 - Correspondence with the owner;
 - The interim code compliance certificate issued by the Building Certifier subject to a cladding inspection by territorial authority; and
 - The EIFS cladding manufacturer's "Technical Data Sheets".
- 3.4 Copies of the owner's submissions and the expert's report were provided to each of the parties. Neither the applicant, nor the territorial authority, made any response to the submissions of the other 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 clause E2.3.2 of the building code (First Schedule, Building Regulations 1992) is correct. Those provisions of the building code provide:

Clause E2—EXTERNAL MOISTURE

- E2.1** The objective of this provision is to safeguard people from illness or injury, which could result from external moisture entering the building.
- E2.2** Buildings shall be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.

E2.3.2 Roofs and exterior walls shall prevent the penetration of water that could cause undue dampness, or damage to building elements.

- 4.2 There are no Acceptable Solutions that have been approved under section 49 of the Act that cover these claddings. Neither cladding has been accredited under section 59 of the Act. The Authority is therefore of the opinion that the cladding systems as installed can be considered to be an alternative solution.
- 4.3 In several previous determinations, the Authority has made the following general observations about Acceptable Solutions and alternative solutions:
- Some Acceptable Solutions cover the worst case, so that in less extreme cases they may be modified and the resulting alternative solution will still comply with the building code.
 - Usually, however, when there is non-compliance with one provision of an Acceptable Solution it will be necessary to add some other provision to compensate for that in order to comply with the building code.

5 THE EXPERT'S REPORT

- 5.1 Because the territorial authority's inspection reports did not provide sufficient information on the condition of the cladding and how it had been installed, the Authority commissioned an independent expert to inspect and report on the cladding. In the report to the Authority, the expert advised that in his view the cladding complied with the building code - with the exception of some minor ground clearance infringements. The expert's report made the following specific comments on the as built details:
- There were no control joints installed in either of the claddings. The longest panel of EIFS wall was 6100 and the longest panel of fibre cement wall was 5800 long. He did not recommend that control joints be added.
 - Clearances between the base of the cladding and natural ground (150 mm minimum) and paving (100 mm minimum) were marginally below manufacturer's recommendations.
 - The horizontal Z flashing along the EIFS / weatherboard junction should have the underside of its bottom edge sealed to the EIFS cladding.
- 5.2 The expert used a non-invasive moisture meter applied to the internal face of the external walls to detect areas of moisture ingress. No moisture was detected beneath the plasterboard surface. While a lack of moisture does not of itself confirm that the cladding is code compliant, it is indicative of the efficiency of the cladding in preventing moisture ingress to date.
- 5.3 The expert noted that head and sill flashings were evident in all locations. An exploratory cut out at one window sill indicated that the PVC jamb flashing was in place.
- 5.4 The horizontal junction between the EIFS cladding and the timber weatherboards was covered by a purpose designed Z flashing. The details of the flashing were approved by the territorial authority. The expert's photographs confirmed that the flashing had not been installed according to the detail in that the outside flange turned up away from the cladding,

instead of turning down towards the cladding. The expert also noted that the flashing extended up behind the weatherboards as designed.

- 5.5 Copies of the expert's report were provided to each of the parties. Neither party commented 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 to determining whether building work complies with clause E2 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 Some important matters to consider 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 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. Desirable characteristics of a wall system are 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 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 no wall/roof intersections and has an overall envelope that is simple in shape;
- Is constructed to two levels;
- Has eaves of generally 500 mm wide;
- Does not involve any decks or balconies;
- Has face-fixed cladding with no drainage cavity;
- Has external frames that were specified to have a treatment level of H1+, which will delay the onset of decay; and
- Is in a low wind zone.

Weathertightness performance

6.8 The cladding appears to have been installed according to good trade practice and to manufacturer's instructions. It can, therefore, be considered to be effective in preventing the penetration of water.

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:

- The cladding generally appears to have been installed according to good trade practice and to manufacturer's specifications;
- The building has a simple shape and does not display to any significant extent any of the weathertightness risk factors. Furthermore the EIFS and fibre cement claddings have been used in simple applications over one level only with no complicating wall roof junctions; and

- The moisture level readings do not indicate any undue moisture ingress behind the cladding at this time.
- 6.10 The Authority therefore considers that the design of this house presents a low risk of weathertightness failure. The simple building envelope and roof design, the presence of eaves and correctly installed window and door flashings provide confidence that the face fixed cladding can meet the requirements of clauses B2 and E2 without requiring a cavity.
- 6.11 The Authority notes the Expert's view that the Z flashing should be sealed on its underside against the EIFS cladding. The Authority disagrees with that view because of the risk of capillary action behind the flashing if the sealant fails. It notes that the original detail, with its inward turning bottom flange was approved by the territorial authority. However it considers that the operation of the flashing is not impaired by the use of the drip edge in lieu of the inward return shown on the approved detail. It therefore finds that the existing Z flashing detail is compliant with E2.
- 6.12 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.
- 6.13 The Authority considers that no control joint is required in any EIFS walls on this house because the maximum EIFS panel size is 6100. It also considers that a control joint is not required on the fibre cement western wall of the garage even though the panel size of 5800 exceeds by 400 the manufacturer's requirement for control joints in fibre cement walls at 5400 centres. The fibre cement wall is a simple rectangular panel built over a concrete slab foundation that will reduce foundation movement. For these reasons the Authority considers that a panel size of 5800 is not, in itself, a reason for non compliance with clause B2.
- 6.14 The Authority notes the requirement included in the territorial authority's subdivision approval that the western wall of the garage shall be fire rated. The Authority has made no comment on whether the fibre cement wall as built meets this requirement because the matter lies outside the scope of this determination.

CONCLUSION

- 7.1 The Authority accepts that the expert's report establishes that:
- The cladding is well installed and has no apparent flaws;
 - The framing is dry; and
 - There is no evidence of external moisture entering the building.

Accordingly, the Authority finds that the cladding on this particular building complies with clause E2.

- 7.2 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.

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.
- 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. Accordingly, it reverses the territorial authority's decision to refuse to issue the code compliance certificate.
- 9.3 While the Authority has found the cladding to be code compliant, it considers that the cladding will require on-going maintenance to ensure future compliance.

Signed for and on behalf of the **Building Industry Authority** on this 16th day of August 2004.

John Ryan
Chief Executive