

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 54

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 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 wall cladding as installed (“the cladding”) on this house complies with the building code (see sections 18 and 20 of the Act). By “external 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 house itself 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 three bedroom detached house arranged on two levels situated on a sloping site in a high wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The building is of conventional light timber frame construction and is of a moderately complex shape with some intersection of roof planes with walls and with other roof planes. The lower floor is built on a concrete slab foundation while the upper floor is supported by a standard light timber frame system. There are two open tiled decks on the upper level, one of which is constructed over the kitchen, while the other is not built over habitable space. The latter deck is supported on an extended upper level joist and post system at its outer edges. The roof is clad with preformed metal tiles. There are no eaves and the various gable ends are flush finished.
- 2.2 The designer’s specification required the use of timber complying with NZS 3602 1975 although at the time the specification was written that Standard had been superseded by a

subsequent Standard (NZS 3602 1996). The latter, but not the former, Standard permitted the use of kiln-dried timber framing under certain conditions. The specification is thus unclear as to what was intended.

- 2.3 The cladding system is known as a monolithic cladding system. 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 both the joint and coating systems are proprietary to 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.
- 2.4 The owner had recently replaced the cladding on the upper levels of the 2 gable ends because of the presence of surface cracking. At this time the entire building was recoated with another textured finish. The repairs were not carried out by the original cladding installer.

Sequence of events

- 2.5 The territorial authority issued a building consent on July 1999 and the construction work was completed late in 1999, although a code compliance certificate was not sought at that time.
- 2.6 The territorial authority made various inspections in the course of construction. No details of the inspection reports have been submitted, but a record of inspections carried out is attached to the submitted drawings. That record shows a "pre-line" inspection took place on 3rd November and a "post-line" inspection on 16th November 1999. A note alongside the "post-line" record appears to read "minor nail off to complete".
- 2.7 After the house was completed it was rented out while the owners were overseas.
- 2.8 On their return the owners noted some surface cracking and engaged a contractor to re-clad two gables. At about that time the owners applied to the territorial authority for a code compliance certificate (CCC) to be issued.
- 2.9 The Authority has no information on whether the recladding work was carried out under the original consent or whether a new consent was sought. Either way, there is no evidence that the recladding work was inspected by the territorial authority.
- 2.10 In a letter dated 23 April 2004 the territorial authority acknowledged the owner's request for a code compliance certificate (CCC) to be issued, and also said:

We have received your request for a code compliance certificate (CCC) for a dwelling at the above address.

Before the council can issue a code compliance certificate, we must ensure that all building work meets the NZ Building Code requirements. In particular, the building code specifies that building work must remain durable for given periods of time after the code compliance certificate is issued.

You will be aware of the current weathertightness issues often reported in the media. These issues have highlighted the care that must be taken to establish that all building elements, but particularly cladding, is durable before any CCC can be issued.

As your building is face fixed (monolithic) construction with no cavities the Council are unable to issue a code compliance certificate for the dwelling because we are unable to verify that it fully complies with the Building Code requirements, manufacturer's details application at the time and that it will remain durable for the required period. Visual inspection by the council has revealed the following-

- 1) Timber treatment unknown
- 2) High wind zone
- 3) Control joints unable to be substantiated
- 4) No pre-plaster inspections
- 5) Evidence of repairs being carried out

There has been recent information and knowledge that face sealed cladding systems without an adequate drainage and ventilation cavity will cause irrevocable damage to structural elements in the event of leakage and/or the effect of residual moisture.

Council cannot be satisfied that the cladding system as installed on the above building will meet the functional requirements of Clause E2 External Moisture of the New Zealand Building Code.

If you still wish to seek a code compliance certificate, you may request a determination from the Building Industry Authority as per section 17 Of the Building Act 1991.

2.11 The owner applied for this determination on 25th May 2004.

2.12 The territorial authority did not issue a final notice to rectify as required under section 42 of the Act, despite being asked for one by the owner.

3 THE SUBMISSIONS

3.1 In support of their application the owner supplied the following:

- Copies of correspondence from the territorial authority;
- A copy of the building consent;
- Copies of the producer statements from the distributors of the original cladding sheets and the installer of the replaced cladding;
- Statements from the builder (who installed the cladding but not the textured coating) and the architect;
- A report on the building carried out for the owner by an independent property inspector, and
- Copies of manufacturers installation instructions for both the fibre-cement products used in the building.

- 3.2 The territorial authority submitted copies of the drawings and specifications for the building. The drawings were marked up with a list of territorial authority inspections carried out on the building during construction.
- 3.3 The written statement from the building contractor says the exterior framing used was “boric gauged” and that all interior framing was “No 1 H1 KD”. The territorial authority submission provides no evidence of treatment levels.
- 3.4 The producer statement dated 16 June 2004 from the distributors of the original cladding sheets certifies that the product was installed in accordance with the manufacturer’s installation details and will meet the requirements of building code clauses B2 and E2.
- 3.5 The installer of the replacement cladding to the gables provided a producer statement dated 19th April 2004. It related to the replacement of the original cladding sheets to the upper level of the two gables, the installation of a horizontal control joint using a proprietary plastic flashing across those 2 gables and the recoating of all the cladding (both existing and new). This statement says, “New sheet was installed in accordance with printed (brand name) Literature”. The brand name referred to is different from the brand name of the original cladding. The statement says the original sheets were removed “due to incorrect initial installation”.
- 3.6 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 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 on the grounds that 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 current Acceptable Solutions that have been approved under section 49 of the Act that cover this cladding. 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 Because of the absence of any detailed inspection reports from the territorial authority, the Authority commissioned an independent expert ("the expert") to inspect and report on the cladding.
- 5.2 The expert said the cladding coating was in very good condition having recently been redone. He noted that metal head flashings had been installed over all units and that they were well sealed at their ends. He removed a small part of the textured coating and confirmed the presence of sealant behind the flanges of the window jambs. He did not detect any sealant under the sill flange of the window joinery. He also noted that deflection flashings had been fitted over some of the opening sashes to deal with heavy volumes of water running down exposed walls that were not protected by eaves.
- 5.3 The expert did not identify any vertical control joints. However he noted that the new texture coating to the cladding was in good condition and that there were no cracks in the coating. He cut away a section of the decorative polystyrene interstorey strip to check for a horizontal control joint. When he removed the strip he noted that water ran out from under the strip and he attributed this to the fact that the strip was sealed along its bottom edge and thus water which entered the gap was not able to exit. The expert's check of the inter-storey joint indicated that it was a simple plastered butt joint rather than the specified control joint formed with a Z flashing. He did note however that the cladding revealed no movement and that he felt that the absence of a horizontal control joint had not, to date, compromised compliance with clauses E2 and B2 of the building code.
- 5.4 The expert reported his conversation with the contractor who had replaced cladding sheets and installed polystyrene trim around the windows on the upper gables. The expert said the contractor reported that he found no high moisture readings in the cladding exposed by the replacement work. The contractor attributed the cracks in the cladding he removed to poor sheet layout which caused joints to be located near window openings. The contractor said he had installed the correct horizontal control joints, noting that such joints had not been installed in the original cladding.
- 5.5 The expert listed the following defects in the cladding:
- The cladding to the tops of the 3 columns and the beams constructed over the 2nd level deck over the kitchen are flat topped and appear to be admitting moisture. He also noted that there was no sign of any saddle flashings between these flat tops and the cladding.
 - Water was ponding on the tiles of this deck, and he noted that it had not been constructed with the appropriate falls.

- Although the tiles on the deck had been laid over a waterproofing membrane and the membrane was turned up under the fibre cement walls, the tile grout had moved into the gap and there was thus no capillary break between the back of the fibre cement and the membrane along the walls and the columns.
- The meter box is not sealed effectively.
- A polystyrene fascia covering to a horizontal joint in the cladding was trapping water and preventing ongoing maintenance inspections to ensure the horizontal joint remained weathertight. Furthermore the butt joint found behind the fascia is not a horizontal control joint and will not operate like one.
- There are no vertical control joints evident in the cladding.
- There are fixing penetrations through the top of the plastered beams supporting the pergola.
- Service penetrations in the bottom plate area of the rear wall are protected with sealant only.
- Ground levels in some areas are too close to the bottom edge of the cladding and drainage improvements are required to the area of the garage and entrance areas.

5.6 The expert used a non-invasive capacitance type meter to identify potential wet areas, and then tested those high moisture areas with a resistance type meter using holes drilled into the frame from the outside. The expert took 29 readings, 23 of which were above 18%, with readings as high as 40%. The highest readings were found in:

- The bottom plates where moisture was entering through the base of the cladding, generally attributable to the lack of a recommended 6mm capillary gap between the cladding and the concrete foundation.
- The tops of the beams and columns supporting the deck over the kitchen, where moisture was entering because of inadequate sealing to the flat tops of the beams and columns,
- The base of the columns on the deck, where moisture was entering through the inadequate seal between the tiled deck and the fibre cement column.
- Boundary joists to the rear deck, where the moisture levels may be due to the penetration of the deck membrane by the fixings for the corner block support to the screen.

Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure.

5.7 Copies of the expert's report were provided to each of the parties. The owner responded with a commentary on various aspects of the report and proposed remedial work that would, in his view, address the deficiencies identified in the expert's report. The territorial authority made no 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 clause 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 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 no effective eaves to either level;
- Is in a high Wind zone;
- Is constructed to 2 storeys;
- Has a moderately complex envelope shape, with roof/wall intersections;
- Has one deck constructed over a living area and one other deck not constructed over a living area.
- Has no drainage cavity where the cladding is face fixed; and
- Has external framing treated to the H1.2 level that was certified by the builder.

Weathertightness performance

6.8 The Authority finds that the cladding has not been installed according to good trade practice and to manufacturer's instructions. There is evidence of moisture in the exterior cladding now, and there are also significant cladding defects that will, with time, allow the ingress of further moisture behind the cladding. These include:

- The base of the cladding has inadequate ground clearance or capillary gap outside the concrete perimeter beam and above the tiles on the 1st floor deck;
- The horizontal joint as installed in the original cladding will not function effectively if the joint starts to move;
- There is no vertical joint in the long north facing ground floor wall which is at risk of cracking because of the shallow panels spanning over the 2 sets of large French doors, nor in the east facing 2 storied wall;
- The beams and columns supporting the deck have flat tops with no saddle flashings, and
- The deck itself is constructed with inadequate falls.

- 6.9 The Authority considers that the design of this house presents a moderate to high risk of weathertightness failure. The Authority thus finds that this house has insufficient compensatory provisions that could offset the lack of a drained and ventilated cavity.
- 6.10 The Authority finds that the recent repairs to the cladding appear to have been carried out to good trade practice and in accord with the manufacturers specifications. However it also finds that the recladding work should have been inspected by the territorial authority.

7 CONCLUSION

- 7.1 The Authority is satisfied that the performance of the cladding system has been reduced because it has not been installed according to good trade practice and manufacturer's instructions. In particular, it demonstrates the key defects listed in para 6.8. The Authority has also identified the presence of a range of known weathertightness risk factors. The presence of the risk factors on their own is not necessarily a concern. The Authority finds however that a significant number of these risk factors are present in this house, and the cladding system itself has significant faults. The structure does not therefore have sufficient provisions that would compensate for the lack of a drained and ventilated cavity. For the reasons set out above, therefore, the Authority is not satisfied that the cladding system as installed complies with clause E2.3.2 of the building code.
- 7.2 The Authority finds that because of the potential complexity of the faults that have been identified with this cladding, it is unable to conclude that targeted rectification would result in compliance with clause E2.
- 7.3 In the circumstances, the Authority declines to incorporate any waiver or modification of the building code in its determination.
- 7.4 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.

8. WHAT IS TO BE DONE?

- 8.1 It is not for the Authority to decide how the building is to be brought to compliance with the building code (subject to any waivers or modifications granted by the territorial authority). 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.

- 8.2 Commonsense dictates that the high moisture levels should be addressed as soon as possible. The Authority suggests that the owner commission a more extensive investigation of the cladding that involves removal of sufficient panels to allow confirmation of moisture levels and the identification of any decay if it is present.
- 8.3 The Authority also suggests that the Council and the owner together examine options that could improve the performance of the cladding. Clearly the faults in the cladding will need to be fixed to maintain the weathertightness of the building. The owner may decide to remove and reinstate some or all of the exterior cladding, and reapply for a code compliance certificate. If the owner does not wish to apply for a code compliance certificate, we would strongly recommend that the faults be remedied and that a regular monitoring and maintenance program be put in place to extend the life of the building by identifying and remedying new leaks before they cause other damage. If the territorial authority issues a notice to rectify that requires the cladding to be made compliant, the owner is required to rectify any building work that has not been carried out in accordance with the building code. Clause 8.1 outlines how that process would work.

9 THE AUTHORITY'S DECISION

- 9.1 In accordance with section 20 of the Building Act, the Authority hereby determines that the cladding system as installed does not comply with clause E2.3.2 of the building code and accordingly confirms the territorial authority's decision to refuse to issue the code compliance certificate.

Signed for and on behalf of the **Building Industry Authority** on 15 November 2004.



John Ryan
Chief Executive