

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 39

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 originally were the two owners of the property, however the new owner who purchased the property from them has continued the determination. The term “owner”, which has been used throughout this Determination refers to the person who was the owner at the time any correspondence was entered into. The other party is the territorial authority and the original owners are named as an “interested party” subsequent to their disposing of the property. The application arises from the refusal by the territorial authority to issue a code compliance certificate for a nearly 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”), which is applied to the walls of 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 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 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 two-storey detached house offset in the centre to form four separate levels. It is situated on a steeply sloping and partly excavated site, which is in a medium wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house is of conventional light timber frame construction, built partly on a concrete block foundation wall, and partly on a timber framed floor supported on braced poles and beams. The external walls are sheathed entirely in a monolithic cladding. The house is of a relatively complex shape, with two bowed main roof areas, sheathed in corrugated steel that is supported off curved laminated timber roof beams, and a flat membrane lined link roof. There are radiused roof/cladding junctions where the lower level roof abuts the link wall.

The house has one large timber framed and gap-boarded semi-circular shaped deck at the upper level, with the deck soffit a maximum of 6500 mm above ground level and it is finished with a glazed metal balustrade. The deck is fixed directly to the cladding and is also supported on beams and poles. A smaller cantilevered timber framed and boarded deck and access stair is constructed at a lower level beneath the main deck. The stair and deck both have a balustrade formed from timber balusters and handrails. A further cantilevered timber framed balcony and adjoining canopy is situated at an upper level. The balcony and canopy have a membrane lining, which is covered with tiles at the deck area. The balcony has a metal and glazed face balustrade with two timber framed end walls, which have their sides and the flat top faced with monolithic cladding. The main entry area has a timber framed close-boarded deck at the main entry. There is a faceted bay window projecting from the upper level of the east elevation wall. There are no eaves projections and the gables have 400 wide projections, which are unlined, being formed by the exposed soffit of the curved roofing.

- 2.2 The Authority notes that the specification calls for H1 treatment for the external wall framing, but it is not clear if this was LOSP or Boric treated. The Authority has not received any evidence, by means of invoices or other documentation, on what timber was purchased for the house construction.
- 2.3 The cladding system is what is described as monolithic cladding. 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 other manufacturers. The manufacturer's instructions identify the joint and coating systems by reference to an independent appraisal but give no other information about them. Neither the painting nor the textured coating was one of those nominated.
- 2.4 The owner provided a producer statement, dated 30 April 2001, for the paint and plaster products used on the house, which also included a warranty for a period of 10 years.

Sequence of events:

- 2.5 The territorial authority issued a building consent on 31 July 2000, based on a certificate provided by a building certifier dated 14 July 2000. None of the "Consent Requirements" attached to the consent referred to the cladding.
- 2.6 The building certifier made various inspections during the course of construction, and on 5 December 2001, carried out a final inspection that failed the building due to certain items requiring attention. As regards the cladding, the relevant items were:

Seal around all service pipes through the [cladding]

Repair all bubbling in [cladding] paint systems.

In a letter to the territorial authority dated 1 July 2002, the building certifier informed the territorial authority that it was withdrawing from the project, because insufficient progress on the house had occurred over the previous 12

months, and was handing back the files to them. The building certifier listed the items needing attention and noted that there was still some documentation to be received.

- 2.7 On 12 July 2002, the territorial authority wrote to the owner stating that it had been informed by the building certifier that progress on the house on the house was too slow and did not meet the requirements of the Building Act. The territorial authority asked the owner what were their intentions in this respect, and also required a time frame from the owner. The territorial authority pointed out that failure to comply with the requests could result in the building consent lapsing. On 17 August 2003, the owner requested in writing that the territorial authority arrange to inspect the house.
- 2.8 Following a final site inspection, the territorial authority issued a “Building Officers Field Memorandum” dated 5 September 2003. Included in the items that were found to contravene the building code, were:

Cladding by garage floor is too close to ground to comply with manufacturer's specifications

Provide details of how roofing is sealed under soffit

The owner provided a drawing showing how the fascia was finished and photographs showing the installation of the building wrap. The territorial authority inspected the house on 3 March 2004 and noted on 19 April 2004, that the house was “high risk for Council due to design, construction method inspected by Certifier etc etc.”.

- 2.9 On 21 April 2004, the territorial authority wrote to the owner pointing out that the territorial authority had to ensure that all building work meets the building code requirements. The letter stated:

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 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. Council also have concerns over the following issues:

- 1) No warranty for the installed cladding system
- 2) House in medium wind zone
- 3) Timber treatment of external wall frames unknown
- 4) Extent of control joints unknown
- 5) Minimal eaves and gables
- 6) No record of specific wrap, flashing and fixing inspections

7) Has been repaired and painted recently

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 and is therefore unable to issue a code compliance certificate.

2.10 The territorial authority did not issue a notice to rectify as required under section 43(6) of the Act.

2.11 The owner applied for a determination on 19 May 2004.

3 THE SUBMISSIONS

3.1 In a covering letter submitted with the application for a determination, dated 22 May 2004, the owner noted that while carrying out interior painting, refitting window coverings, and opening a wall to accommodate a large window, there was no evidence of water ingress, moisture, mould, staining damp or other indications that the wall cavities allowed the ingress of water.

3.2 The owner also provided copies of:

- The drawings and specifications;
- Some building consent documentation;
- The correspondence with the territorial authority;
- The correspondence with the building certifier;
- The inspection sheets;
- The detail showing the fascia sealing;
- The photographs showing the building wrap;
- The producer statements; and
- A letter dated 28 May 2004, from a builder who had installed a new window in the house, who confirmed that there was no sign of water entry in the area of the house where the alteration had been carried out.

3.3 The owner also supplied a copy of a report, relating to an inspection of the house by a consultant engaged by the owner, which had taken place on 22 August 2003. The consultant found the wall cladding and the exterior joinery units to be “generally good”. The consultant summarised the house as appearing to be “in a generally sound condition with the use of low maintenance materials noted in its exterior construction”. The report covered all the interior and exterior areas of the building but no moisture or invasive testing appeared to have been undertaken. The Authority notes that this report does not

consider many of the issues raised by the expert engaged by the Authority and which are referred to in paragraph 5.1.

- 3.4 The territorial under a covering letter to the Authority, dated 13 July 2004, provided copies of:
- The building consent documentation;
 - The plans and specifications;
 - The territorial authority's inspection reports and memoranda;
 - The correspondence with the owner and building certifier;
 - The inspection reports;
 - The detail showing the fascia sealing; and
 - The producer statements.
- 3.5 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 B2.3.1 and E2.3.2 of the building code (First Schedule, Building Regulations 1992) is correct. Those provisions of the building code provide:

Clause B2 DURABILITY

B2.3.1

Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building, if stated, or:

- (a) The life of the building, being not less than 50 years, if:
- (i) Those building elements (including floors, walls, and fixings) provide structural stability to the building, or
 - (ii) Those building elements are difficult to access or replace, or
 - (iii) Failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.
- (b) 15 years if:
- (i) Those building elements (including the building envelope, exposed plumbing in the 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. The expert also took moisture readings through holes drilled through the exterior cladding at 22 locations. At 17 locations readings of 18% and above were recorded, up to a maximum of 33%. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. The significant readings are included with the following expert’s specific comments on the cladding:

- The exterior joinery units had metal head flashings;
- Blistering of the textured coating is evident at several locations, although there was currently no evidence of the presence of moisture behind those closely examined;
- Minor cracking is visible in the cladding at various locations and there is evidence that remedial textured coating has been applied at some joints. There is also cracking at the corner moulds of the cladding;
- There was evidence of moisture ingress at the horizontal inter-storey control joint as indicated by readings of 29.3%, 30.0 % and 33.0% taken below the joint at various

locations. There was also an indication of high moisture levels above the joint adjacent to the joinery unit sills;

- There is no evidence that vertical control joints have been installed. The expert noted that the manufacturer's instructions require joints at 5400 mm centres. The Authority notes that one east wall is 6400 mm long, and the north wall is 12000 mm long;
- The expert would not determine whether the facings of the exterior joinery units had been correctly sealed as required by the manufacturer's instructions. Three moisture readings of 23.0%, 24% and 30.0% adjacent to some units indicated an installation failure;
- The ribbon plate securing the large high-level deck to the north elevation was fixed directly to the cladding, prior to the sealing and painting of the cladding. The bolt fixings had not been sealed and no flashing had been installed. The moisture readings taken at two areas immediately below the plate were 23% and 24.5%, and at three points immediately above the deck the readings were 27%, 29% and 30 %;
- The lack of a soffit lining to the curved gables allows condensation to form on the underside of the roofing steel and this could track into the top of the external wall;
- The faceted window on the east elevation is a difficult detail to weatherproof;
- The northern part of the house, to which the main high-level deck is attached, is very elevated and this will be particularly susceptible to flexing in high winds;
- The expert also noted that the cladding manufacturer recommended the use of this cladding in a pole house of this type only if the poles, as they do in this case, terminate at the ground floor diaphragm;
- The high-level deck off the master bedroom has the following faults:
 - a) The joint between the timber framed balustrade and the main wall cladding is not properly flashed or waterproofed,
 - b) The bottom edge of the balustrade cladding is in contact with the deck tiles;
 - c) The plastered top of the parapet wall is flat, has no flashing or impervious membrane protection;
 - d) The glazed balustrade fixings allow for water penetration and the presence of a "fruiting body" at one fixing point is indicative of severe decay in the adjoining framing;
 - e) Moisture readings of 23.5% and 28.0% were recorded at the main wall area adjoining both timber-framed balustrades. The expert was of the opinion that there was severe water entry into the balustrade and some of this may have extended into the cantilevered deck joists.

5.2 The expert also inspected the pipe penetrations, which had been of concern to the building certifier and was of the opinion that they were adequately sealed.

5.3 Copies of the expert's report were provided to each of the parties. The owner responded by letter on 14 September 2004, noting statements in the report that the owner considered

were not supported by test data or additional information. The Authority has considered these observations in its deliberations.

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 buildings 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:

- Has verges with no eaves projections on 2 sides of the house and curved gable ends that have 400 wide projections with soffits which are unlined. Because the underside of the roof cladding is fully exposed, condensation is unlikely to form. The Authority also notes the detail provided by the owner shows a sealed joint at the junction of the curved corrugated roofing and the wall fascia;
- Is in a medium wind zone;
- Has two stories; but is further elevated at the northern elevation and, because of the pole construction, would be more liable to lateral movement;
- Has exterior joinery units with head flashings, but there is uncertainty as to whether the jambs and sills are adequately sealed because there is moisture evident in the framing underneath these windows;
- Has curved wall/roof intersections;
- Has an overall envelope that is relatively complex on plan, with two curved main roofs and a membrane clad flat link roof;
- Has a faceted bay window at the upper level;
- Has one large deck and one cantilevered balcony at the upper level, a cantilevered deck and associated stairs at an intermediate level, and a timber framed entry deck. Neither the decks nor the balcony are constructed over a living space;
- Has no drainage cavity where the cladding is face fixed; and
- Has external walls constructed with H1 LOSP treated timber, which would not be effective in preventing the onset of decay.

Weathertightness performance

- 6.8 The Authority finds that the cladding in general does not appear to have been installed according to good trade practice and to the manufacturer's instructions. As a result, there are a number of identified defects, which are set out in paragraph 5.1 and in the expert's report, which have contributed to the penetration of the moisture already evident in many areas.
- 6.9 The Authority considers that, as the faults apparent in the cladding are so manifest, it cannot accept that the cladding complies with the relevant requirements of the building code. The major areas of concern are:
- The blistering and cracking apparent in the cladding;
 - The possible failure of the main horizontal control joint;
 - The lack of vertical control joints;
 - The efficiency of the sealing to the jambs and sills of the exterior joinery units;
 - The main high-level deck, which is 6 metres above the ground, is inappropriately connected through the cladding and lacks a flashing at this junction. This deck is hard up against the cladding, and although the deck boarding is gapped, which will facilitate drainage at this point, the moisture is entering the framing at deck level through the joist junction and connections;
 - The timber-framed balustrade to the balcony off the master bedroom is inappropriately connected to the main cladding, its cladding is in contact with the deck tiles, and the capping has potential weatherproofing problems;
 - The glazed balustrade fixings to the above balcony are points of water penetration; and
 - Although the poles terminate at the floor level of the house and are fully braced, this structure will be subject to increased lateral movement, which, in turn, will make it harder for this fibre cement cladding to perform adequately.
- 6.10 The Authority notes that one elevation of this building demonstrates a high weathertightness risk rating and the other 3 demonstrate a moderate risk rating when calculated by the E2/AS1 risk matrix. The matrix is an assessment tool 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.
- 6.11 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 the cladding to be subject to "normal maintenance". That term is not defined, so 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, repainting, replacing sealants, and so on.
- 6.12 The Authority is also concerned that the ingress of water adjacent to the decks and balconies, which are constructed at significant height above ground level, could seriously

affect their structural stability. Accordingly, the Authority emphasises that all aspects of the deck and balcony construction must be checked to ensure its continuing structural integrity and the safety of persons using them.

7 CONCLUSION

- 7.1 The Authority is satisfied that the performance of the cladding has been reduced because it has not been installed according to good trade practice. In particular, it demonstrates the key defects listed in paragraph 6.9. The Authority has also identified the presence of a range of known weathertightness risk factors in this design. The presence of the risk factors on their own is not necessarily a concern, but they have to be considered in combination with the significant faults identified in the cladding system. It is that combination of risk factors and faults that indicate that the structure does not have sufficient provisions that would compensate for the lack of a drained and ventilated cavity. Consequently, 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 apparent complexity of the faults that have been identified with this cladding, it is unable to conclude, with the information available to it, that remediation of the identified faults, as opposed to partial or full recladding, could result in compliance with clause E2.
- 7.3 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.
- 7.4 Finally, the Authority expresses its concern that the inspections by the building certifier did not identify the numerous faults in the cladding system, which were subsequently raised by the expert. The Authority emphasises that it is paramount that all such inspections be carried out in a proficient manner, so that any faults can be identified and subsequently rectified at an early stage in the construction or life of a building.
- 7.5 In the circumstances, 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 1991 the Authority hereby determines that the cladding system as installed does not comply with clause E2.3.1 of the building code and accordingly confirms the decision of the territorial authority decision to refuse to issue a code compliance certificate.
- 8.2 The Authority notes the territorial authority has issued a Notice to Rectify requiring the owner to re-clad the house with cladding that incorporates a drained and ventilated cavity. Under the Act, a Notice to Rectify can require that the owner bring the cladding into compliance with the code, but the Authority has already found in a previous determination

(2000/1) that the Notice to Rectify cannot specify how that compliance is to be achieved. The Authority considers that this Notice to Rectify should therefore be put aside. A new Notice should be issued that requires the Owner to bring the cladding into compliance with the code without specifying the features that are required to be incorporated.

- 8.3 How the cladding is to be brought to compliance with the building code 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 the building will require on-going maintenance to ensure its continuing code compliance, and that this maintenance programme should be undertaken after consultation with the territorial authority. This is particularly important, as the cladding has now been in place for some 9 years or so.
- 8.5 The Authority has in the past issued a public warning about the danger to people caused by moisture-induced timber decay in deck and balcony construction. The Authority reiterates its concerns about the structural integrity and safety aspects of the large deck in this house and emphasises the need for a full investigation of its current state, proper rectification and ongoing inspection and maintenance. Accordingly, the Authority suggests that the deck be checked by the territorial authority for compliance with all the relevant clauses of the building code and that the territorial authority takes all necessary steps to address in terms of the Act and the building code, the issues arising from any non-compliant building work.

Signed for and on behalf of the **Building Industry Authority** on 28 September 2004.



John Ryan
Chief Executive