

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 15

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 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 part two, part three storey detached house on an open site with a basement garage, which is set down below the level of the main ground floor. Based on the observations of the expert commissioned by the Authority, it is in a very high wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house is of conventional light timber frame construction faced with monolithic cladding constructed on a concrete block foundation wall, which extends 700 mm above ground floor level. It is of a relatively complex shape with a curved fascia at roof level along one side of the house. The house has one large ground floor balcony, which is constructed over the garage space and a first floor balcony constructed over the stairwell. Each balcony has a butyl waterproofing membrane overlaid with ceramic tiles. A large pergola is attached to one elevation with a deck constructed under it, and there is also a butyl covered canopy roof over the doors to the large balcony. There are wall/roof intersections where the base of the cladding adjoins the roofs at various levels. The majority of the roof drains to a central butyl lined roof gutter, and the building has small flashed parapet upstands to all roof perimeters. There are

no eaves projections, except to one part elevation, which has a 350 mm wide projection, and one long elevation where the projection varies from 0 to 1200 mm in width.

- 2.2 The owner states that the framing in external walls is H1+, LOSP treated timber. However, the Authority has been unable to verify this claim.
- 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 those other manufacturers and their system brands but give no other information about them. Both the jointing system and the coating system are one of those systems referred to in the manufacturer's instructions. The coating in this instance is a trowelled two-coat sponge finished polymer-modified cement based plaster followed by 2 coats of 100% acrylic paint.
- 2.4 The coating manufacturer issued a "Material Components Guarantee", dated 19 November 2003 in respect of the jointing and coating systems.

Sequence of events:

- 2.5 The territorial authority issued a building consent on 19 September 1996.
- 2.6 The territorial authority made various inspections in the course of construction and passed both the pre-line and the post-line inspections. As this post-line inspection took place on 20 March 1998, it can be assumed that the cladding has been in place for at least six and a half years. A final check took place on 19 November 2003 and six items required attention, one of which requested paperwork for "Plaster system 15 year material warranty". A letter from the territorial authority to the owner dated 20 November 2003 reconfirmed the items requiring attention. It also stated that the territorial authority reserved "the right to issue any further requisitions as may be required to bring this consent to a satisfactory conclusion".
- 2.7 A "recheck" inspection was carried out on 26 November 2003, which noted that "items [were] completed and paperwork attached". On 19 January 2004, the territorial authority carried out a further inspection of the house.
- 2.8 Following a request by the owner for a code compliance certificate, the territorial authority wrote to the owner on 28 January 2004, setting out two reasons why it was unable to issue a code compliance certificate. The reasons were:
1. Council undertook insufficient inspections of the cladding and plastering stages to enable it to certify that the cladding complies with the manufacturers specification in order to ensure long term compliance with section E2 of the building code.
 2. The inspection dated 19 January 2004 of the property revealed a number of deficiencies which indicated to Council that the building work did not comply with the New Zealand Building Code. The deficiencies are listed as follows:
 - The cladding was not fixed to the building framing in accordance with manufacturer's specification in particular in relation to the sheet layout around windows and door openings.
 - The cladding system does not have the required control joints as per the manufacturer's specifications.

- The cladding and the plastered surface is in contact with the ground or concrete driveway in various locations.
- The handrail is fixed to the flat top of the plastered balustrade. This is a type of construction known to cause water penetration.
- The plastered surface of the cladding appears to be, in places, continuous over the cladding and block foundation. This type of construction does not allow water that may penetrate the surface cladding to escape from the space between the cladding and the building paper.
- Pergola fixing to the cladding does not appear to provide for a waterproof connection and is likely to cause water to penetrate the cladding surface.
- The block base ventilation has been blocked by placing excavated material against the block base. The subfloor ventilation requirements in the New Zealand Building Code are not being complied with.

2.9 The territorial authority issued a Notice to Rectify on 3 March 2004. The “Particulars of Contravention” attached to the Notice listed the seven deficiencies set out in reason 2 of the territorial authority’s letter of 28 January 2004. The Notice also described out the work that the owner was required to undertake to ensure code compliance as follows:

- a) Remove the existing cladding and re-clad the dwelling with either a monolithic type cladding system incorporating a [Named organisation] appraised drainage cavity or an [Council] approved drainage cavity or re-clad the dwelling with an approved alternative cladding system. Any cladding system will need to comply with the manufacturers and or suppliers specification.
- b) The top of the barrier to the deck is to be reconstructed so that it slopes and sheds water. Remove the hand rail attached to the barrier and reattach a hand rail in an approved manner without penetrating the top of the plastered surface.
- c) Removal of the pergola from the dwelling and waterproof the penetrations. If you choose to reattach the pergola you are to provide details as part of the amendment to the building consent for approval.
- d) Remove the earthfill or spoil currently placed against the foundations of the dwelling to such an extent that the vents in the block base are clear and able to vent the sub-floor space as required by the New Zealand building Code.

2.10 In a letter dated 8 March 2004, the owner responded to the territorial authority’s letter of 28 January 2004 setting out the history of compliance check inspections and the owner’s dealings with the territorial authority in this respect. The owner also responded to the issues raised by the territorial authority in their letter of 28 January 2004 as follows:

The Inspector who arrived with [Named person] made the comment that it has only been recently that the council has carried out thorough inspections of surfaces to be plastered. The house was built 7 years ago, not recent at all.

We believe that there are a few areas on the north side of the house which has some cracking due to incorrect fixing of the cladding, but these are minimal, and have not caused leaks in the past 7 years, and can be fixed.

The inspector made the comment that it does not have the required control joints, but as he pointed out, there is no cracking in that area where the joints should be.

The area they are talking about is down by the front door, when [Named person] did the original inspection he asked if there had been any signs of leaking or if flooding had occurred, none of which has happened as the fall in the driveway in the house is more than adequate. He said that was OK then.

The handrail is fixed to the balustrade in such a way it would be unlikely to leak, nor has it, in 7 years.

The plaster was sprayed on the concrete blocks, to remain in keeping with the rest of the house and this in no way effects (sic) the [Cladding system].

The pergola was fixed to the house with 2 bolts, which were sealed, and there is sealant running along the top of the cedar joist against the cladding.

The inspector noticed the vents on the north and east sides of the house had been filled to stop dirt coming through. This is because those walls are retaining and the vents should never have been there in the first place, but the blocklayer got carried away.

The owner concluded by querying that if the house was as bad as the territorial authority claimed would not the effects be apparent after 7 years?

2.11 The owner applied for this determination on 8 March 2004.

The Plasterer's Report

2.12 The Plasterer who carried out the exterior plastering to the cladding inspected the house and on 5 March 2004 issued a report, which included the following observations that related to the specific issues raised by the territorial authority in their Notice to Rectify:

- At the time this house was built, it wasn't common practice for inspectors to bother with pre-plaster inspections, and I would not have plastered it if the cladding were not to specification at the time.
- With reference to the sheet layout, I have found minor cracking under 3 small windows. These can easily be repaired, and a flexible joint put in to prevent any further cracking. The cracking is below floor level and over sub-floor block work.
- With reference to control joints, manufacturers specify a control joint is required at 5.4 metre centres. This house does not have any wall of that length that is not broken up by windows or doors, vertically and horizontally.
- The garage driveway butts up to the house in two small areas, both of which are by the garage. The concrete driveway has such a fall that all water drains away from the house into a cesspit which is situated approximately 4 metres away from the house. There is no sign in the garage of any moisture after 7 years, so can't see it being a problem in the future.
- The handrail fixing does appear to have damaged the integrity of the plastering. To install a fall at this stage, would probably cause more of a problem in the future, and is best left as is, as it hasn't leaked.
- I plastered down over some of the block work to remain in keeping with the finish of the house. This would not, in any way stop water from escaping from between the cladding and building paper, as there is no sealant between the two surfaces.
- The pergola was fixed to the house after I plastered it. It was done in a professional manner, and looks to be sealed adequately.

The Plasterer concluded by stating that the plaster manufacturer had issued their guarantee and that as a licensed applicator of their product the Plasterer stood by his workmanship.

3 THE SUBMISSIONS

3.1 The owner provided copies of:

- The building plans;
- The building consent and the territorial authority's inspection records;
- The Notice to Rectify;
- The owner's letter to the territorial authority of 8 March 2004;
- The territorial authority's letters to the owner of 20 November 2003 and 28 January 2004;

- The report from the plasterer described in paragraph 2.12;
- The “Material Components Guarantee” issued by the coating manufacturer; and
- A letter and a fax from a geotechnical engineer that described some aspects of the retaining walls that the territorial authority refers to as requiring venting.

3.2 The territorial authority forwarded a submission in the form of a letter dated 11 March 2004. In it, the territorial authority stated that it was not in a position to issue a code compliance certificate, as it had not carried out sufficient inspections to verify compliance with the building code and also because of the issues notified in the Notice to Rectify. The territorial authority then clarified its position as follows:

- a) Council decided to under take an on-site assessment because the dwelling had a monolithic cladding system together with the following features:
 - Is locate[d] in a high wind zone and in a salt water spray environment.
 - It has a non-traditional design i.e. flat roof, two storeys and parapets.
 - Decks over habitable areas.
- b) The issues identified varied in importance with issues associated with the cladding being of prime concern. The sheet layout and fixing in so far as it was able to be seen was of concern. Some exterior finishing timber has rusted nails and a horizontal control joint in the Harditex sheeting appeared to be absent. The connection to the concrete block base was also of concern. Hair line cracks near corner windows had been repaired however the problem appeared to be related to the incorrect layout of the sheeting material.
- c) The ground conditions under the house was (*sic*) wet in locations and there appeared to be insufficient ventilation to enable the moisture to be removed with airflow nor in so far as compliance with the New Zealand Building Code.
- d) Penetrations through the cladding are now regarded as areas that require very care full detailing to avoid moisture entry.

3.3 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 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 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.

5.0 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 furnished a report and noted the following specific faults during the inspection:

- The quality of finish is variable, and while much of it appeared sound, there are areas of poorly applied, incomplete or failed coatings;
- There are no vertical or horizontal control joints evident in the cladding;
- There are cracks evident in some of the cladding locations;
- The location of repairs and cracks in the cladding indicated that the sheets are set out from openings, which is contrary to the manufacturer's instructions;
- There are situations where the ground clearance of the cladding is inadequate and it is likely that the cladding extends below the ground level at the deck position;
- The unfilled gaps where the cladding is covered with a cap flashing at the Kitchen roof provide a direct entry for rainwater to the back of the cladding;
- A soffit drip detail, under the upper floor bedroom, that is a manufacturer's requirement has not been applied and there was evidence of water ingress at that point;
- The tops of the ground floor balcony parapet walls do not have any slope to them, and there are penetrations through the horizontal surfaces of these walls;
- The balustrade fixings to the first floor balcony penetrate the butynol membrane at the upstand, which is only 40 mm high and this combined with the lack of an adjacent roof overflow poses a potential leaking problem;
- The cladding is not continuous at the electricity meter;
- Windows and doors have been recessed into the cladding and provided with correctly installed head, jamb and sill flashings;
- An external sump is of questionable design, lacks a cap flashing and is a likely source of moisture ingress;

- The under floor space is inadequately ventilated, as there are no vents to the north or west walls; and
 - The sub floor ground surface was dished and retained water.
- 5.2 The expert also used an-invasive type moisture meter applied through the exterior cladding to detect areas of moisture ingress. The moisture readings ranged from 13% to 52% at a total of 17 locations, with an average of 25% taking all readings into account. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. The expert also noticed cracks in the internal plasterboard linings that could be attributed to moisture or structurally induced movement. There was also localised decay in the boundary floor joist and flooring at the ground level adjacent to the entrance stairway.
- 5.3 Copies of the expert's report were provided to each of the parties. Neither the territorial authority nor the owner made any 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 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:
- 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 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 likely 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:

- 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:

- With two exceptions lacks the eaves projections to most elevations that would have afforded protection to the cladding;
- Is in a very high wind zone;
- Is constructed generally to two and partly 3 levels;
- Has wall/roof intersections;
- Has a complex overall envelope;
- Has roofs mainly enclosed by parapet upstand walls which are drained by major internal gutters;
- Has a large balcony constructed over a garage space and a balcony constructed over a stair well;
- Has a large pergola and a deck to one elevation;
- Has no drainage cavity where the cladding is face fixed; and
- Has external walls claimed to be constructed from HI+, LOSP treated timber, which would be reasonably effective in delaying 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 numerous defects that could contribute to the penetration of the moisture that is already evident. These include:

- The quality of finish is variable, with areas of coating that are poorly applied, or incomplete, or that have even failed;

- There are no vertical or horizontal control joints evident in the cladding, and as a likely consequence, there are cracks in some of the cladding locations;
- Sheets were set out from openings, which is contrary to the manufacturer's instructions;
- There are situations where the ground clearance of the cladding is inadequate and possibly extends below the ground level at the deck position and on the columns supporting the level 2 bedroom;
- The sheets have not been overlapped over the concrete masonry basement wall in a way that allows moisture to drain out from behind the cladding;
- There is an unfilled gap between the fibre cement sheets where the cladding adjoins a cap flashing at the kitchen roof;
- The soffit drip detail under the level 2 bedroom, has not been applied as recommended by the manufacturer, and water penetration is evident;
- The tops of the ground floor balcony parapet walls do not have any slope to them, and there are penetrations through the horizontal and vertical surfaces of these walls;
- The balustrade fixings to the first floor balcony penetrate the butynol membrane at the upstand, which is only 40 mm high and there is no roof overflow adjacent;
- The cladding is not continuous at the electricity meter;
- The weathertightness of the attachment of the pergola to the structure relies on the long term durability of silicone sealants. This junction should be flashed to maintain weathertightness;
- The internal gutter to part of the kitchen and dining room roof is of questionable design, lacks a cap flashing and may be causing the penetration of water in this area;
- The internal gutter servicing the main roof drains through an internal sump and an internal overflow, both of which drain internally through the structure;
- The under floor space is inadequately ventilated as there are no vents to the north or west walls; and
- The sub floor ground surface is dished and retains water.

6.9 The Authority finds that the design of this building shows a lack of those compensating factors that can assist in preventing moisture from entering the building, and even if it has H1+ LOSP treated timber in the external walls, this in itself is not sufficient to offset the faults set out in paragraph 6.8.

7 CONCLUSION

- 7.1 The Authority, therefore, finds that as at the time of this determination that there is evidence of external moisture entering the building, the cladding on this particular building does not comply with clause E2.
- 7.2 In the circumstances, the Authority also 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 finally decide 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.
- 8.2 The Authority 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 addressed 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 remediated and that an agreed regular monitoring and maintenance program be put in place to extend the life of the building by identifying and remediating new leaks before they caused other damage. If the territorial authority issues a notice to rectify requiring that the cladding be made compliant, the owner is required to rectify the building work not done in accordance with the code.

9 THE AUTHORITY'S DECISION

- 9.1 In accordance with section 20 of the Building Act, the Authority determines that the cladding as installed does not comply with clause E2.3.2 of the building code. Accordingly, it 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 11 June 2004



John Ryan
Chief Executive