Determination 2004/20

Refusal of a code compliance certificate for a building with a "monolithic" cladding system: House 11

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 main ground floor external walls of the building are faced with a brick veneer and the upper floor external walls and the two-storey entrance porch are clad with a monolithic system. The Authority's task in this determination is to consider whether it is satisfied on reasonable grounds that only the monolithic cladding as installed ("the cladding") on this house complies with the building code (see sections 18 and 20 of the Act). By "wall cladding as installed" we mean the components of the system (such as the backing sheets, the flashings, the joints and the plaster and/or the coatings) as well as the way the components have been installed and work together.

1.3 The house itself is described in paragraphs 2.1 to 2.3, and paragraph 9 sets out the Authority's final decision.

2 PROCEDURE

The building.

2.1 The building is a two-storey detached house on a slightly sloping site that is in a medium wind zone in terms of NZS 3604: 1999 "Timber framed buildings". It is of conventional light timber frame construction and is a relatively simple shape. There are wall roof intersections where the base of the cladding adjoins the roof beneath it. The house has a brick veneer to the majority of the lower level. The upper high level and the two-storey porch are clad with a monolithic system. The house has one balcony, which is constructed partially over a living space. The building has 360 mm wide eaves, with the attached spouting giving a further 120 mm projection.

2.2 The framing in external walls is untreated kiln dried timber.

2.3 The upper level of the building is clad with what is described as monolithic cladding. As detailed in the manufacturer's technical data sheet, it incorporates 40 mm thick expanded polystyrene (EPS) backing sheets fixed through the building wrap face fixed directly to the framing timbers. The backing sheets are finished with a 100% acrylic sealer coat overlain with one of three plaster options, each reinforced with fibreglass mesh. The plaster has an external 100% acrylic paint system applied to it. The manufacturer details the sheet joints,

sheet terminations and flashings at various junctions. The jointing and finishing systems are described in detail. Both the jointing and the acrylic plaster systems applied to this building are one of those described in the manufacturer's instructions. The plaster has been applied by a contractor licensed by the manufacturer.

Sequence of events:

2.4 The territorial authority issued a building consent on 9 July 1999.

2.5 The territorial authority made various inspections in the course of construction, a final inspection was carried out on 9 May 2002 and a final recheck on 3 December 2003.

2.6 The cladding on the top level of this building varies from that shown on the consent documentation. However, as the territorial authority has provided from its records a producer statement from the manufacturer of the cladding that was eventually used, the Authority is of the opinion that the territorial authority has accepted this change.

2.7 In a letter to the owner dated 29 January 2004, the territorial authority stated that a subsequent inspection was carried out on 27 January 2004 and it identified two matters requiring attention. One of these stated:

> In regard to monolithic cladding applied to the upper storey of your dwelling, and not withstanding approval in your consented plans and specifications, recent information has indicated that monolithic claddings that do not have appropriate drainage, adequate ground clearance, reinforcing, control joints, and external joinery weather flashings will, in the event of leakage and/or residual moisture, cause irrecoverable damage to the structural elements of the building. Doubt has arisen to the extent that monolithic claddings that do not have these features may not meet the requirements of Clauses B2 and E2 of the NZ Building Code.
>
> As the monolithic cladding system fixed to your building has been individually assessed as being such a cladding, Council needs to be assured that it meets the requirements of the NZ Building Code before a final code compliance certificate can be issued…

2.8 The territorial authority did not issue a Notice to Rectify as required under section 42 of the Act.

2.9 The owner applied for this determination on 9 February 2004.

3 THE SUBMISSIONS

3.1 The owner made a submission in which they stated that they had carried out all the minor requirements that the territorial authority had requested for the code compliance certificate to be issued but the territorial authority still refused to issue it. The owner went on to say:

> This house has never leaked, has eaves (detailed in plans), has been built by a [builder] who only builds high quality homes…and who only applies qualified tradesmen.
>
> The plaster [System] was put on by [the Plasterer], a long established licensed applicator for this plaster system.

The owner also provided:

- Copies of the plans;
- Copies of the cladding manufacturer's data sheets and a relevant appraisal certificate; and

- A copy of a letter from the builder describing their organisation and the building and querying why the territorial authority were refusing to issue a code compliance certificate.

3.2 The territorial authority made a submission, which had details of the territorial authority's record of building inspections and a copy of the building consent attached. The submission noted that the territorial authority:

> "[H]as doubts as to the complying nature of the monolithic cladding that had been fixed to the upper floor of the dwelling – in particular, compliance with Building Code Clause E2 – External Moisture – to the extent that it should not now issue the final code compliance certificate unless it is satisfied on reasonable grounds that it should do so.

3.3 The territorial authority also provided:

- Copies of the building consent documents and field inspection records;
- A copy of a producer statement from the plasterer that certified that the cladding had been carried out with materials that meet the manufacturer's specifications and all work had been carried out in accordance with the manufacturer's instructions and a current appraisal certificate; and
- Copies of the plans and the outline specification.

3.4 The Authority commissioned an independent expert to inspect and report on the cladding.

3.5 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 THE EXPERT'S REPORT

5.1 The Authority commissioned an independent expert to inspect and report on the cladding. The expert inspected the building and furnished a report, which stated that the plaster coating had a smooth even finish and the painting appeared sound and evenly applied. There was also "no evidence of stress in the cladding in the absence of control joints", which in any case were not a requirement of the manufacturer. The expert also noted the following faults during the inspection:

- The ends of the PVC extrusion to the base of the cladding above the roof flashings were of questionable effectiveness;
- There was one crack at the junction between the balcony parapet wall and the main house cladding;
- There were inadequate ground clearances to the porch and balcony claddings;
- The top of the balcony parapet does not have a sufficient degree of slope;
- There were no rubber gaskets where the glazed balustrade fixings penetrated the parapet wall top; and
- The finish between a copper gutter and the base of the cladding at the balcony deck edge could have been constructed in a more appropriate manner.

5.2 The expert also used a non-invasive type moisture meter applied to the internal face of external walls to detect areas of moisture ingress. The moisture readings varied between 8% and 26.2%. The expert attributed the two highest readings to the fact that the porch and balcony balustrade cladding ground clearances were inadequate and the poor sealing of the balcony fixings. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. While a moisture reading of less than 18% does not of itself indicate that the cladding is code compliant, it is indicative of the efficiency of the cladding in preventing moisture ingress to date.

5.3 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:

- Has eaves projections 360 mm wide and an attached spouting, which together give an overall projection of 480 mm, which is reasonably effective in shielding the cladding;
- Is in a medium wind zone;
- Is constructed to two levels with the cladding generally at the upper level only;
- Has wall/roof intersections;
- Has an overall envelope that is relatively simple on plan;
- Has a ground level deck which finishes directly against the cladding;
- Has a balcony that is constructed partially over a living space;
- Has a full-height porch attached to the building;
- Has no drainage cavity where the cladding is face fixed; and
- Has external walls constructed from untreated timber, which is not effective in delaying the onset of decay.

Weathertightness performance

6.8 Generally the cladding appears to have been installed according to good trade practice and to manufacturer's instructions. It can be considered to be reasonably effective in preventing the penetration of water. There are, however, defects that have allowed the ingress of moisture behind the cladding. The base extrusion to the roof/cladding intersections is defective and there are inadequate ground clearances to the porch and balcony cladding. There is one junction crack adjoining the balcony and the balcony parapet top has an insufficient slope to it. The fixing of the balcony handrail will need to be addressed, as will the balcony cladding base junction with the spouting. All these defects are required to be rectified to ensure ongoing weathertightness.

6.9 Notwithstanding the fact that the backing sheets are fixed directly to the timber framing, thus inhibiting ventilation behind the cladding sheets, the Authority finds that there are compensating provisions that assist the performance of the cladding in this particular case. These are:

- Generally, the cladding appears to have been installed according to good trade practice and to manufacturer's specifications;
- The building does not display to any significant extent any of the weathertightness risk factors;
- The building has eaves that are effectively 480 mm wide, which offer reasonable protection to the building; and
- Apart from two areas, the moisture level readings do not indicate any undue moisture ingress behind the cladding at this time.

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

6.11 The Authority also notes that the statement made by the territorial authority as set out in paragraph 2.7, appears to describe a policy on monolithic claddings. The Authority emphasises that the use of such a policy in circumstances such as this is contrary to the requirements of the Act. The Act requires that decisions on whether an alternative solution is code compliant have to be taken with due regard to the performance of the building (and any element of it) in its as built condition and environment. In other words, it requires the

territorial authority to assess performance on a case-by case basis. In this instance, the territorial authority does not appear to have followed such a process.

7 CONCLUSION

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

7.2 However, the Authority is concerned that the moisture readings obtained by the expert's testing are above acceptable limits in 2 areas. It believes that the ingress of this moisture can be minimised if:

- All sources of moisture entry are identified and investigated;
- The items of non-compliance that are listed in paragraph 5.1 and outlined in more detail in the expert's report (and any others that may subsequently become apparent) are rectified; and
- Moisture levels are reduced to an acceptable level as a result of these measures.

7.3 The Authority believes that if moisture ingress can be demonstrated to have ceased, the cladding will be code compliant because of the compensating factors listed above in paragraph 6.7. The Authority believes that while a drainage cavity is advisable, it is not necessary for code compliance in this instance.

7.4 The Authority declines to incorporate any waiver or modification of the building code in its determination.

8 WHAT IS TO BE DONE?

8.1 It is not for the Authority to decide exactly how the cladding is to be brought to compliance with the building code. That is a matter for the owner to propose and for the territorial authority to accept or reject, with either of the parties entitled to submit doubts or disputes to the Authority for another determination.

9 THE AUTHORITY'S DECISION

9.1 In accordance with section 20 of the Building Act, the Authority determines that the cladding, which is unable to fully prevent the ingress of moisture, does not comply with clause E2 of the building code. Accordingly, it confirms the territorial authority's decision to refuse to issue the code compliance certificate.

9.2 The Authority finds that because of the compensating factors in this case, the lack of a ventilated cavity behind the fibre cement panels is not, on its own, sufficient grounds to withhold a code compliance certificate.

9.3 The Authority, therefore, finds that once the items of non-compliance that are listed in paragraph 5.1 are rectified to the approval of the territorial authority, together with any other instances of non-compliance that become apparent in the course of rectification, the cladding as installed on the house will comply with the building code, notwithstanding the lack of a drainage cavity.

9.4 The Authority considers that the cladding will require on-going maintenance to ensure its continuing code compliance, and this maintenance programme should be undertaken after consultation with the territorial authority.

Signed for and on behalf of the **Building Industry Authority** on 18 May 2004

John Ryan

Chief Executive