Determination 2004/75

Refusal of a code compliance certificate for a building with a "monolithic" cladding system: House 58

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 building 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 5-year old 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 single-storey detached house situated on a level site, which is in a low wind zone in terms of NZS 3604: 1999 "Timber framed buildings". The house is of conventional light timber frame construction, built on concrete block foundation walls, and the external walls are sheathed with monolithic cladding. The house is of a fairly simple shape, but the main coated steel pitched roofs have several complex valley and wall/roof junctions. There are two areas of flat roofing over the lounge and the entry, which are lined with a butyl rubber membrane and that have junctions with the cladding above them. Two dormers are inset into the main roof, and the faces of these are infilled with monolithic cladding. The sloping eaves to the main roof are 212mm wide on plan, with the exception of two short lengths that are 424mm on plan, and the ends of the truss rafters are exposed at these eaves. The flat roof eave projections are 300mm wide. An attached 125mm gutter gives further protection to all the eaves. The main roof verges have no projections.

2.2 The specification does not give any details of timber treatment, and the Authority has not received any evidence confirming whether the external wall framing was treated.

2.3 The external walls of the building are clad with what is described as monolithic cladding. In this instance it incorporates 7.5mm thick fibre-cement backing sheets fixed through the building wrap directly to the framing timbers and finished with a sprayed on pigmented acrylic coating system. The backing sheets have been subject to a test by an independent organisation. The cladding applicator has identified the type of backing sheet, jointing, sealing, plaster and paint systems that were applied on this house.

2.4 The cladding applicator has provided an undated "Compliance Form", which identifies the cladding system used, and advises that the form is not a warranty.

Sequence of events:

2.5 The territorial authority issued a building consent on 2 June 1998.

2.6 The territorial authority made various inspections during the course of construction, and on 11 February 1999, approved the preline inspection. A final inspection undertaken on 6 August 2002 did not pass the building work.

2.7 The territorial authority issued two Interim Notices to Rectify on 6 August 2002 and the items that related to the cladding were:

- Additional sealing of penetrations was required;
- Some ground levels were too high relative to the base of the cladding;
- Additional nailing, sealing and pointing of the backing sheets to be carried out; and
- The requirement for the cladding installer to provide a producer statement, together with details of the cladding system installed.

2.8 Two further final building inspections were carried out in November 2003. However, neither approved the building work and both required a list of items to be carried out.

2.9 Following another inspection on 21 May 2004, the territorial authority wrote to the owner on 30 May 2004, identifying the following matters requiring attention:

1. Producer Statement re texture coating.
2. Details of texture coating used.
3. In regard to the monolithic cladding applied to your dwelling, and not withstanding the approval in your building 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 irrevocable damage to the structural elements of the building. Doubt has arisen to the extent that monolithic claddings that do not have all of 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 building code compliance certificate can be issued. If you made an application to the Building Industry Authority for a determination on this issue under Section 17 of the Building Act 1991, it would decide the matter…

2.10 The owner applied for a determination on 9 June 2004.

3 THE SUBMISSIONS

3.1 The territorial authority did not make a submission and the owner supplied copies of:

- The plans and specifications;
- Wall bracing details and manufacturer's instructions;
- The letter from the territorial authority to the owner of 30 May 2004;
- The territorial authority's inspection documentation;
- The Interim Notices to Rectify; and
- The cladding applicator's "Compliance Form".

3.2 The copies of 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**
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> **B2.3.1**
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> 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:
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> (i) Those building elements (including floors, walls, and fixings) provide structural stability to the building, or
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> (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; and

- 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 exterior of the building, but was unable to gain access to the interior. The expert furnished a report, which noted that while the final finish has been done to a good standard, there were numerous areas where the requirements of good workmanship were not met. The expert also made the following comments regarding the cladding:

- The exterior joinery units have standard aluminium head flashings, but the cladding finished hard against the flashing. There is no evidence of inseal strips or sealant under the jamb flanges of these units;

- There are no flashings to the head and jambs of the garage door openings;

- No vertical control joints have been installed;
- There are numerous cracks evident in the cladding on all elevations of the building;
- The cladding overlap at the foundation wall is insufficient at some locations;
- There is insufficient ground clearance to the cladding adjoining the garden areas, and there are high moisture readings at the bottom plates adjoining these areas;
- The cladding is buried in the paving outside the front and garage doors;
- At four cladding/roof junctions the flashings are face mounted and driven rain can enter the cladding at these areas. However these areas are sheltered by the wide eaves immediately above them.
- The junctions between the vertical edge of the cladding and the butyl rubber flat roof membrane have the potential to permit moisture ingress;
- Some cladding penetrations are not properly sealed; and
- The timber ribbon boards and the truss rafters that have exposed sprocket ends at the soffits are not treated. The sprocket ends are not end flashed.

5.2 Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. The expert took non-invasive and shallow penetration readings of the external walls throughout the house from the exterior of the building. The results of these inspections are as follows:

- West elevation, readings of 22%, 27% and 50%;
- North elevation, readings of 21%, 22% (three), 25% (two), 27% (three), 30%, 46.3%, 70.4%, and 75.4%;
- South elevation, readings of 21%, 25%, 27% (two), and 45%. The readings in garage 2 were similar to these; and
- East elevation, there were no readings above 18%.

These excessive moisture readings occurred generally under windows or at the bottom plates of the walls. The expert considered that it was possible that the ingress of moisture could have weakened the untreated timber behind the cladding.

5.3 Copies of the expert's report were provided to each of the parties.

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 clauses B2.3.1 and 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 Research data and experience, both internationally and locally, 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 show 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 337 mm, 425mm and 570mm total wide eaves projections that provide some protection to the cladding under them;
- Has verges without any projections and therefore no protection for the cladding at the gable ends;
- Is in a low wind zone;
- Is single storey;
- Has exterior joinery units that have head flashings installed, but there are no inseal strips or sealants behind the jambs of these units;
- Has an overall envelope that is fairly simple in plan, but with roofs having complex hip and cladding/roof junctions with the cladding;
- Has no decks or balconies; and
- Has external walls constructed with untreated timber, which is likely to decay if it absorbs and retains moisture**.**

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 large number of identified defects, which are set out in paragraph 5.1 and in the expert's report that have contributed to the penetration of the moisture already evident in several areas.

6.9 The Authority notes that the cladding/roof junction flashings should be set behind the cladding. However, in this case, as these are well protected by projecting eaves, the Authority accepts that this omission does not affect the weathertightness performance of the cladding.

6.10 The Authority observes that these are no inseal strips or sealants under the jamb flanges of the exterior joinery units. The Authority recommends that, if a decision is taken by the parties to remove these units to correctly seal the jambs during the rectification process, then the installation of sill flashings at the same time should also be considered.

6.11 The Authority is also concerned that none of the Interim Notices to Rectify issued by the territorial authority made any mention of the lack of control joints. The Authority considers that the provision of control joints is a critical consideration when assessing cladding compliance for buildings of this type.

6.12 The Authority notes that all elevations of the building demonstrate a low weathertightness risk rating as calculated using the E2/AS1 risk matrix. The matrix is an assessment tool that is 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.

7 CONCLUSION

7.1 The Authority is satisfied that the performance of the cladding is inadequate because it has not been installed according to good trade practice. In particular, it demonstrates the key defects listed in paragraph 5.1 and in the expert's report. The main areas of concern are the lack of control joints, the evidence of widespread cracking in the cladding, insufficient ground clearances, the lack of inseal and sealants to the jambs of the exterior joinery units, the sealing of penetrations, and the untreated and unflashed exposed soffit timbers. The Authority has also identified the presence of some 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. The Authority considers that any final decision on whether code compliance can be achieved by either remediation or recladding, or a combination of both, can only be made after a more thorough investigation of the cladding. This will require a careful analysis by an appropriately qualified expert as to the correct remedial option to be followed. Once that decision has been made, it should be submitted to the territorial authority for its comment and approval. If the territorial authority chooses to reject the proposal, then the owner is entitled to seek a further determination that will rule on whether the proposed remedial work will comply with the requirements of clauses E2 and B2.

7.3 The Authority note that effective maintenance of monolithic claddings is important to ensure ongoing compliance with clause B2 of the building code. That maintenance is the responsibility of the building owner. The code assumes that the normal maintenance necessary to ensure the durability of the cladding is carried out. For that reason clause B2.3.1 of the building code requires that the cladding be subject to "normal maintenance". That term is not defined and 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. The Authority recognises that a territorial authority does not have any statutory responsibility for the ongoing maintenance of a building. However, the maintenance programme adopted by the owner could be undertaken after consultation with the territorial authority, bearing in mind that the nature of the advice, and the basis on which it is provided to the owner, are for the territorial authority to decide.

7.4 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 territorial authority has issued several Interim Notices to Rectify. Under the Act, a Notice to Rectify can require the owner to bring the house into compliance with the building code. A new Final Notice to Rectify should be issued that requires the owner to bring the cladding into compliance with the building code, without specifying the features that are required to be incorporated.

8.3 Continuing maintenance of the cladding will be required to ensure its continuing building code compliance.

Signed for and on behalf of the **Building Industry Authority** on 29 November 2004.

John Ryan
Chief Executive