

*Determination 2004/74*

# ***Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 57***

## **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 one of the two owners of the property, represented by a legal adviser (referred to throughout this document as “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 large house of approximately 500m<sup>2</sup> in area, which has two double garages attached (“the house”) and a separate garage, double garage and rumpus room building (“the garage”), on which the exterior wall cladding has been in place for some 7 years, 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 monolithic wall cladding as installed (“the cladding”), to the walls of the house and garage complies with the building code (see sections 18 and 20 of the Act). By “external monolithic 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 Building 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 Both the house and the garage are single-storey-structures, situated on a level site in a medium wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house and garage are of conventional light timber frame construction on a concrete slab and concrete block foundation walls. The house has a main floor at three levels and is of a relatively complex shape, with steeply pitched concrete tiled roofs at varying levels that have numerous valley and hip intersections. There are also 8 lengths of roof/cladding intersections. Three bay windows have small roof extensions over them, supported on plastered blockwork buttresses and timber framed arches lined with plywood and plastered to match the monolithic cladding. Three porticos supported on monolithic clad timber

beams and plastered concrete block columns adjoin the main entrance, the living room and the family room. Two pergolas consisting of timber beams and rafters, supported on plastered concrete block columns, are attached to one elevation. The eaves projections are generally 350mm wide, with the gutters adding a further 150mm. There are some locations where the fascia is buried in the cladding without any projection. The roof is extended an additional 600mm over the bay windows and to a maximum of 2400mm over other minor areas. The garage has roofs to varying heights with several hip and valley junctions and there are two bay windows constructed as described for those of the house. Apart from one long elevation where the fascia is buried in the cladding, the eaves have 350mm wide projections plus a 150mm wide gutter.

- 2.2 The owner forwarded a letter, dated 7 September 2004, from the timber supplier, confirming that the frame for the house was manufactured from graded H1 treated timber, however the actual level of H1 treatment was not verified.
- 2.3 The external walls of the house and garage are clad with what is described as monolithic cladding. In this instance it incorporates 4.5 mm thick fibre-cement backing sheets fixed through the building wrap directly to the framing timbers and finished with 20 mm thick sand and cement stucco plaster reinforced with galvanised reinforcing mesh. The plaster in turn is finished with an acrylic paint system.

#### **Sequence of events:**

- 2.4 The territorial authority issued a building consent on 23 January 1996, subject to a resource consent restriction imposed under section 35 of the Act. On 8 February 1996, the territorial authority wrote to the owner advising that the proposed building work could proceed.
- 2.5 The territorial authority made various inspections during the course of construction, and passed the “Netting for Plaster (Exterior)” inspection on 23 October 1996 and the “Preline” inspection on 29 November 1996. A final code compliance certificate inspection took place on 26 May 2004, but the territorial authority’s “Field Sheet” records:- “Monolithic Cladding -No”.
- 2.6 Following the May inspection, the territorial authority wrote to owner on 28 May 2004, noting that certain items required attention. There was a reference to the cladding, which stated; “Exterior cladding, monolithic cladding letter, to follow, Garage plus Dwelling”.
- 2.7 The territorial authority issued a Notice to Rectify, dated 27 May 2004, and the “Particulars of Convention” were:

Monolithic cladding systems without a 20 mm cavity, provision for adequate ventilation, drainage, and vapour dissipation will, in the event of leakage and/or the effect of residual moisture, cause irrecoverable damage to the structural elements of the building

As you have used a cavity system that has not had the required system of inspections: -

You are required to:

- Remove the monolithic cladding and replace with an approved cladding, system which has been subjected to the Council's recently adopted inspection system.

- Lodge with Council an application for and amended building consent and provide all necessary information that may be requested to allow this consent application to be processed.”

2.8 The owner applied for a determination on 17 June 2004.

### **3 THE SUBMISSIONS**

3.1 The owner stated that the “Matter of Doubt or Dispute” was “Council’s decision to refuse the issue of a code of compliance certificate for matters relating to the monolithic cladding system”.

3.2 The owner provided copies of

- The building plans and specifications;
- The building consent documentation;
- The Notice to Rectify;
- The territorial authority’s documentation recording the inspections of the building;
- The territorial authority’s letter to the owner of 27 May 2004; and
- The timber supplier’s confirmation that H1 treated timber was supplied for the frame of the house.

3.3 The territorial authority made a submission in the form of a letter, dated 14 July 2004, which confirmed that a building consent had been issued for the cladding and also stated:

The work was undertaken during the period March 1996 to May 2004

Construction of the cladding was not the subject of the changed inspection procedures implemented by this Council as a consequence of a [Named] adjudication.

In the absence of the additional inspections implemented as a consequence of those changed inspection procedures, and in the absence of a cavity as a first line of defence, the Council does not believe it is able to be satisfied, on reasonable grounds, that the cladding applied to this dwelling will achieve the functional requirements of Clause E2.2, or the performance requirements of E2.3.2, of the Building Code...

The Authority assumes that the house was substantially complete, including the cladding by late 1997 and that only minor work was carried out between 1997 and 2004.

3.4 The copies of the submissions and other evidence were provided to each of the parties and neither party made a further response.

### **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 B.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 subfloor 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. It noted that the plaster had a smooth even finish. All the edges of the exterior joinery units have flashings, with the exception of the sills to the units that sit on the concrete floor slab. The block base to these latter units is not plastered out to the thickness of the surrounding walls and this provides a useful capillary break/drip edge at this junction. The expert cut away a section of the cladding at a window sill/jamb junction in order to check the flashings, and found that both jamb and sill flashings were in place. The expert's report made the following specific comments on the cladding:

### *Both the house and flat (garage)*

- There are no vertical control joints in the plaster to the walls that exceed 4000mm in length. Walls of such dimensions require control joints in order to comply with the recommendations set out in NZS 4251;
- There is cracking at stress points and at the house garage doors, some of which have been painted over. The expert attributes some of the cracks to the lack of control joints;
- Some lengths of the timber fascias are buried in the plaster;
- There are no upturns to the end of the installed sill flashings and there is evidence that moisture is running over the ends of the sill flashings and down into the framing at these locations. The Authority notes that the presence of moisture ingress is verified by the corrosion occurring in the adjoining reinforcing mesh; and
- Some penetrations through the cladding are inadequately sealed.

### *The house only*

- The base of the cladding adjacent to the garage doors is buried in the paving; and
- There is no capillary break between the plaster to the cladding and the blockwork foundation wall below it.

### *The flat (garage) only:*

- There is insufficient clearance to the ground at the base of the cladding at most locations, and the cladding is buried at some locations.

The expert also noted that there was a broken tile adjacent to one of the apron flashings that will undoubtedly let in moisture.

- 5.2 The expert took moisture readings throughout the house and garage at the interior linings of the external walls using a non-intrusive meter, 6 areas in the house and 2 areas in the garage registered "high" readings. The expert also took further readings with an intrusive meter, and the readings over 18% were as follows.

*The house*

- Readings of 20% (two), 21%, 24%, 32%, and 40% at the garage bottom plates;
- Readings of 19% and 20% at a stud and bottom plate adjacent to the meter on the southeast wall;
- Readings of 20%, 21%, 24% and 25% at the studs and bottom plates at the rear of the house; and
- Readings of 38% and 40% (four) at the bottom plates and adjacent to the bay window at the sitting area of the family room and at a pool-facing window. The expert also found evidence of advanced fungal decay under the bay window.

*The flat (garage)*

- Readings of 24% (two) at the bottom plate of the garage door wall;
- Readings of 18%, 20%, 24% and 32% at the bottom plate and adjacent to joinery units at the rear wall of the garage; and
- A reading 21% at the bottom plate of the wall closet in the flat.

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

- 5.3 Copies of the expert's report were provided to each of the parties and neither party made a response.

## **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/AS1 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 International and local research 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 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 the house and the garage:

- Have generally 500mm total wide eaves projections that provide some protection to the main cladding areas, although where the fascia is imbedded in the plaster there is no protection. Roof projections afford additional protection to other locations;
- Are in a medium wind zone;
- Are single storey;
- Have flashings to the heads, sills and jambs of the exterior joinery units, but no turn up to the sill flashing ends;

- Have complex roofs at varying levels with numerous hips and valleys and some roof/cladding junctions;
- Have no attached decks or balconies;
- Have external walls constructed with timber treated to an H1 LOSP level that will not prevent decay if it absorbs and retains moisture; and
- The house itself is relatively complex in plan and has three porticos and two pergolas attached to it.

### **Weathertightness performance**

6.8 The Authority finds that generally, the cladding appears to have been installed according to good trade practice. However, this does not apply to a limited number of localised areas where the cladding has been ineffective in preventing the penetration of water into the wall structure. These areas being

#### *Both the house and garage*

- The lack of vertical control joints in the plaster to the walls;
- The cracking at stress points and adjacent to the garage door jambs;
- The lengths of timber fascias buried in the plaster;
- The lack of upturns to the end of the sill flashings to all windows; and
- The inadequately sealing of some penetrations through the cladding..

#### *The house only*

- The base of the cladding is buried by paving adjacent to the garage doors; and
- The lack of a horizontal capillary break between the cladding and the plastered blockwork base.

#### *The garage only:*

- There is insufficient clearance between ground level and the base of the cladding at most locations.

6.9 Notwithstanding the fact that the fibre-cement sheets are fixed directly to the timber framing, so restricting ventilation behind the cladding, the Authority finds that there are compensating factors that assist the performance of the cladding in this particular case. In regard to both the house and the garage these are:

- Both are single storey;
- Both are in a medium wind zone and have for the most part protective eaves together with additional roof projections; and
- There are no attached decks or balconies.



- 6.10 The Authority considers that these factors adequately compensate for the lack of a drained and ventilated cavity and can allow the house to comply with the weathertightness and durability provisions of the building code.
- 6.11 The Authority accepts that the step formed by the unplastered block upstands under the exterior joinery units as described in paragraph 5.1, compensates for the lack of a flashing.
- 6.12 The Authority considers that the high moisture levels that were found can be generally attributed to the lack of stopped ends to the window sill flashings, together with the lack of ground clearances between the cladding and the ground around the 4 garage doors.
- 6.13 The Authority also considers that vertical control joints must be installed in the cladding. The Authority appreciates that the house and garage have been constructed since 1997 and at the present time demonstrate in-service performance. However, there is a requirement to minimise any future risk of differential movement, taking into account the large size of the house and the stepped nature of its concrete ground floor slab.
- 6.14 The Authority notes that the Notice to Rectify incorrectly states that the house has a “cavity system that has not had the required system of inspections”. The monolithic cladding used on this house is fixed directly to the wall framing and there is no cavity. In addition, the Authority is concerned that the territorial authority has not identified the specific areas where it considers that the cladding on this house is not compliant with the building code.
- 6.15 The Authority notes that all elevations of both the house and the garage 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 current performance of the cladding is not adequate because it is currently allowing water penetration into the wall framing. 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 the faults that have been identified with this cladding occur in discrete areas, it is able to conclude that satisfactory rectification of the items outlined in paragraph 6.8, including the replacement of the broken roof tile, is likely to result in the building being weathertight and in compliance with clauses B2 and E2, notwithstanding the lack of a ventilated cavity
- 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 The Authority emphasises that each determination is conducted on a case-by-case basis. Accordingly, the fact that a particular cladding system has been established as being code compliant in relation to a particular building does not necessarily mean that the same cladding system will be code compliant in another situation.
- 7.5 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. There are also a number of items to be remedied to ensure that the house and garage remain weathertight and thus meet the durability requirement of the code. Consequently the Authority finds that the house and garage do not comply with clause B2. Accordingly, it confirms the territorial authority's decision to refuse to issue a code compliance certificate.
- 8.2 The Authority finds that rectification of the items outlined in paragraph 6.8, including the replacement of the broken roof tile, to the approval of the territorial authority, along with any other faults that may become apparent in the course of that work, is likely to result in the building being weathertight and in compliance with clauses B2 and E2, notwithstanding the lack of a ventilated cavity.
- 8.2 The territorial authority has issued a Notice to Rectify requiring a ventilated cavity or an alternative approved system. Under the Act, a Notice to Rectify can require the owner to bring the house into compliance with the building code. The Authority has already found in a previous determination (2000/1), that the Notice to Rectify cannot specify how that compliance can be achieved. A new Notice 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. It is not for the Authority to dictate how the defects listed in paragraph 6.8, are to be remedied. How that is done 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 building code compliance.

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

**John Ryan**  
Chief Executive