

# ***Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 62***

## **1 THE DISPUTE TO BE DETERMINED**

- 1.1 This is a determination by the Chief Executive of the Department of Building and Housing (“the Chief Executive”) under section 17 of the Building Act 1991, as amended by section 424 of the Building Act 2004 (“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 7-year old house unless changes are made to its monolithic cladding system.
- 1.2 My task in this determination is to consider whether I am satisfied on reasonable grounds that the external monolithic wall cladding as installed (“the cladding”), to the walls of the house complies with the building code (see sections 18 and 20 of the Act). By “external monolithic wall cladding as installed”, I 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 This determination is made under the Building Act 1991 subject to section 424 of the Building Act 2004. That section came into force (“commenced”) on 30 November 2004, and its relevant provisions are:

“. . . on and after the commencement of this section,—

“(a) a reference to the Authority in the Building Act 1991 must be read as a reference to the chief executive; and

“(b) the Building Act 1991 must be read with all necessary modifications to enable the chief executive to perform the functions and duties, and exercise the powers, of the Authority . . . ”

It should be noted that the new legislation does not amend the determination process set out under the 1991 Act, other than to transfer the power to make a determination from the Authority to the Chief Executive of the Department of Building and Housing.

- 1.4 This determination refers to the former Building Industry Authority (“the Authority”)
- (a) When quoting from documents received in the course of the determination, and
- (b) When referring to determinations made by the Authority before section 424 came into force.

- 1.5 No other aspects of the Building Act or the building code have been considered in this determination.
- 1.6 The house itself is described in paragraphs 2.1 to 2.3, and paragraph 8 sets out the final decision.

## **2 PROCEDURE**

### **The building**

- 2.1 The house is a single-storey house with a split floor level, constructed on a pole and pile foundation and situated on a sloping site in a low wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. There is also a detached garage at the same level as the house. Both the house and the garage are of conventional light timber frame construction on timber-framed floors, which are supported on piles or poles, with the house floor a maximum of 3700mm above the finished ground level. The walls of each building are lined with a monolithic cladding. The house and garage are of relatively simple shapes, with pitched longrun steel covered roofs set at varying levels with several junctions with the wall cladding. A large stepped deck, which is a maximum of 3800mm above the finished ground level, runs around two elevations of the house and two smaller decks with associated access steps are situated on two other elevations. The decks are timber framed, clad with gapped boarding, with balustrades or handrails formed from timber rails, posts, and balusters. The eaves projections are 450mm wide and the verge projections are 200mm wide. The roof is extended an additional 450mm over the laundry entrance and fully extended over the main entrance where it is supported on beams and a timber corner post.
- 2.2 The expert engaged by the Authority has verified that timber in the exterior walls of the house is H1 LOSP treated.
- 2.3 The external walls of the house and garage are clad with what is described as monolithic cladding. In this instance it incorporates 7.5 mm thick fibre-cement backing sheets fixed through the building wrap directly to the framing timbers and finished with a textured finish, which in turn is finished with an acrylic paint system. No information has been provided as to what jointing, plaster and paint systems have been applied to the backing sheets.

### **Sequence of events**

- 2.4 The territorial authority issued a building consent on 25 June 1996.
- 2.5 The territorial authority made various inspections during the course of construction, and passed the “Preline” inspection on 16 August 1996. Two final code compliance certificate inspections took place on 25 March 2004 and 29 June 2004. The territorial authority’s “Field Sheet” for the latter inspection records:- “[Named cladding] issues still to be sorted out (Notice to Rectify)”.
- 2.6 The territorial authority issued a Notice to Rectify, dated 30 March 2004, and the “Particulars of Convention” were:
  1. Seal [cladding] behind decking, handrail barrier, gutter ends, bottom of sheet edges and under ranchslider/doors.

2. Remove sheets off head flashing to allow 5mm minimum clearance as per [Manufacturer's] instructions.
3. Cracks seen in cladding require repair and re-sealing.
4. Remove ground from direct contact with cladding.
5. Verify bracing sheets ([Named cladding] type) are fixed with stainless steel clouts.
6. Provide evidence of the following:
  - a) Control joints/expansion joints.
  - b) Corner mouldings.
  - c) [Sealant strip] behind joinery and control joints.
  - d) Jamb and sill flashings.
7. Please provide written confirmation from [Manufacturer] that the cladding is adequate and suitable for this type of house.

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."

2.7 The territorial authority wrote to owner on 2 July 2004, noting that certain items required attention. There was a reference to the cladding, which stated; "[Named cladding] issues still to be addressed (Notice to Rectify dated 30<sup>th</sup> March 2004).

2.8 The owner applied for a determination on 21 July 2004.

### **3 THE SUBMISSIONS**

3.1 The owner stated that the "Matter of Doubt or Dispute" was "[Territorial authority] has declined to issue of a certificate [code compliance certificate] for the building because of the use of [Named product]".

3.2 The owner provided copies of:

- The building plans and specifications;
- The building consent documentation; and

- The Notice to Rectify.

3.3 The owner also engaged a firm of building consultants to make a report on the property and the owner forwarded a copy of this report, dated 30 July 2004, to the Authority. The main points of this report can be summarised as:

- A description of the house and its location;
- A summary of various moisture readings obtained throughout the building using both an intrusive and a non-inclusive meter. The recorded high readings were:
  - Readings of 46% to 70% at the bottom plate of the lounge wall;
  - A reading of 30% at the bottom plate of the south wall of the breakfast room;
  - High readings beneath the north elevation stringer of the bedroom 2 deck;
  - A reading of 25% at the bottom plate of the north wall of bedroom 4; and
  - Readings of 60% at the bottom plate of the north wall of the office.
- The consultant also noticed decay in a boundary joist under the family room ranchslider, and moisture damage to the wall lining and skirting beneath the north elevation office window;
- The cladding was performing well, and while there were no control joints, only minimal cracking was noted on the cladding;
- The moisture was entering the building:
  - Around the deck fixings;
  - At the base of the apron flashings due to the lack of deflector flashings; and
  - Because of incorrect ground levels.
- The exterior joinery is not sealed appropriately against the cladding, but there is no evidence of moisture ingress, apart from one area in the office.

3.4 The consultant then went on to say that once the nominated items were rectified the building would meet the requirements of the building code to the same extent as if a cavity system had been installed behind the cladding. They nominated items were:

- Installing deflector flashings;
- Reducing ground levels;
- Adequately sealing penetrations through the cladding;
- Opening up areas with high moisture readings and replacing damaged framing; and
- Completely repainting the exterior.

3.5 The territorial authority made a submission in the form of a letter, dated 3 August 2004, which confirmed that a building consent had been issued for the cladding and also stated:

The work was undertaken during the period June 1996 to March 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...

3.6 The territorial authority also submitted copies of:

- The building consent;
- Some of the territorial authority's inspection sheets; and
- Correspondence with the owner.

3.7 I assume that the house was substantially complete, including the cladding by late 1997 and that only minor work was carried out between 1997 and 2004. No reasons were given for the delay in carrying out the final inspections.

3.8 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 B2.3.1 and E2.3.2 of the building code (First Schedule, Building Regulations 1992) is correct. Those provisions of the building code provide:

##### **Clause B2—DURABILITY**

**B2.3.1** Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building, if stated, or:

- (a) The life of the building, being not less than 50 years, if:
  - (i) Those building elements (including floors, walls, and fixings) provide structural stability to the building, or
  - (ii) Those building elements are difficult to access or replace, or
  - (iii) Failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.
- (b) 15 years if:
  - (i) Those building elements (including the building envelope, exposed plumbing in the 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. I am 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, which in my view remain valid:
- 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 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 quality of finish was generally sound and there were no areas where the coating was flaking, blistering or failing. As the house was less than 5400mm high and kiln-dried timber had been used in its construction, horizontal relief joints were not required. The expert cut away a section of the cladding at a window sill/jamb junction in order to check the jamb sealants. The expert's report made the following specific comments on the cladding:
- There are no vertical control joints in the walls, and some walls exceed 5400mm in length. Walls of such dimensions require control joints in order to comply with the manufacturer's recommendations. However, there is no evidence of significant cracking, despite the age of cladding;
  - There is some localised cracking and pouting in the cladding and there is a crack above one window head;

- Some head flashings to the exterior windows and doors overlap the frames by dimensions less than that recommended by the manufacturer, and there are no sealing strips beneath the jamb flanges. The fillet of sealant on the outside edge of the unit flanges is not adequate because it would be subject to UV degradation;
- There is insufficient clearance to the ground at the base of the cladding outside bedroom 1, at the garage, and adjacent to the entrance;
- The sealant between the apron flashings and the cladding is inadequate and the flashings have no stop ends or other features to deflect water from the cladding;
- The decks generally were constructed prior to the texture coating of the cladding, and the paint that is applied to the backing boards at these junctions does not meet the manufacturer's requirements and is unlikely to provide a moisture proof barrier;
- The laundry deck ribbon plate is not separated from the cladding and there is evidence of previous leaking through the fixings, which have recently been resealed;
- The handrail balustrade fixings to the laundry deck penetrate the cladding;
- Some downpipe fixing clips had been installed prior to the coating of the cladding;
- There is no visible seal to the electric light fittings; and
- The ridge flashings were not dressed down onto the roofing leaving openings for moisture that could run down the roofing underlay. The underlay did not extend into the gutters, and consequently, any discharge would drain into the eaves soffit. The staining on the soffits in a number of locations is indicative of this problem.

The expert noted that the east elevation gutter was partially blocked and as the back of the gutter was lower than the front, water could enter the cladding via the eaves soffit. The expert also considered that the gutter and/or the outlet might be undersized taking into account the size of the roof that they serve. The drainage channel in front of the garage was incomplete as it was surrounded by stones and not permanently secured with concrete.

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, and readings at the corner of some of the windows registered “borderline” readings. The expert also took further readings with an intrusive meter, and the readings over 18% were as follows.

- A reading of 18.3% at the under house framing;
- A reading of 18.7% at a stud in the living room;
- A reading of 19.1% at a stud in bedroom 2;
- Readings of 19.5% and 20.2% at the studs of the master bedroom;
- A reading of 21.0% at the bedroom 1 cut out;
- A reading of 21.4% at the floor under the office window;
- A reading of 22.9% at a stud in the study; and

- A reading of 33% at the dining room floor level.

Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. The expert also observed fungal growth at one bottom plate location and staining on and adjacent to the eaves soffits.

5.3 The expert also commented on the remedial work that had already been undertaken by the owner where water ingress had occurred and which was visible where areas had been opened up for repair. The expert noted that:

- Water stained timber had been left in place, and no preservative treatment had been applied to it;
- As no samples had been taken for laboratory analysis, the extent of the decay, how much timber was affected and the loss of structural strength, had not been established;
- The new framing that had been installed was untreated;
- No repairs had been carried out on the building wrap; and
- The application of sealant to repair the roof flashings was inadequate and not likely to be durable.

5.4 In response to a comment on the Notice to Rectify, the expert noted that as the pole supports terminated at the underside of the ground floor level, the use of this cladding in this situation did not contravene the manufacturer's recommendations in this respect.

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

## **6 DISCUSSION**

### **General**

6.1 I have considered the submissions of the parties, the expert's report and the other evidence in this matter. The 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 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, I believe 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 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. I believe 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, I believe 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, I find that the house:
- Has 450mm wide eaves projections that provide some protection to the main cladding areas, although the 200mm wide verge projections offer only minimal protection. Roof projections afford additional protection to both of the smaller decks;
  - Is in a low wind zone;
  - Is one storey high and, because of the pole foundation construction, would be more liable to lateral movement;

- Has flashings to the heads of the exterior joinery units, but there is no sealant strip to the jambs;
- Has some roof/cladding junctions;
- Has three attached decks, which are not built over habitable spaces and which will drain freely because the decking is gap boarded; and
- Has external walls constructed with timber treated to an H1 LOSP level that will not prevent decay if it absorbs and retains moisture.

### **Weathertightness performance**

- 6.8 I find that the cladding in general does not appear to have been installed according to good trade practice. As a result, there are a number of identified defects, which are set out in paragraph 5.1 and in the expert's report, which have contributed to the high levels of moisture penetration already evident in locations of the external walls of the house. The main areas of concern are the lack of vertical control joints, the cracking of the cladding, the defective apron flashings, insufficient ground clearance, the lack of sealing strips to the jambs of the exterior joinery units, and the sealing of penetrations. The failure to carry the roofing underlay into the gutters and the apparent inadequacy of the gutters themselves is also of concern. The expert has attributed the majority of the leaks to the apron flashings, the exterior joinery units and the roof and its associated gutters. In addition, the external wall framing timber is H1 LOSP treated and thus unable to delay the onset of decay if it gets wet. As reported by the expert, there is already visible evidence of decaying timber and fungal growth.
- 6.9 I consider that the remedial work that has already been carried out by the owner is unsatisfactory and has not prevented the continued ingress of moisture. In addition, the repairs to the decaying timber have not been carried out in accordance with good trade practice. The use of new untreated timber when making the repairs is also unwise. It is stressed that no new remedial work should be carried out until there has been full consultation with the territorial authority, as described in paragraph 7.2.
- 6.10 I am also concerned that there appears to be an over reliance on sealants at cladding junctions and intersections on this house and that these sealants have not been fully effective.
- 6.11 The expert has noted that the laundry entrance deck is located above the level of the study. I note that the boarding is gapped at this location and consider that this should provide adequate drainage of moisture away from the wall cladding.
- 6.12 I note that two elevations of the building demonstrate a moderate weathertightness risk rating, and two elevations of the building demonstrate a low weathertightness risk rating when calculated by 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 I am 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 paragraphs 5.1. I have also identified the presence of a range of known weathertightness risk factors in this design. The presence of the risk factors on their own is not necessarily a concern, but they have to be considered in combination with the significant faults identified in the cladding system. It is that combination of risk factors and faults that indicate that the structure does not have sufficient provisions that would compensate for the lack of a ventilated cavity. Consequently, I am not satisfied that the cladding system as installed complies with clause E2.3.2 of the building code.
- 7.2 I find that because of the apparent complexity of the faults that have been identified with this cladding, I am 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. I consider that any final decisions 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 their 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 I 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 I take 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. I recognise 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, I decline to incorporate any waiver or modification of the building code in its determination.

## **8 THE DECISION**

- 8.1 In accordance with section 20 of the Building Act 1991, I hereby determine that the cladding system as installed does not comply with clause E2.3.1 of the building code and accordingly confirm the decision of the territorial authority to refuse to issue a code compliance certificate.
- 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 me to dictate how the defects listed in paragraph 5.1, 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 Chief Executive for another determination.

- 8.3 Finally, I consider that continuing maintenance of the cladding will be required to ensure its continuing building code compliance.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 21 December 2004 by John Gardiner, Determinations Manager.

.....