

Determination 2005/74

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 64

1 THE DISPUTE TO BE DETERMINED

- 1.1 This is a determination of a dispute referred to the Chief Executive of the Department of Building and Housing (“the Chief Executive”) under section 17 of the Building Act 1991 (“the Act”) as amended by section 424 of the Building Act 2004. 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 2-year old house unless changes are made to its monolithic cladding system.
- 1.2 The question to be determined is whether on reasonable grounds the external monolithic wall cladding as installed to the walls of this house, (“the cladding”), 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 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 Building Industry Authority (“the Authority”) to the Chief Executive.

- 1.4 This determination refers to the former 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 In making my decision, I have not considered any other aspects of the Act or the building code.
- 1.6 The house itself is described in paragraphs 2.1 to 2.3, and paragraph 8 sets out the decision.

2 PROCEDURE

The building

- 2.1 The building is a two-storey detached house situated on a level site in a low wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house is of conventional light timber frame construction on concrete block foundation walls. All the external walls are sheathed with monolithic cladding. The house is of a relatively simple shape with the roofs situated on two main levels, and the lower roofs have intersections with the cladding above. The upper floor is cantilevered out to form a 4000mm long balcony, the deck of which is sheathed with a fibreglass waterproof membrane over plywood sarking. The balcony has a timber-framed balustrade to the front and one end, which is sheathed with the cladding on both faces and the top is finished with a wooden capping and a timber handrail. A small cantilevered canopy roof has been constructed over the main entrance and this abuts the cladding on two edges and has a small gable infill wall to its freestanding end. A polystyrene moulding has been installed between the two levels of the house. An open pergola is attached to the northern face of the house and is supported on timber posts. Apart from an overhang of the main roof over the balcony, there are no eaves projections.
- 2.2 The builder advised the expert engaged by the Authority that the framing in the external walls is treated against decay. While the approved plans and specification specify H1 Boric treatment for this timber, no further evidence has been provided to verify this.
- 2.3 The external walls of the building are clad with what is described as monolithic cladding. In this instance it incorporates fibre-cement backing sheets fixed through the building wrap directly to the framing timbers and finished with a textured spray finish and an acrylic paint system. The expert engaged by the Authority has identified the type of backing sheet used and that the finish was textured plaster. However, no other evidence has been produced as to which jointing, sealing, plaster

or paint systems have been applied on this house. While the territorial authority in its Notice to Rectify, has described a named type of cladding, which is a thick plaster mesh reinforced system, I accept that the cladding to the house has a textured spray finish as described by the expert. I also note that the consent plans refer to cedar weatherboarding and a fibre-cement backing sheet as forming the external cladding. The territorial authority in its documentation has not referred to this amendment.

Sequence of events

- 2.4 The territorial authority issued a building consent on 1 February 2002.
- 2.5 The territorial authority carried out various inspections during the course of construction, and passed the pre-building inspection on 27 March 2002 and the final inspection on 17 December 2002.
- 2.6 The territorial authority wrote to the builder on 21 January 2003, stating that a code compliance certificate would be issued on receipt of the following:
 1. Producer Statement for the Construction (piling, retaining walls, other building work).
 2. Engineers observation for the foundations.
- 2.7 The territorial authority carried out a further inspection and in a letter, dated 9 March 2004, the territorial authority stated that it had inspected the house, regretted that it may not comply with the building code in a number of respects and described the territorial authority's current concerns as regards weathertightness problems involving monolithic clad buildings. The territorial authority attached a copy of a Notice to Rectify, dated 9 March 2004, to this letter.

The "Particulars of Contravention" attached to the Notice to Rectify noted that in regard to the cladding:

1. The following have not been installed per the manufactures [sic] specifications
 - The exterior cladding system can be taken below finished ground, provided the bottom edge of the [Named cladding] is finished 50 mm below finished floor level, and a styrene screed and PVC moulding are installed between the bottom edge of the [Named product] and finished ground level. These clearances have not been achieved.
 - Control joints at a maximum of 4.0 centres vertically and at floor joist level horizontally are required. Control joints have not been installed vertically and I am unable to confirm horizontal control joints have been installed.
 - The junction between the bottom edge of the window joinery and the wall cladding is to have a sill flashing installed and the junction is to remain open. This junction has been sealed and no sill flashing appears to have been installed.
 - The minimum finished floor level to finished ground level is 150mm to paved surfaces. This clearance has not been achieved.

- The bottom edge of the aluminium joinery has been sealed to the cladding: this should have a sill flashing installed and be left open to allow water egress.
2. The following items have not been installed per the acceptable solutions of the building code, (no alternative solutions have been applied for)
- The distance between finished floor level and finished paving of 150mm has not been achieved.
 - Two outlets are required to internal gutters/decks. The cross-sectional area of the outlet shall be not less than the cross sectional area of the downpipes serving the gutter/deck. The minimum internal diameter permitted is 63mm. The overflow outlet for the deck off the master bedroom is less than permitted.
3. The following items have not been installed per accepted trade practice
- At the junction between horizontal surfaces (i.e. top of barrier) and a vertical surface (i.e. house wall) flashing (*sic*) are required. The deck barrier/house junction has no flashing installed.
 - All flashings are to be installed in such a way to direct water away from the building, and prevent ingress of moisture. The garage roof, gable end wall junction flashings have not been installed to direct water away from the wall and into the spouting.
 - A minimum clearance of 50mm is required between the cladding and adjacent surfaces. There is minimal clearance between the roof and wall flashings.
 - Penetrations through the cladding system shall be as waterproof as the cladding itself. There are a number of penetrations through the cladding that should be protected with rubber flanges and silicon.
 - Head flashings to project a minimum of 15mm past the edge of the window facing or flange, and the front edge at the ends of the flashing to be bent up. The head flashings do not project 15mm nor are they bent up.
4. Ventilated cavity system
- The Council has recently received information which shows that monolithic cladding systems without a drainage plane/cavity, provision for adequate ventilation, drainage and vapour dissipation will, in the likelihood of leakage and/or the effects of residual moisture, cause irrevocable damage to the structural elements of the building.

The territorial authority also noted:

The Council cannot be satisfied that the above building meets the performance requirements of Clauses B1 Structure, B2 Durability, E2 External Moisture, E3 Internal Moisture, G4 Ventilation and H1 Energy Efficiency Provisions of the Building Code... This is in breach of Sections 7(1), of the Building Act 1991...

Also that the owner was required to:

1. Provide adequate ventilation to the monolithic cladding and into the wall frame space by means of either a ventilated cavity or alternative approved system, and ensuring all issues related to the above are resolved.

2. Lodge with the council an application, within 28 days from the date of this notice, for an amended building consent, and provide all necessary information that may be requested to allow this consent application to be processed, alternatively.
3. Confirm to council, within 28 days from the date of this notice, your intention to apply to the Building Industry Authority for a determination in accordance with the Building Act 1991

The territorial authority also provided a set of photographs relating to the cladding.

2.8 The owner applied for a determination on 25 May 2004.

3 THE SUBMISSIONS

3.1 The owner provided copies of:

- The building plans;
- The territorial authority's inspection reports;
- The Notice to Rectify;
- The consultant's report; and
- Correspondence with the territorial authority.

3.2 The territorial authority in a letter to the Authority, dated 28 October 2004, listed:

- The Particulars of Contravention as being clauses of the building code B1 Structure, B2 Durability, E2 External Moisture, E3 Internal Moisture, G4 Ventilation and H1 Energy Efficiency, and
- The specific construction defects as being in the following areas:
 - Ground clearances,
 - Control joints,
 - Flashings,
 - Drip edges,
 - Provision of outlets,
 - Cracking, and
 - Insufficient means for dissipation of water where the water passes through the exterior cladding.

3.3 The territorial authority also forwarded copies of the following:

- The building plans and specifications;
- The consent documentation;
- The territorial authority's inspection reports;
- The Notice to Rectify; and
- Correspondence with the owner.

3.4 The builder wrote to the Authority on 14 June 2004, stating that the house was constructed in accordance with the cladding manufacturer's specifications at the time of construction, and also with the consent, which did not require a cavity wall system. The house had been inspected and passed throughout the construction period, including the final inspection on 17 December 2002. The builder also referred to the territorial authority's letter to the builder of 21 January 2003, as set out in paragraph 2.6.

3.5 The copies of the submissions and other evidence were provided to each of the parties.

3.6 Following the issue of the draft determination the owner commented in a letter received by the Department on 29 April 2005. The owner noted that there were no tiles on the balcony deck, and that the cladding differed from that shown on the consented plans. The owner also stated that the owner had not forwarded the letter from the builder dated 14 June 2004, and the territorial authority had not written to the owner on 21 January 2004. The owner noted that, while the original submission for a determination was made in May 2004, the application had gone astray and a new application was made in September 2004. I have made the appropriate amendments to the determination based on this letter from the owner, but these amendments have not affected the discussions and decision.

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. The relevant 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, which in my view remain valid in this case, 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 (“the expert”) to inspect and report on the cladding. The expert inspected the building and furnished a report. It

stated that the quality of finish is good, and both the plaster coating, which has been evenly applied, and the painting are of a good standard, except where noted otherwise in the report. The expert was unable to confirm whether a horizontal control joint had been installed under the horizontal mid-level band. The expert made the following specific comments on the cladding:

- The exterior joinery unit head flashings extend 10-15mm beyond the opening, whereas a minimum of 30mm is generally required, and the cladding has been brought hard down against the head flashing;
- There are no sill flashings installed to the exterior joinery units nor has an insole strip been applied behind the jambs and sills. In addition, the silicone bead to the edge of the units is not an acceptable substitute;
- A head flashing has not been installed over the garage doors;
- Vertical control joints have not been installed on either level;
- Sheet joints on the lower floor are showing signs of deterioration, and are peaking and bulging;
- The cladding has cracked at the junction of the balcony with the house and in several locations across the northern face of the building;
- The required 6 mm capillary break has not been provided at some locations where the cladding oversails the foundation wall;
- At several locations sputings, apron flashings, and fascias are buried in cladding or sealant, and there is no plaster or paint at some of these junctions;
- The spouting from two sides of the second storey has not been fitted with a stop-end or downpipe and discharges onto the lower roof of the garage;
- The pergola ribbon plate has been fixed directly to the cladding, no air gap has been provided, and there is bulging at the sheet joint below this connection, indicating possible moisture ingress;
- There is insufficient ground clearance between the bottom edge of the cladding and the lower-level roofing;
- There is insufficient clearance at the base of the cladding to the areas either side of the garage door opening and at the front entry;
- There are no flashings around the gas meter, the electrical meters and a wall vent;
- There are no flanges to the pipes that penetrate the cladding;
- The downpipe fixing bracket screws are not sealed;

- A TV cable penetrates the cladding, and a latch for a gate is affixed to the cladding; and
- In respect to the balcony:
 - There is minor cracking at the internal corner of the balustrade and the house,
 - There is also cracking in the cladding on the external face of the balustrade at the cantilevered end of the balcony which indicates that permanent downward deflection of this end has occurred
 - The bottom edge of the cladding to the inside face of the balcony has not been painted or sealed,
 - The capping has been top fixed into the horizontal surface of the barrier and the fixings penetrate the waterproof membrane,
 - No saddle flashings have been installed between the house and the balustrade and there is cracking around this junction, and
 - The overflow from the balcony is undersized (approximately 30mm) and its position is too high should the deck be subjected to flooding.

5.2 The expert took moisture readings of the external wall cavities through the internal wall linings throughout the house and obtained only one reading over 18 %. This was in the garage, where 20 % was recorded. The expert then used an invasive type moisture meter to investigate 10 locations, and 3 readings of 21.9%, 24.5% and 27.5% along the bottom plate of the garage, exceeded 18%. 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. Neither party made a submission in response to the expert's report.

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 and E2 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 research and experience, both international and local, 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, it is believed 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. 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 consider 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 this house:

- Has with one minor exception, no eaves projections that could provide some protection to the cladding;
- Is built in a low wind zone;
- Is two stories high;
- The jambs and sills of the exterior joinery units lack flashings and inseal strips, and there are no sill flashings installed.
- Has an overall envelope that is relatively simple on plan, with roofs at the two main levels and intersections and junctions with the cladding;
- Has a cantilevered upper-level balcony that is exposed on plan;
- Has an open pergola to one elevations of the house; and
- Has external walls constructed with untreated timber that is likely to 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 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 I observe that the head flashings to the exterior joinery units extend 15mm beyond the opening, whereas 30mm is required by the manufacturer's instructions. However, I consider that this is not an issue that would affect the weathertightness of the house. Neither the territorial authority nor the expert were able to verify the existence of a horizontal control joint under the mid-floor moulding. As a control joint is required at this location, I suggest that this issue be further investigated, and that a horizontal control joint be installed if one is not present.

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 I note that the original plans show construction plywood installed under the tiled roofing, and that this constituted the required roof bracing. The roofing eventually installed on the house does not include this plywood, and I recommend that the issue of roof bracing be thoroughly investigated to ensure that this element is code compliant.
- 6.12 I note that two elevations of the building demonstrate a high weathertightness risk rating and the two remaining elevations a medium 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 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 paragraph 5.1 and in the expert's report. The main areas of concern are the lack of some control joints, the evidence of cracking, the ineffective apron flashings, insufficient ground clearances, the balcony issues, and the sealing of penetrations. In addition, the question of a horizontal control joint should be investigated. 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 drained and ventilated cavity. Consequently, I am not satisfied that the cladding system as installed complies with clause E2 of the building code.
- 7.2 In addition, the building is also required to comply with the durability requirements of clause B2. Clause B2 requires that a building continues to satisfy all the objectives of the building code throughout its effective life, and that includes the requirement for the house to remain weathertight. Because the cladding faults in the house are allowing the ingress of moisture, the house does not comply with the durability requirements of clause B2.
- 7.3 I find 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 clauses B2 and 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.

- 7.4 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.
- 7.5 In the circumstances, I decline to incorporate any waiver or modification of the building code in its determination.
- 7.6 I note that the original plans show construction plywood installed under the tiled roofing, and that this constituted the required roof bracing. The roofing eventually installed on the house does not include this plywood, and I recommend that the issue of roof bracing be thoroughly investigated to ensure that this element is code compliant.
- 7.7 The Authority has previously issued a public warning about the dangers presented by balconies that might be affected by timber decay. I have assumed for the purposes of this determination that the balcony framing timber is untreated and also note that part of the balcony is cantilevered. I agree with the expert that H3 treated framing timber should have been used at this location, and recommend that if the existing timber is not replaced, additional vertical support be provided to remove the cantilevered aspect of the balcony. In a letter to the Department dated 25 January, the territorial authority requested that the determination should be amended to include non-compliance with clause B2 of the building code in respect of the comments made in this and the preceding paragraph. However, in both instances these are matters that require further investigation by the territorial authority so that it can assure itself that the roof and balcony are code compliant. Further, I note that the territorial authority referred to neither of these issues during any of its inspections, and this casts doubt on the efficacy of the territorial authority’s inspection processes.

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 clauses B2 and E2 of the building code and accordingly confirm the decision of the territorial authority decision 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 to Fix 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 Chief Executive of the Department of Building and Housing on 19 May 2005.

John Gardiner
Determinations Manager