

Determination 2005/135

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 115

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 as amended by section 424 of the Building Act 2004 (“the Act”). The applicants are the 2 joint owners (referred to throughout this Determination 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 5-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 on all the timber framed external walls of the house (“the cladding”), 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 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 Building Act or the Building Code.
- 1.6 The house itself is described in paragraphs 2.1 to 2.4, and paragraph 8 sets out my decision.

2 Procedure

The building

- 2.1 The building is a two-storey detached house with a single-storey attached garage, situated on a level site in a medium 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 and all the external walls, with the exception of the block wall to the east elevation of the garage, are sheathed with monolithic cladding. The house is of a generally simple shape, with colour-coated steel tiled roofs at two main levels. The lower roofs have hips and roof/wall junctions. There are no eaves projections to the lower roofs and the upper roofs have 256mm wide eaves and verge projections. The eaves have copper gutters that give an additional 125mm projection. A pergola that was shown on the consent drawings has not yet been constructed.
- 2.2 The builder has informed the Authority that the wall framing timber was H1 treated, but not to what level. No further evidence has been provided as to what treatment, if any, was applied to the exterior wall framing.
- 2.3 All the timber-framed external walls of the house are clad with a stucco system that is described as monolithic cladding. In this instance it incorporates fibre-cement backing sheets fixed through the building wrap directly to the framing timbers, reinforcing mesh spaced off the backing and a 25mm thickness of solid plaster. The plaster in turn is finished with a proprietary acrylic waterproof membrane system. No information has been given as to what jointing and plaster systems were applied to the house.

- 2.4 The plastering company that carried out the work issued the confirmation certificate that is described in paragraph 3.6.

Sequence of events

- 2.5 The territorial authority issued a building consent sometime in 1999. Certain requirements that are conditions of the consent were imprinted on the consent drawings by the territorial authority.
- 2.6 The territorial authority carried out and passed various inspections while the house was being constructed. Following a final inspection, the territorial authority noted in a “Final Check List”, dated 2 April 2003 that the cladding clearances from ground level did not pass this inspection.
- 2.7 On 2 July 2003, the territorial authority wrote to the owner, and attached a copy of an invoice relating to code compliance certificate fees.
- 2.8 The territorial authority wrote to the owner on 16 June 2004, stating that it had inspected the house, regretted that the house may not comply with the Building Code in a number of respects and described the territorial authority’s current concerns about weathertightness problems involving monolithic clad buildings. To this letter the territorial authority attached a copy of a Notice to Rectify dated 16 June 2004.

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

1. The following items have not been installed per the manufactures [sic] specifications
 - The bottom edge of the cladding system is to finish minimum 100mm above paved surfaces and 175mm above unpaved surfaces. The cladding has been taken closer that these measurements.
 - The bottom edges of the sheet must be capped to stop any moisture wicking. This has not been done.
2. The following items have not been installed per the acceptable solutions of the Building Code, (no alternative solutions have been applied for)
 - The minimum finished floor level to finished ground level is 150mm to paved surfaces, and 225mm to unprotected ground. This clearance has not been achieved.
3. The following items have not been installed per accepted trade practice
 - All flashings are to be installed in such a way as to direct water away from the building, to prevent the ingress of water. The head of the garage door has no flashing installed.

- A minimum clearance of 35mm is required between the cladding and adjacent surfaces. There is minimal clearance between finished ground level and wall claddings.
- The finished cladding system, including the plaster coatings is to be taken up behind spouting, fascia boards and the like. The plaster finish is unsealed at the spouting end and there is no gap between the Cedar fascia and wall cladding.

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 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.

- 2.9 In a letter to the owner dated 29 July 2004, the territorial authority listed the various items of correspondence that had passed between the parties, and also stated that the territorial authority had not been in a position to consider the issue of a code compliance certificate until 8 March 2004, when all the requested documentation had been received. However, the territorial authority was unable to issue the code compliance certificate because of concerns that had arisen regarding weathertight issues in relation to monolithic cladding.
- 2.10 The owner applied for a Determination on 5 August 2004.

3 The submissions

- 3.1 The owner in a letter to the Authority dated 4 August 2004, noted that the house was completed in November 1999, and that the territorial authority had carried out a final inspection on 30 May 2003. The owner stated that the territorial authority advised on 2 July 2003 that a code compliance certificate would be issued on payment of the requisite fee, provision of site inspection records, and provision of “as built drainage record”. The owner complied with the first two requests, but did not supply the drainage plans until February 2004, at which time the territorial authority declined to issue a code compliance certificate. The owner stated that a registered engineer was used, named the builder and noted that only qualified tradesmen were used on the house.
- 3.2 The owner also provided copies of:
- The building plans;
 - The territorial authority’s inspection notes;
 - The correspondence with the territorial authority;
 - Correspondence from the builder as described in paragraph 3.3, including attached letters; and
 - A set of photographs.
- 3.3 The builder in a letter to the Authority dated 2 September 2004, set out the builder’s experience and credentials, noted that territorial authority inspections were carried out and passed, and described the construction process, which included the use of H1 treated wall framing and the installation of head, sill and jamb flashings to the exterior doors and windows. The builder also referred to, and attached, reports as detailed below from an independent inspection consultancy firm and the painter, together with a confirmation statement from the plasterer.
- 3.4 The consultancy firm in a report to the owner dated 23 August 2004, noted that as regards the cladding, non-invasive moisture tests taken against the interior linings of the outside wall had disclosed that readings to the left-hand side (the hinged side) of the dining room door were between 26% and 30 %. It was considered that cracking at the joinery/plaster junction was a likely cause of the moisture ingress, and that this could be easily remedied. I note that the builder in the letter to the Authority attributes the constant use of the door and its contact with the cladding as the cause of the cracking.
- 3.5 The painter, in a letter to the owner dated 26 August 2004, confirmed the type of acrylic waterproofing membrane that was applied to the plaster, warranted the application and materials for an undisclosed time and attached the manufacturer's instructions for the paint finishes.

3.6 The plasterer in an undated handwritten note, confirmed that all procedures were carried out as per good stucco trade practice, and noted that correct materials were used and that the plaster had passed all inspections

3.7 The territorial authority forwarded information to the Authority on 18 November 2004 and also noted:

Particulars of Contravention

As detailed in the NTR the areas of contravention relate to six clauses of the Building Code, namely:

- B1 structure,
- B2 durability,
- E2 external moisture,
- H3 internal moisture,
- G3 ventilation, and
- H1 energy efficiency.

Specific construction defects may be grouped into the following areas:

- Ground clearances
- Moisture wicking
- Flashings
- Insufficient means for dissipation of water where the water passes through the exterior cladding.

3.8 The territorial authority also forwarded copies of:

- The Notice to Rectify;
- Correspondence with the owner;
- The territorial authority's Final Checklist and Site Meeting Check List; and
- A set of photographs illustrating some of the territorial authority's concerns.

3.9 Copies of the submissions and other evidence were provided to each of the parties.

3.10 The territorial authority commented on the Draft Determination on 19 September 2005. In particular, the territorial authority was concerned that paragraphs 6.8 and 8.2 indicate a scope of work required to make the house code compliant. The territorial authority stated that this is not part of the Determination.

3.11 The owner accepted the Draft Determination on 10 March 2005.

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 current Acceptable Solution, E2/AS1, allows for solid plaster systems with fibre cement backing sheets, but requires that they be fixed on battens to create a 20mm cavity between the sheet and the framing. The previous acceptable solution E2/AS1, which was in force when this consent was issued, allowed for mesh reinforced solid plaster to be applied to fibre cement backing sheets that were face fixed to the framing. The cladding is not currently

accredited under section 59 of the Act. I am, therefore, of the opinion that the cladding system as installed must now 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 experts 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 the stucco finish is generally good. The paint finish is sound and well adhered, but it is discoloured and losing gloss in some areas. The thickness of plaster is approximately 25mm at the base of the cladding, and this exceeded the recommendations of NZS 4251 by 4 mm. The expert removed a small section of the plaster to examine a sill/jamb intersection of one window, and found that both jamb and sill flashings had been correctly installed. A further invasive investigation was also made at one horizontal control joint. I accept that these exposed details are likely to be representative of the remaining joints and window and door flashings. The expert noted that the cladding and coating was continuous behind the spouting and plumbing. The expert’s report made the following specific comments on the cladding:

- The horizontal control joints do not comply with good trade practice. However, the expert did not identify any cracking that could be attributed to vertical movement;
- There are hairline cracks in the cladding at various locations, but these were limited and did not suggest a general failure of the plaster;
- There is a crack beneath the surface of the cladding on the east elevation of the house, which may be attributed to the lack of a vertical control joint to this wall;
- On three walls, the distance between vertical control joints exceeded the 4000mm recommended by E2/AS1. The dimensions of these walls are 5900mm, 6300mm, and 6900mm respectively. The expert commented that there was no cracking in two shorter walls;

- The base of the plaster was finished square, without a drip feature or a gap between the foundation wall and the cladding;
- There is insufficient ground clearance to the base of the cladding at both sides of the garage door;
- The ends of the roof apron flashings had no “stop” details. In this respect, the expert noted that remedial work had been undertaken that had remedied for the time being the leak adjacent to the breakfast/family room door to the garden, which had produced a reading of 26% to 30% as recorded by the consultancy firm engaged by the owner; and
- The expert had concerns that some of the penetrations through the cladding would remain adequate only if properly maintained.

- 5.2 The expert carried out a series of moisture tests at the interior linings of the exterior walls of the house, using a non-invasive meter. While the majority of the readings were in the “safe/air dry” range, there were some readings in the “borderline” range adjacent to some windows. The expert then took a further 5 invasive readings in the timber framing and obtained readings of 9.1%, 11.7%, 12.2%, 12.5% and 14.6%. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure.
- 5.3 The expert also noted that a “bell cast drip” having a 45 mm projection had been installed on the plaster over the garage door head to compensate for the flush joinery and the lack of a flashing. The expert considered that this appeared to be adequate to discharge rain and run-off clear of the door head.
- 5.4 Copies of the expert’s report were provided to each of the parties.

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 Recent research 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 In my opinion, the 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 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. It is believed 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 no eaves projections that could protect the cladding at the lower level, and 256 mm wide eaves and verge projections at the higher level, which even with the added spouting projections only provide minimal cladding protection;
- Is built in a medium wind zone;
- Is two storeys high;
- Is generally simple in plan, but has wall/roof junctions to the lower level roofs;
- Has exterior windows and doors that are fully flashed;
- Has no balconies or decks;
- Has external walls, that I accept are constructed with timber treated to an H1 level that is likely to decay if it absorbs and retains moisture; and
- Has no vertical control joints installed, contrary to the terms of the consent and to good trade practice.

Weathertightness performance

6.8 Generally, apart from the absence of vertical control joints, the cladding appears to have been installed according to good trade practice, and I consider it has been effective to date in preventing the penetration of water. There are, however, some defective areas of the house, which if not remedied, will eventually allow the ingress of moisture behind the cladding. These are set out below:

- The hairline cracks in the cladding at various locations, and the crack beneath the surface of the cladding on the east elevation of the house;
- The lack of a drip feature or a gap between the foundation wall and the base of the cladding;
- The insufficient ground clearance to the base of the cladding at both sides of the garage door; and
- The lack of “stop” details to the ends of the roof apron flashings.

- 6.9 Notwithstanding the fact that the backing sheets are fixed directly to the timber framing, thus inhibiting drainage and ventilation behind the cladding sheets, I find that there are compensating factors that assist the performance of the cladding in this particular case. These are:
- Generally, the cladding appears to have been installed according to good trade practice;
 - The exterior windows and doors have effective flashings;
 - There are no decks or balconies; and
 - There is no moisture evident at this time in the external wall cavities.
- 6.10 I consider that these factors adequately compensate for the lack of a full drainage and ventilation cavity and can allow the house to comply with the weathertightness and durability provisions of the Building Code.
- 6.11 I note that the expert does not consider the horizontal control joints comply with good trade practice, and that some walls have dimensions that require vertical control joints to meet the manufacturer's recommendations. However, the expert went on to say that there is no evidence of cracking that could be attributed to vertical movement after 5 years of its life. Nor has the territorial authority considered the horizontal joint or the lack of vertical joints to be problems in its Notice to Rectify, despite its having clearly made the installation of such joints a condition of the consent by imprinting that requirement on the consent drawings. I applaud the territorial authority for considering so carefully the requirement for such joints and for recording its requirements so transparently on the consented drawings. I am surprised that the owner's failure to comply with those requirements, contrary to s80 (a) of the Building Act 1991, was not mentioned in the territorial authority's submission or in correspondence with the owner. I accept that the horizontal control joints are installed and functioning correctly and that to retrofit vertical joints now will be a difficult task to execute properly. I also accept that the drip projection that has now been installed over the garage door head is an acceptable alternative to a head flashing.
- 6.12 I note that two elevations of the house demonstrate a moderate weathertightness risk rating and two elevations demonstrate a high weathertightness risk rating 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 consider that the expert's report establishes there is no evidence of external moisture entering the house, and accordingly, that the monolithic cladding does comply with clause E2 at this time.

- 7.2 However, 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 likely to allow the ingress of moisture in the future, the extension does not comply with the durability requirements of clause B2.
- 7.3 I also consider that because the faults in the house cladding occur in discrete areas, I am able to conclude that rectification of the identified faults is likely to bring the cladding into compliance with the code. Once the cladding faults listed in paragraph 6.8 have been satisfactorily rectified, this house should be able to remain weathertight and thus comply with both 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 I emphasise that each Determination is conducted on a case-by-case basis. 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.
- 7.6 I decline to incorporate any waiver or modification of the Building Code in this Determination.

8 The decision

- 8.1 In accordance with section 20 of the Act, I determine that the house is weathertight now and therefore the cladding complies with clause E2. However, as there are a number of items to be remedied to ensure it remains weathertight and thus meet the durability requirements of the code, I find that the house does not comply with clause B2. Accordingly, I confirm the territorial authority’s decision to refuse to issue the code compliance certificate.
- 8.2 I find that once the items of non-compliance that are listed in paragraph 6.8 are rectified to the approval of the territorial authority, together with any other instances of non-compliance that become apparent in the course of rectification, the cladding as installed on the house will comply with the Building Code, notwithstanding the lack of a drainage cavity.

- 8.3 I note that the territorial authority has issued a Notice to Rectify requiring provision for adequate ventilation, drainage and vapour dissipation. 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. It is not for me to dictate how the defects described in paragraph 6.8 are to be remedied.
- 8.4 I would suggest that the parties adopt the following process to meet the requirements of clause 8.3. Initially, the territorial authority should issue the notice to fix, listing all the items that the territorial authority considers to be non-compliant. The owner should then produce a response to this in the form of a technically robust proposal, produced in conjunction with an expert, as to the rectification or otherwise of the specified issues. Any outstanding items of disagreement can then be referred to the Chief Executive for a further binding determination.
- 8.5 Finally, I consider that the cladding will require on-going maintenance to ensure its continuing code compliance.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 29 September 2005.

John Gardiner
Determinations Manager