

Determination 2005/19

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 17

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 applicant is one of the two building owners (referred to 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 an extension to an existing house (“the extension”) and a separate garage, unless changes are made to their monolithic cladding systems, which have been in place for 5 years.

1.2 The question to be determined is whether on reasonable grounds that the external monolithic wall cladding as installed to all the external walls of the extension and to 3 external walls of the garage (“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 2.3, and paragraph 8 sets out my decision.

2 PROCEDURE

The building

- 2.1 The main building work is a basement extension to an existing single-storey detached house situated on a slightly sloping excavated site in a medium wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. There are also some alterations and extensions to the existing ground floor of the building. The extensions are of conventional light timber frame construction on concrete block foundation walls and all the new external walls are sheathed with monolithic cladding. The extension is of a generally simple shape and has timber windows and doors inset into the cladding reveals. The existing ground floor balcony has been extended a further 1000mm in width with a timber-framed deck lined with construction plywood. The altered balcony extends over a new living space and both the new and existing decks are lined with ceramic tiles over a butyl-rubber waterproof membrane with the exposed edges of the tiled deck finishing above a copper gutter. The balcony has galvanised mild steel balustrades fixed through the tiling and membrane or to the existing wall cladding. The existing upper floor above the extension has 300mm wide eave projections. The separate garage is constructed on a concrete slab, with one concrete block external wall and the remaining external walls being timber framed and monolithic clad. The garage is of a simple rectangular shape with timber exterior joinery units and a pitched corrugated steel roof that has 200mm wide eave projections.
- 2.2 No evidence has been provided as to what treatment, if any, was applied to the exterior wall framing.
- 2.3 All the new timber framed external walls of the extension and garage 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 20mm minimum thickness of solid plaster. The plaster in turn is finished with a 100% acrylic high-build paint system. No information has been given as to what jointing, plaster and paint systems were actually applied to the extension and the garage.

Sequence of events

- 2.4 The territorial authority issued a building consent in 1995, and a building consent, which amended the study to form an ensuite bathroom, and for the installation of a gas-burning heater, was issued on 16 June 2000.
- 2.5 According to the owner, construction commenced in early 1996 and the cladding system was completed by October 1999. The territorial authority carried out and passed various inspections during the course of construction. The territorial authority carried out a further inspection on 9 January 2004, and the “Final Check List” covering this inspection noted, “stucco plaster system is not on a cavity system”. The territorial authority undertook a final inspection on 23 April 2004, and a Notice to Rectify, dated 19 May 2004, was subsequently issued. The “Particulars of Contravention” attached to the Notice to Rectify noted that in regard to the cladding:

A site inspection of [the] property carried out on the 23 April 2004 revealed that the exterior cladding of the new building constructed at the above address is a monolithic cladding system (stucco on [backing sheet]) with no provision for ventilation of the wall space.

1. 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 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

- 2.6 The owner applied for a determination on 14 June 2004.

3 THE SUBMISSIONS

- 3.1 The owner made a submission, dated 16 June 2004, in a covering letter sent with the owner’s documentation. This set out details of the construction progress and noted the inspections carried out by the territorial authority. The owner stated the

cladding, which had been completed in 1999, shows no sign of leaking or cracking and had been carried out in accordance with the manufacturer's approved methods. The territorial authority had approved the cladding system and had made no amendments to the consent documentation. The owner also noted that the house had large eaves and it was not foreseen that there would be any cladding problems.

3.2 The owner also provided copies of:

- The building plans;
- The building consent documentation;
- The territorial authority's inspection notes; and
- The Notice to Rectify.

3.3 The territorial authority forwarded a lengthy submission. The bulk of the submission was a general comment on monolithic cladding, although some of the material related to this particular house, and stated that:

1. The principle design and current construction methods are the primary failure in the stucco wall system comprising stucco, backing boards building paper, timber frame, fibreglass insulation (batts) and plasterboard in that it is defectively designed as in Auckland conditions it results in a RH (relative humidity) in the timber wall cavity sufficiently high for mould and rot to grow. Current construction methods do not provide for ventilation and a drainage plane.
2. The secondary failure is that work in excess of normal maintenance is required to keep the stucco and wall elements of sufficiently low moisture content to prevent the effects of the primary failure from reoccurring even if all the water entry points were eliminated.
3. The third failure of the stucco system is that it is an inflexible cladding and does not allow for the expected movement associated with timber frame construction, and thereby cracks form and sealants tear letting water in.
4. Fourthly the building materials in the wall assembly are inadequate and there is no allowance for the consequence of failure of the system components or the system as a whole. Especially the timber frame the end result means the timber will degrade and be incapable of lasting 50 years as required by the Building Regulations.

3.4 The submission also included a copy of the Notice to Rectify and a set of photographs illustrating some of the territorial authority's concerns.

3.5 The territorial authority felt that it must refuse to issue a code compliance certificate on the grounds that there was insufficient scientific evidence on the performance of these building elements.

3.6 The territorial authority in a subsequent letter to the Authority, dated 24 August 2004, elaborated on its original submission and stated that its areas of concern were those itemised in the Notice to Rectify and then listed them in detail. The territorial authority, using the risk matrix contained in the revised Acceptable Solution E2/AS1, calculated the weathertightness risk to the house to be moderate. Apart from further generalised comments, the territorial authority noted

that the coating applicator is not the same company as manufactured the backing board, but is a well-known coating company.

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

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 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 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 about acceptable solutions and alternative solutions, which in my view remain valid in this case;

- 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 standard of workmanship throughout the extension both internally and externally is generally good and it appears that considerable effort has gone into detailing. The plaster generally was quite sound and was free from surface cracking. The expert removed a small section of the plaster to examine a head/jamb intersection of one exterior joinery unit, and found the flashings correctly installed. The expert was unable to determine whether sill flashing had been installed but there were no excessive moisture readings at the 3 affected windows. A further investigation was made of a horizontal joint between the new and existing plaster at the ground floor level. The expert noted that there was corrosion of the reinforcing mesh in the newer cladding at this location. I accept that these exposed details are likely to be representative of the remaining joints and joinery flashings. The expert noted that the garage was a low risk building, with the only area of concern being the cladding junction with the garden wall. However, in this respect, it appeared that a saddle flashing had been installed at this junction and moisture readings at this location were well within the "dry" range. The expert's report made the following specific comments on the extension cladding:

- At the ground floor level horizontal junction of the extension, the new plaster has been installed hard up against the original bead that encased the base of the existing plaster. In addition, no new Z or proprietary flashing, or an appropriate control joint is installed where the new plaster adjoins the casing bead;
- The reinforcing mesh to the newer plaster below the horizontal junction is quite heavily corroded, indicating that moisture is ingressing to the back of the plaster;

- There is insufficient ground clearance to the base of a small proportion of the cladding at the north elevation;
- The existing plaster is finished hard onto the balcony tiling;
- The balustrade fixing screws are set through the tiles and membrane or into the existing wall cladding and are inadequately protected or sealed; and
- Some penetrations through the cladding were not adequately sealed, including the light fittings, the clothes line fixings, the downpipe bracket fixings, the gas unit, and the hose taps.

5.2 The expert carried out a series of moisture tests at the interior linings of the exterior walls of both the extension and the garage, using a non-invasive meter, and all the readings were below 11%. The expert then took further non-invasive readings at potential risk areas of the exterior cladding and obtained a higher than normal reading at one location of the extension. This location was re-tested invasively and a reading of 11% was obtained at this point. 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. The owner responded by e-mail on 10 January 2004, stating that while there was general agreement with the expert's report, the owner wished to comment on some aspects of it. These comments are summarised as being:

- The area of higher moisture on the west area will be subject to future renovation, which would alleviate any future problems;
- The balcony had a two-pot epoxy/fibreglass waterproof membrane rising over 100mm above the finished level, it has not leaked and is covered by the house roof and overhanging eaves;
- While there is a minimum use of sealant at the cladding penetrations, it is sufficient, and no leaks have been detected at these locations; and
- The presence of a retaining wall footing and rock at the furthest north elevation has restricted the ground clearance and the location falls from this point to two stormwater cesspits. In addition, no moisture has been detected at this area.

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 accept 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 I consider that 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 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:

The extension:

- Has eaves projections 300mm wide to the existing upper floor that provide only minimal protection to the lower cladding;
- Is built in a medium wind zone;
- Results in a two storey high building;
- Is simple on plan;
- Has one ground floor level balcony constructed over a living space; and
- Has external walls that, in the absence of any information to the contrary, are constructed with untreated timber that is likely to decay if it absorbs and retains moisture.

The garage:

- Has eaves projections 200mm wide that provide only minimal protection to the cladding;
- Is built in a medium wind zone;
- Is single storey;
- Is simple on plan; and
- Has external walls that, in the absence of any information to the contrary, are constructed with untreated timber that is likely to decay if it absorbs and retains moisture.

Weathertightness performance

6.8 I have carefully considered the principal points in the territorial authority's main submission (and outlined in paragraph 3.3).

6.9 The territorial authority's general submission effectively questions the technical basis of a number of the benchmarks for assessing the likely code compliant performance of timber-framed construction in New Zealand and proposes that an alternative (and more conservative) benchmark be used to assess likely building code compliance for monolithically-clad buildings within its jurisdiction. The Authority considered and commented on these issues in determination no 2004/41. In essence, the Authority determined that the performance of building elements as installed in a house should be based on code compliance benchmarks established in the new external moisture acceptable solution E2/AS1, together with observations of the current state of the building, and not on the higher

performance levels suggested by the territorial authority. Accordingly, I have followed the Authority's approach in this determination.

- 6.10 Generally the cladding appears to have been installed according to good trade practice, and I consider that it has been effective to date in preventing the penetration of water. There are, however, some defective areas of the extensions, which if not remedied, will eventually allow the ingress of moisture behind the cladding. These are set out below:
- The new plaster to the extension being installed hard up against the original casing bead of the existing plaster at the ground floor level horizontal junction, with no flashing or appropriately sealed control joint having been installed at this junction;
 - The insufficient clearance to the base of a small proportion of the cladding at the north elevation. I note that the owner has indicated the difficulties for rectification presented by the rock base and retaining wall footing, and that the location is drained to two stormwater cesspits. Accordingly I suggest that the territorial authority take these matters into consideration when assessing the question of ground clearances; and
 - The inadequately sealed penetrations through the cladding.
- 6.11 I note that the expert's report has not referred to the need for vertical control joints in the plaster. However, I consider that the need for these joints should be examined against the requirements of E2/AS1, and that they should be installed if considered necessary. Likewise, the balustrade fixing screws should be examined, and remedial work carried out if they are incorrectly sealed or protected.
- 6.12 I accept the findings of the expert that that the flashings as installed to the windows and doors are effective, and consider that the lack of a sill flashing is compensated in this particular case by the timber sill projections.
- 6.13 While the existing plaster finishes hard onto the balcony tiling, as this location is well protected by the eaves or the recessed area, I do not consider that any remedial work need be carried out remedy this.
- 6.14 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 timber exterior joinery units have effective head and sill flashings
 - Both the extension and garage have simple shapes; and
 - There is no moisture evident at this time in the external wall cavities.
- 6.15 I consider that these factors adequately compensate for the lack of drainage and ventilation cavity and can allow both the extension and garage to comply with the weathertightness and durability provisions of the building code.

- 6.16 I note that all the elevations of the extension demonstrate a moderate 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 that there is no evidence of external moisture entering either the extension or the garage, and accordingly that the cladding on both the extension and the garage does comply with clause E2 at this time.
- 7.2 However, the buildings are 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 extension to remain weathertight. Because the cladding faults in the extension 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 extension 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 6.10, together with the vertical joint issues noted in paragraph 6.11, have been satisfactorily rectified, this extension 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 extension 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 6.10, together with the vertical joint issues noted in paragraph 6.11, 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 extension 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 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 6.10, or the vertical joint issues noted in paragraph 6.11, 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.
- 8.4 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 15 February 2005.

John Gardiner
Determinations Manager