Determination 2005/12

Refusal of a code compliance certificate for a building with a "monolithic" cladding system: House 10

1 THE DISPUTE TO BE DETERMINED

1.1 This is a determination by the Chief Executive of the Department of Building and Housing ("the Chief Executive") under section 17 of the Building Act 1991, as amended by section 424 of the Building Act 2004 ("the Act"). The applicant is the owner and the other party is the territorial authority ("the TA"). The application arises from the refusal by the TA to issue a code compliance certificate ("CCC") for a 7-year old extensive extension to a house ("the extension"), unless changes are made to its monolithic cladding system.

1.2 My task in this determination is to consider whether I am satisfied on reasonable grounds that the external monolithic wall cladding as installed ("the cladding"), to the walls of the extension 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 No other aspects of the Act or the building code have been considered in this determination.

1.6 The house itself is described in paragraphs 2.1 to 2.3 and paragraph 8 sets out the decision.

2 PROCEDURE

The building

2.1 The building is a large living area extension, with an attached carport, to an existing single-storey house situated on a excavated slightly sloping site in a medium wind zone in terms of NZS 3604: 1999 "Timber framed buildings". The extension is of conventional light timber frame construction on a piled timber-framed floor. The walls of the building are lined with a monolithic cladding. The extension is of a very simple shape, with the corrugated steel clad roof abutted into the existing building wall cladding. A timber-framed open boarded deck is constructed outside the master bedroom, and a small covered porch has been built over the rear door of the house. I note that neither the deck, the porch roof, nor the carport were detailed on the consent documents, and that the alignment of the new and existing buildings, the windows as installed, and the extended retaining wall are variations to the consented plans. These changes have not been raised as issues by the TA and there is no evidence that consents, where required, have been obtained for the amended building works. There are no eaves or verge projections on the extension.

2.2 The owner is of the opinion that the timber in the exterior walls of the extension is treated. However, no evidence has been produced as to the treatment, if any, of these timbers.

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 three-coat solid plaster. The plaster in turn is finished with a paint system.

Sequence of events

2.4 The TA issued a building consent on 19 May 1997.

2.5 The TA made various inspections during the course of construction, and passed the "Preline" inspection on 29 October 1997.

2.6 On 23 March 2004, the TA wrote to the owner stating that there were 9 items of building work requiring attention. One of these noted:

8. Complete plaster system, paint house, etc.

2.7 A final CCC inspection took place on 29 April 2004. The TA's "Field Sheet" for the latter inspection noted that the building had failed the inspection, and that there were "monolithic cladding NTR issues".

2.8 The TA issued a Notice to Rectify, dated 28 May 2004.

2.9 The owner applied for a determination on 7 July 2004.

3 THE SUBMISSIONS

3.1 The owner wrote to the Authority on 17 August 2004, stating that her son, a qualified plasterer with 24-years experience, had carried out the plasterwork, and also described the cladding. The owner noted that the house had been lived in for over 6 years, and that there have been no problems with mould on walls, damp patches, etc, despite the fact that the cladding had not been painted during this time.

3.2 The owner provided copies of:

- The building plans;
- Some of the consent documentation;
- The Notice to Rectify;
- Some of the TA's inspection sheets; and
- The correspondence with the TA.

3.3 The TA made a submission in the form of a letter, dated 25 August 2004, which confirmed that a building consent had been issued for the cladding and also stated:

> The work was undertaken during the period August 1997 to May 2004;
>
> Construction of the cladding was not the subject of the changed inspection procedures implemented by this Council as a consequence of a [Named] adjudication;
>
> In the absence of the additional inspections implemented as a consequence of those changed inspection procedures, and in the absence of a cavity as a first line of defence, the Council does not believe it is able to be satisfied, on reasonable grounds, that the cladding applied to this dwelling will achieve the functional requirements of Clause E2.2, or the performance requirements of E2.3.2, of the Building Code…

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

4 THE RELEVANT PROVISIONS OF THE BUILDING CODE

4.1 The dispute for determination is whether the TA's decision to refuse to issue a CCC because it was not satisfied that the cladding complied with clauses B2.3.1 and E2.3.2 of the building code (First Schedule, Building Regulations 1992) is correct. Those provisions of the building code provide:

Clause B2—DURABILITY

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

(a) The life of the building, being not less than 50 years, if:

(i) Those building elements (including floors, walls, and fixings) provide structural stability to the building, or

(ii) Those building elements are difficult to access or replace, or

(iii) Failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.

(b) 15 years if:

(i) Those building elements (including the building envelope, exposed plumbing in the subfloor space, and in-built chimneys and flues) are moderately difficult to access or replace, or

(ii) Failure of those building elements to comply with the building code would go undetected during normal use of the building, but would be easily detected during normal maintenance.

Clause E2—EXTERNAL MOISTURE

E2.1 The objective of this provision is to safeguard people from illness or injury, which could result from external moisture entering the building.

E2.2 Buildings shall be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.

E2.3.2 Roofs and exterior walls shall prevent the penetration of water that could cause undue dampness, or damage to building elements.

4.2 There are no Acceptable Solutions that have been approved under section 49 of the Act that cover this cladding. The 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, 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; and

- Usually, however, when there is non-compliance with one provision of an acceptable solution, it will be necessary to add some other provision to compensate for that in order to comply with the building code.

5 THE EXPERT'S REPORT

5.1 The Authority commissioned an independent expert ("the expert") to inspect and report on the cladding. The expert inspected the building and furnished a report. Except as noted otherwise, the exterior finish, including the plaster coating and painting, is generally of good quality. The plaster appeared to be of a consistent thickness and has been evenly applied. Horizontal control joints and expansion joints were not required in the plaster for this building. The owner informed the expert that the southern wall of the extension had only a scratch coat of plaster applied until this year, when the two final plaster coats and the paint finish was completed. According to the cladding applicator, the extension had only recently been painted at the request of the TA. The expert's report made the following specific comments on the cladding:

- No vertical control joints were present in those walls over 4000 mm long as required by the manufacturer's recommendations. To meet these requirements, one such joint was required to each of the east, west and north walls and two were required to the south wall;

- The bottom edges of backing sheets are unpainted, and the required 6mm clearance has not been provided between the base of the cladding and the foundations;

- The plaster is carried down over the foundations and into ground, allowing moisture to wick up the plaster;

- The raised garden beds, the sleepers, the steps, etc are erected against cladding;

- A 50mm clearance has not been maintained between the roofing and the wall cladding over lounge, kitchen, and dining area;

- There are no sill flashings, jamb flashings or jamb seals to the exterior windows and doors, and there is no head flashing to the window of the master bedroom adjacent to carport;

- No apron flashing are fitted at the junctions of the wall cladding and the roofing;

- The carport rafters are not fixed in the correct manner, lack the required 12mm clearance between the framing and cladding, and are not flashed;

- The downpipe brackets lack a silicone sealant behind fixings;

- The decking, the end of the retaining wall, and a spa pool fencing post are fixed hard up against cladding, whereas a 12mm clearance is required;
- The spouting abutting the wall beside existing and new structures is sealed to the cladding, whereas a free airspace should be provided;
- The cladding behind the spouting is unpainted;
- There are no saddle flashings installed where the porch roof rafters penetrate the cladding;
- There is inadequate sub floor ventilation, the significance of which is accentuated by the fact that the sub floor area is wet;
- A gully trap is partially enclosed under the sub floor area; and
- No flashings have been installed around the meter box, the light fittings, the clothesline, or the ventilation duct from bathroom.

5.2 The expert also noted that as the backing boards are installed as bracing elements, the building code requirement for its durability would be increased to 50 years.

5.3 The expert took moisture readings throughout the house at the interior linings of the external walls using an invasive meter. Raised moisture levels were recorded as follows:

- Readings of 14.1% to 18.3% and 15.8 to 21.1% in the lounge;
- Readings of 16.1% to 18.8% and 17.4% to 21.0% in the dining room;
- Readings of 18.9% to 22.0% and 19.3% to 30.0%+ in the master bedroom;
- Readings of 17.0% to 19.0% and 18.1% to 20.3% in bedroom 2; and
- Readings of 20.2% to 23.7% in the bathroom.

Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. The expert also removed a section of the internal lining in the dining room and in the master bedroom. These investigations revealed evidence of damage caused by the ingress of water, including the presence of white fungi spores on the master bedroom timber framing.

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

6 DISCUSSION

General

6.1 I have considered the submissions of the parties, the expert's report and the other evidence in this matter. The approach in determining whether building work complies with clauses B2.3.1 and E2.3.2, is to examine the design of the building, the surrounding environment, the design features that are intended to prevent the penetration of water, the cladding system, its installation, and the moisture tolerance of the external framing.

Weathertightness risk

6.2 International and local research and experience indicates that the impact of weathertightness problems in monolithic clad houses can be minimised if good and effective design and construction practices are followed.

6.3 The installation of exterior cladding to manufacturer's specifications and to accepted good trade practice is an important but not the only requirement to ensure good weathertightness performance.

6.4 The next priority is to reduce the ability of moisture to get through the cladding by using design measures that minimise the effects of the rain impacting on the walls.

6.5 Important matters for consideration are:

- Data show a strong relationship between the width of the eaves and the incidence of wall leaks. An effective deflection mechanism, such as eaves greater than 600 mm wide, has been shown by Canadian data to manage more than 90% of rain incidence;

- While most reported leaks are substantially caused by defects in the cladding that require little or no wind pressure differential, I believe that buildings in high and very high wind zones (as defined by NZS 3604) are likely to experience wind pressure differentials and thus a higher risk of water ingress;

- Taller buildings result in an effective increase in the catchment area of the wall. Available data suggests a clear correlation between higher number of storeys and an increased incidence of leaking;

- Complex roofs and overall envelope shapes where the roofs frequently intersect with the walls on upper floors create opportunities for leaks into the wall; and

- Recent data also shows that decks and balconies that are exposed in plan and/or cantilevered from the external walls are the most frequent location for water leaks.

6.6 Any likely penetration of moisture through the cladding can then be countered by a combination of effective drainage, ventilation of the drainage cavity and moisture tolerance in the external wall framing timber. In particular:

- The structure should allow water that has penetrated the cladding to drain out as quickly as possible. I believe that generally a drainage cavity should be provided behind the outer cladding barrier in monolithic construction;

- The design of the outer walls should allow walls to dry to the outside once moisture penetrates the cladding and the moisture barrier. If walls do not dry, decay fungi can become established in as little as 3 months. Until scientific data on the optimum depth and configuration of the ventilation mechanism in New Zealand conditions is available, I believe that the drainage cavity should be not less than 20 mm deep; and

- The external walls should have some degree of decay resistance or moisture tolerance to allow for situations when moisture circumvents the cladding and moisture barriers and moisture levels in the timber rise to more than 18%.

6.7 In relation to these characteristics, I find that the extension:

- Has no eaves or verge projections that could provide some protection to the cladding areas below them;

- Is in a medium wind zone;

- Is one storey high;

- Is of a very simple shape on plan;

- Has external windows and doors that lack adequate flashings;

- Has one deck fixed hard against the cladding; and

- Has external wall framing that is not treated to a level that would prevent decay if it absorbs and retains moisture.

Weathertightness performance

6.8 I find that the monolithic cladding in general does not appear to have been installed according to good trade practice. As a result, there are a number of identified defects, which are set out in paragraph 5.1 and in the expert's report, which have contributed to the high levels of moisture penetration already evident in locations of the external walls of the buildings and at the garage roof framing. The main areas of concern are the lack of vertical control joints, insufficient ground clearance, unpainted areas of cladding, the lack of flashings, inadequately sealed cladding junctions and penetrations, the deck and steps finished hard against the cladding, and the inadequate sub floor ventilation. In addition, the external wall framing timber is in all likelihood not treated, and thus unable to delay the onset of decay if it gets wet. As reported by the expert, there is already visible evidence of fungi on the timber wall framing.

6.9 The expert has noted that the deck and carport are not shown on the consented plans and that there have also been other deviations from these plans. I suggest

that the TA investigate these additions and amendments to ensure that the appropriate consents were obtained and that the items are also code compliant.

6.10 I note that three elevations of the buildings demonstrate a low weathertightness risk rating and that the remaining elevation of the buildings demonstrates a medium weathertightness risk rating, when calculated by the E2/AS1 risk matrix. The matrix is an assessment tool that is intended to be used at the time of application for consent, but must be supplemented at the time of issuing a CCC by careful inspection of the building as actually built.

7 CONCLUSION

7.1 I am satisfied that the performance of the monolithic cladding is inadequate because it has not been installed according to good trade practice. In particular, it demonstrates the key defects listed in paragraphs 5.1. I have also identified the presence of some known weathertightness risk factors in this design. The presence of the risk factors on their own is not necessarily a concern, but they have to be considered in combination with the significant faults identified in the cladding system. It is that combination of risk factors and faults that indicate that the structure does not have sufficient provisions that would compensate for the lack of a ventilated cavity. Consequently, I am not satisfied that the cladding system as installed complies with clause E2.3.2 of the building code.

7.2 I find that because of the apparent complexity of the faults that have been identified with this cladding, I am unable to conclude, with the information available to me, that remediation of the identified faults, as opposed to partial or full recladding, could result in compliance with clause E2. I consider that any final decisions on whether code compliance can be achieved by either remediation or recladding, or a combination of both, can only be made after a more thorough investigation of the cladding. This will require a careful analysis by an appropriately qualified expert as to the correct remedial option to be followed. Once that decision has been made, it should be submitted to the TA for their comment and approval. If the TA chooses to reject the proposal, then the owner is entitled to seek a further determination that will rule on whether the proposed remedial work will comply with the requirements of clauses E2 and B2.

7.3 I note that effective maintenance of monolithic claddings is important to ensure ongoing compliance with clause B2 of the building code. That maintenance is the responsibility of the building owner. The code assumes that the normal maintenance necessary to ensure the durability of the cladding is carried out. For that reason clause B2.3.1 of the building code requires that the cladding be subject to "normal maintenance". That term is not defined and I take the view that it must be given its ordinary and natural meaning in context. In other words, normal maintenance of the cladding means inspections and activities such as regular cleaning, re-painting, replacing sealants, and so on. I recognise that a TA does not have any statutory responsibility for the ongoing maintenance of a building. However, the maintenance programme adopted by the owner could be undertaken after consultation with the TA, bearing in mind

that the nature of the advice, and the basis on which it is provided to the owner, are for the TA to decide.

7.4 In the circumstances, I decline to incorporate any waiver or modification of the building code in its determination.

8 THE DECISION

8.1 In accordance with section 20 of the Act, I hereby determine that the monolithic cladding system as installed does not comply with clause E2.3.1 of the building code and accordingly confirm the decision of the TA to refuse to issue a CCC.

8.2 The TA has issued a Notice to Rectify. However, a new Notice should be issued that requires the owner to bring the cladding into compliance with the building code, without specifying the features that are required to be incorporated. It is not for me to dictate how the defects listed in paragraph 5.1, are to be remedied. How that is done is a matter for the owner to propose and for the TA to accept or reject, with either of the parties entitled to submit doubts or disputes to the Chief Executive for another determination.

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

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 1 February 2005.

John Gardiner
Determinations Manager