Determination 2005/54

Refusal of a code compliance certificate for a building with a "monolithic" cladding system: House 46

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 4-year old house unless changes are made to its monolithic cladding systems.

1.2 The question to be determined is whether on reasonable grounds the monolithic wall cladding as installed to the timber-framed external walls of the house ("the cladding"), complies with the building code (see sections 18 and 20 of the Act). By "the 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 Act or the building code.

1.6 The house itself is described in paragraphs 2.1 to 2.4, and paragraph 8 sets out the decision.

2 PROCEDURE

The building

2.1 The building, as shown on the plans, is an alteration to an existing two-storey detached house ("the house"), situated on an sloping site in a high wind zone in terms of NZS 3604: 1999 "Timber framed buildings". The new external walls of the house are of conventional light timber frame construction built on concrete block foundation and retaining walls, and sheathed with monolithic cladding. The house is of a fairly simple shape, with the metal tiled pitched roofs having hip, valley, and wall to roof junctions. One area of roof has a low plastered parapet adjoining a butyl rubber membrane gutter. This roof has junctions with the cladding and the main roofing. There are wide recesses over the entrance and the dining room doors and windows. There is a wide eaves projection to the length of the west elevation, but apart from this, there are no eaves or verge projections. The aluminium joinery is inset into the plaster, and there is a bay window projection on the east elevation.

2.2 A timber-framed monolithic-clad chimney is constructed onto an exterior wall and is set into an upper-level roof. A timber-framed balcony is constructed partly over a habitable space at the first-floor level, and the deck is lined with a butyl-rubber membrane on a plywood substrate. The membrane is overlaid with tiles. The timber-framed balcony balustrade is monolithic-clad on both faces, and is finished with a metal capping. A tiled concrete deck with associated steps leads up to the dining area at the ground-floor level. I note that, with the exception of the garage, the existing structure has been removed and replaced with a new construction.

2.3 No evidence has been provided as to what treatment, if any, was applied to the external wall framing.

2.4 The new timber-framed external walls of the house that are the subject of this determination are clad with a stucco system that is described as monolithic cladding.

In this instance it incorporates 4.5mm thick fibre-cement backing sheets fixed through the building wrap directly to the framing timbers, reinforcing mesh spaced off the backing, and a 20mm thickness of three-coat solid plaster finished with a 3-coat paint system.

Sequence of events

2.5 The territorial authority issued a building consent on 27 July 2001. The "Consent Endorsements" noted that certain inspections were required and that untreated timber could be used where the moisture content did not exceed 18% and where the timber was not exposed to ground atmosphere.

2.6 On 3 September 2002, the territorial authority wrote to the owner noting that parts of the building had been removed instead of being altered and amended drawings were required for these changes. In addition, information was required in respect of the amended foundations. The territorial authority stated that, when the additional details were provided, a final inspection would take place, and if this were satisfactory a code compliance certificate would be issued.

2.7 The territorial authority again wrote to the owner on 4 August 2004, noting that certain work was outstanding and that there had been no inspections requested or undertaken with regard to the cladding. The territorial authority also enclosed a Notice to Rectify, dated 6 August, which date I note is 2 days later than that of the letter enclosing it. The "Particulars of Convention" of the Notice to Rectify noted that the building work did not satisfy the following provision of the New Zealand Building code:

> E2 "External Moisture" in that the installation of the cladding system cannot be established as meeting technical information from the substrate supplier. Given the information now available on face fixed cladding systems, their adequacy in terms of satisfying the performance criteria for external moisture can not be readily established.

2.8 The owner applied for a determination on 15 November 2004.

3 THE SUBMISSIONS

3.1 The owner forwarded copies of:

- The plans and specifications;
- Some consent documentation;
- The Notice to Rectify;
- The correspondence with the territorial authority; and
- Some manufacturer's recommendations.

3.2 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 say:

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, 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 Department commissioned an independent expert ("the expert") to inspect and report on the cladding. The expert inspected the building and furnished a report that was completed on 11 March 2005. The expert noted that the external windows and doors have proprietary head, sill and jamb flashings and sill trays where appropriate. The expert's report made the following specific comments on the cladding.

- There is an absence of horizontal control joints as set out in the relevant New Zealand Standard;
- There is cracking in the plaster below the bedroom windows on the south elevation, and below the raked window of the rumpus room;
- There are locations where there is either no clearance or insufficient clearance between the base of the cladding and the ground or paving and between the base of the cladding and the balcony deck tiling;
- The metal chimney cap does not have a drip edge or a capillary kick-out;
- The apron flashings at the garage wall junction lacks a deflector that would divert water away from the flashing;
- At most locations, the fascias at the roof level are not adequately sealed to the plaster below them; and
- Some penetrations through the cladding, including the meter box and gas bottle cover, are inadequately sealed.

5.2 The expert carried out a series of non-invasive moisture tests at the interior of the external walls and no reading higher than 13.5% was recorded. Further non-invasive and invasive readings were made at the exterior of the external walls and no reading higher than 16.0% was recorded. 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 and neither party commented on it.

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 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 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 suggest 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 house:

- Apart from one location, has no eaves or verge projections that could provide protection to the lower cladding;

- Is built in a high wind zone;

- Is maximum two storeys high;

- Is fairly simple on plan;

- Has one balcony constructed partly over a habitable space;

- Has fully flashed external windows and doors; and

- Has external wall framing that may not be able to resist the onset of decay if it absorbs and retains moisture.

Weathertightness performance

6.8 Generally the cladding appears to have been installed according to good trade practice, but some junctions, edges, and penetrations are not well constructed. These areas are all as described in paragraph 5.1 and in the expert's report as being:

- The absence of horizontal control joints;
- The cracking in the plaster below the bedroom windows on the south elevation, and below the raked window of the rumpus room;

- The locations where there is either no clearance or insufficient clearance between the base of the cladding and the ground or paving and between the base of the cladding and the balcony deck tiling;
- The lack of a drip edge or a capillary kick-out to the metal chimney cap;
- The lack of a deflector to the apron flashings at the garage wall junction;
- The inadequately sealed fascias; and
- The inadequately sealed penetrations, including the meter box and gas bottle cover.

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 house is relatively simple on plan;
- The external windows and door are fully flashed;
- There is no moisture entering the external wall cavity at the present time; and.
- The lower level roof areas provide some ventilation to the upper wall framing.

I consider that these factors 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.

6.10 I note that one elevation of the house demonstrates a moderate weathertightness risk rating, and the remaining three elevations a high 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, before the building work has begun and, consequently, before any assessment of the quality of the building work can be made. Poorly executed building work introduces a risk that cannot be taken into account in the consent stage, but must be taken into account when the building as actually built is assessed for the purposes of issuing a code compliance certificate.

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 house 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 will consequently 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 consequently 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. It is not for me to dictate how the defects described in paragraphs 6.8 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 28 April 2005.

John Gardiner
Determinations Manager