Determination 2005/43

Refusal of a code compliance certificate for a building with a "monolithic" cladding system: House 37

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 of the property, acting through the architect (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 7-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 cladding as installed ("the cladding"), which is applied to the external walls, beams and columns of this house complies with the building code (see sections 18 and 20 of the Act). By "external 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 2.7, and paragraph 8 sets out the decision.

2 PROCEDURE

The building

2.1 The building work comprises a very large, beach front, maximum three-storey, split-level, detached house, that was originally consented to as two conjoined separate houses, situated on an excavated sloping site, which is in a very high wind zone in terms of NZS 3604: 1999 "Timber framed buildings". The external walls of conventional light timber frame construction are built on concrete block foundation walls and are sheathed with two types of claddings. The cladding on the lower-level walls and on some of the column bases consists of a membrane over plywood under fibre-cement backing sheets faced with a veneer of basalt. The remainder of the timber-framed exterior walls are lined with a monolithic cladding, with plastered cappings at the junctions with the basalt-veneered walls below them. The exposed concrete masonry foundation walls also have a basalt veneer. The house is of a very complex shape, with some curved walls, and upper floor and window projections of varying profiles. The complex roof configurations are generally clad in Cedar shingles, but there are also several low-pitched roofs and internal gutters finished with a butyl rubber membrane. The roofs have numerous hip, valley and wall to roof junctions. The majority of the eaves have 260mm projections, including the gutter widths, but there are larger roof projections up to 2000mm wide, generally extending over the balconies, and these are supported on monolithic clad timber-framed columns. The timber external doors and windows are recessed into the cladding openings.

2.2 The house has a total of six timber-framed balconies, all of which are constructed entirely or partially over habitable spaces. One end of the house has a circular timber-framed open veranda area supported on plastered masonry columns, with a pitched shingle clad skirting roof around it. The deck of the veranda is lined with timber flooring into which are set glass brick panels. The other five balconies are situated at various upper levels and the decks of these are lined with butyl-rubber membranes over which tiles are laid. Three balconies have stainless steel balustrades

and there are nosings or tiled upstands to the deck edges under these. The other two balconies have timber-framed balustrades with monolithic clad faces, timber cappings plastered to form oversailing tops, and stainless steel handrails. The deck tiles are recessed to form drainage channels at these two situations. A number of monolithic clad timber-framed columns extend through the decks and are either stopped off at the balustrade height or extend up to the roofline.

2.3 There are three timber-framed monolithic-clad chimneys formed in the external walls. Two of these are full height, partially set into an upper-level roof and extending above the roofline. The other chimney is similar but its cladding commences at a lower level roof. All the chimneys have shaped recessed panels and plastered projections, and are capped with copper cowls.

2.4 A circular entrance colonnade is constructed on the west elevation of the building. This is constructed with monolithic-clad columns and beams, and timber rafters. Pergolas are situated at the entrance and driveway and these have monolithic-clad columns with basalt veneers to their bases and timber beams and rafters.

2.5 The specification calls for all wall framing to be H1 treated and timbers having a moderate decay hazard to be H3 "Tanalith" treated. However, no written evidence has been forwarded as to the treatment, if any, applied to the external wall framing. The expert commissioned by the Department was able to view the framing timber at certain locations and noted that no discolouration consistent with pressure treatment was apparent on the observed timber. The expert was of the opinion that at best the timber would only be H1 LOSP treated. Based on drill bit samples, the expert considered that the column framing timber would be H3 CCA treated.

2.6 The majority of the external timber-framed walls and columns of the house are clad with what is described as monolithic cladding. The wall cladding is a particular proprietary product, installed in accordance with the manufacturer's instructions, which include flashings to heads, jambs, sills, trims and corners. As detailed in that manufacturer's instructions ("the instructions"), it incorporates 7.5mm fibre-cement backing sheets fixed through building wrap directly to framing timbers and finished with a proprietary mesh reinforced product plaster system supplied by the manufacturer of the backing sheet system. The plaster is also finished with three coats of 100% acrylic exterior paint system. The system has been subject to an appraisal by an independent appraisal organisation. On this house, an additional plywood substrate is fixed between the backing sheets and the building wrap.

2.7 The cladding to the base of the timber-framed external walls and some of the columns consists of 7.5mm fibre-cement backing sheets fixed over plywood and through the building wrap directly to framing timbers and finished with a self-adhesive, cold applied membrane and finally with a basalt veneer. The exposed masonry foundation walls have basalt veneers applied over a similar membrane.

2.8 The plaster system manufacturer provided a "Materials Components Guarantee" dated 16 September 2004, covering the cladding materials for a period of 15 years. The plasterer issued a "Workmanship Guarantee" dated 16 September 2004 covering the plaster system for a period of 5 years.

Sequence of events

2.9 The territorial authority issued a building consent on 23 May1996. There were no specific conditions relating to inspections required for the cladding on the consent.

2.10 The territorial authority made various inspections during the course of construction, and approved the "Preline Building Inspection" on 7 August 1997. A "Final Building Inspection" was undertaken on 3 May 1998. The house was not passed after these inspections, as there was outstanding documentation to be provided.

2.11 Following a request from the owner, the territorial authority wrote to the owner's lawyers on 3 June 2004, listing the reasons for not issuing a code compliance certificate. The issue concerning the cladding was:

> The type of cladding system used is "monolithic" without a cavity, which has not had specific inspections to deal with weather-tightness issues. Council is therefore not in a position to issue a CCC.

2.12 On 4 June 2004, the territorial authority forwarded to the owner a standard letter regarding monolithic cladding without a cavity.

2.13 On 9 September 2004, the plaster system manufacturer wrote to the architect stating that it had inspected the cladding. The cladding was found to be in very good condition but required cleaning and repainting. There was some delamination in the copings to the monolithic cladding over the stone walls and some fine cracks in some areas. These defects were not considered to be serious and were in the manufacturer's opinion, due to settlement. There were more serious base clearance issues and these affected code compliance.

2.14 The territorial authority did not issue a Notice to Rectify as required under section 43(6) of the Act.

2.15 The owner applied for a determination on 25 August 2004.

3 THE SUBMISSIONS

3.1 Under the "Matter of doubt or dispute" heading, the owner noted that during the building phase, the builder rather than the owner dealt directly with the territorial authority. Due to a request for further information not being dealt with by the builder, a code compliance certificate had not been issued after the territorial authority had carried out its final inspections. The owner stated that the as-built window detailing was of a higher specification than that on the original documentation and the cladding was installed in accordance with the manufacturer's specifications.

3.2 In a letter to the Authority dated 27 September 2004, the owner gave details about the builder's qualifications, and noted that the construction of the house had taken place from late 1996 to August 1998.

3.3 The owner supplied copies of:

- The plans and specifications;
- The consent documentation;
- The territorial authority's inspection documentation;
- The correspondence with the territorial authority;
- The plaster system guarantees and the manufacturer's letter of 9 September 2004.

3.4 The territorial authority made a submission in the form of a letter to the Authority dated 21 October 2004, which summarised the consent and inspection processes relating to the house. The territorial authority also noted that while certain inspections had been carried out during the construction of the house, no specific inspections were recorded for the external cladding. The territorial authority then listed the major risk issues set out in their letter of 3 June 2004 to the owner's lawyers. The owner had been informed that, due to the type of monolithic cladding applied to the house and its attendant risk factors, the territorial authority was unable on reasonable grounds to accept the compliance of the cladding. The territorial authority listed the matters of doubt as being:

- Whether the installed cladding system complies with clauses B2.3.1 and E2.3.2 of the Building Code.
- Whether building elements, which have 5 and 15-year durability requirements comply with clause B2 of the Building Code, considering the age of construction.

3.5 The territorial authority supplied copies of:

- The consent documentation;
- The territorial authority's inspection documentation; and
- The correspondence with the owner.

3.6 The copies of the submission and other evidence were provided to each of the parties. Neither the owner nor the territorial authority made any further submissions in response to the submissions of the other party.

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. Those 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 sub floor space, and in-built chimneys and flues) are moderately difficult to access or replace, or

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

Clause E2—EXTERNAL MOISTURE

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

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

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

4.2 There are no Acceptable Solutions that have been approved under section 49 of the Act that cover this cladding. The cladding is not accredited under section 59 of the Act. I am therefore of the opinion that the cladding system as installed can be considered to be an alternative solution.

4.3 In several previous determinations, the Authority has made the following general observations, which in my view remain valid in this case, about acceptable solutions and alternative solutions:

- Some acceptable solutions cover the worst case, so that in less extreme cases they may be modified and the resulting alternative solution will still comply with the building code; and

- 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 10 February 2005. It noted that the final coat of plaster was completed to a "consistently high standard" and that the general impression was "of good trade practice in terms of the plastering". There is minimal cracking on the cladding surfaces. The expert removed the plaster coating to reveal the window flashing details at several locations, and to check the membrane to the top of one beam. The expert also made the following comments regarding the cladding:

The main areas

- There is a horizontal crack in the wall to the left of the main chimney, and a corner crack up the full height of the chimney itself;
- In almost all locations, either the base of the cladding to both the walls and the columns is buried in the pavings, or the recommended ground clearances have not been achieved. The expert was of the opinion that the sheet membrane applied at these locations had not been successful in preventing water entry ;
- In some locations there is no plywood substrate or building wrap and accordingly, the fibre-cement backing sheets are fixed directly to the framing;
- There is a vulnerable junction where the wall cladding meets the parapet wall around the rear entry walkway;
- The flat tops to some of the beams and parapet walls do not adequately shed water;
- The cladding to the end of the beam extending from the circular balcony is cracked and the membrane wraps around behind the cladding and can direct water into the wall cavity;
- The wall that was originally to divide the two conjoined houses has a broken area of plaster at its base at the junction between the cladding and the concrete plinth;
- The timber sills of the rear door to the garage and the doors from the open-plan area at the rear if the house are either touching, or are buried in, the paving;
- The ends of all the apron flashings are poorly finished at most locations in respect of the lack of "kickouts", the buried gutters, and the incomplete

plastering. As a result, water is being diverted into the cladding and wall cavities;

- All the monolithic-clad timber-framed columns show an excessive moisture content;
- There is no timber framing supporting the columns on either side of the curved entry window;
- The ends of the entrance colonnade beams are inadequately fixed and the nail holes provide access for water entry; and
- The downpipe penetrations through the cladding are inadequately sealed.

The lower basalt veneered wall areas

- There is no protective layer between the basalt and the membrane on the lower areas of the timber-framed walls; and
- The bottom plates of these walls are below the level of the exterior paving.

The balconies

- At the balcony over the garage, there is no capillary gap between the base of the cladding and the deck tiles, the deck membrane upstand height is insufficient, and the support columns are not ventilated;
- There is a crack at the junction of the wall and balustrade claddings of the balcony adjoining the children's rooms;
- At the balcony outside the master bedroom, there is either a minimal or no capillary gap between the base of the cladding and the deck tiles, at the two single doors the internal floor level is below the deck tile level, and there is a minimal upstand under the doors;
- At the two balconies overlooking the pool, there is either a minimal or no capillary gap between the base of the cladding and the deck tiles and the junction between the columns and the tiled deck is inadequate;
- Water has soaked right through the decking of the circular balcony and damaged the plasterboard soffit lining beneath it, and there is evidence of leakage into the ceiling space above this balcony; and
- The handrail penetrations on all the balconies are inadequately sealed, and in the case of the circular balcony, the handrail is loose.

External windows and doors

- The as-built window and door perimeter details are not constructed in accordance with the original design details as follows;

- There are neither jamb flashings nor facing boards. Instead, the details are entirely reliant upon sealants for their effectiveness, and
- There are adjacent drainage holes in the reveals adjoining sill flashings; and.

- There are cracks between the timber jambs and the cladding.

5.2 The expert took non-invasive readings at the interior linings of the external walls throughout the house and some "off the scale" readings were recorded. The expert also took invasive moisture readings through the exterior walls cladding and external soffits. Moisture readings of 19%(2), 20%, 22%(2), 23%, 24%(3), 28%(2), 32% (2), 33%, 38%, and 40%(16) were recorded in these instances at various locations throughout the building. The expert noted that the recorded readings were taken after a long spell of fine weather and that the 40% readings registered were at the limit of the scale on the meter used to take the readings. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure.

5.3 The expert noted that the bracing wall that was detailed to divide the conjoined houses has been shortened and modified with an opening, and that these amendments could affect its bracing capabilities. The wall also only extends for only one storey and not the two storeys indicated on the consented plans.

5.4 The expert also pointed out that there were significant variations from the original plans. For example, only 5 columns had been constructed to support the circular balcony, and not the 13 indicated on the plans.

5.5 Copies of the expert's report were provided to each of the parties. The territorial authority did not comment on the report, but the owner, through the architect, commented in detail. In particular, I note that the architect states that the builder claims that there are copper jamb flashings to the windows. This statement contrasts with the evidence provided by the expert, whose invasive investigation showed there to be no such flashings in two separate locations.

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 Research data 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 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, the I find that this house:

- Has 260 mm wide eaves projections that provide little protection to the cladding under them. However, the various roof projections provide some additional protection;
- Is in a very high wind zone;
- Is a maximum of three storeys high;
- Has exterior joinery units that have head and sill flashings, but no jamb flashings;
- Has an envelope that is very complex on plan, with a roof system having hip, valley and wall to roof junctions;
- Has six high level balconies constructed either totally or partially over a habitable spaces;
- Has a circular colonnade and several pergolas; and
- Has external walls constructed with what I accept, in the absence of documentary evidence to the contrary, is timber that provides little resistance to decay if it gets wet and cannot dry out.

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, set out in paragraph 5.1 and in the expert's report, which have contributed to the levels of moisture penetration already evident in many locations in the external walls of the house. The main areas of concern are the balconies, the monolithic clad columns and beams, the evidence of cracking, the lack of adequate ground clearance, the apron flashings, and the lack of adequate flashings and sealing to the exterior windows and doors. In addition, the external wall framing timber is in all likelihood only treated to a level that is unable to delay the onset of decay if it gets wet. As reported by the expert, there is already visible evidence of wet timber wall framing. I have already noted the discrepancy between the expert's findings and the claim by the builder as to the presence or otherwise of jamb flashings to the windows. I recommend that this issue be fully investigated to ascertain which windows lack such flashings.

6.9 The expert has expressed concerns about the bracing wall that originally was designed to separate the conjoined houses and the reduced number of columns supporting the circular balcony. I note also that there is water penetration through the deck of the circular balcony that has caused damage to the soffit lining. I recommend that the territorial authority further investigate these matters, and if necessary, appropriate remedial work be carried out to ensure continuing structural integrity.

6.10 The expert also noted that as the membrane applied to the concrete masonry foundation walls behind the basalt veneer was essentially the only barrier against the ingress of moisture, it was required to be unbroken. In addition, the expert queried whether the basalt veneer at these locations drains freely at its base. Again, I recommend that these issues be investigated to ensure that the walls are adequately waterproofed.

6.11 I note that all elevations of the buildings demonstrate a very high 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 code compliance certificate 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 of the building code.

7.2 In addition, the building is also required to comply with the durability requirements of clause B2. Clause B2 requires that a building continues to satisfy all the objectives of the building code throughout its effective life, and that includes the requirement for the addition to remain weathertight. Because the cladding faults in the house are allowing the ingress of moisture, it does not comply with the durability requirements of clause B2.

7.3 I find that because of the apparent complexity of the faults that have been identified with the cladding, I am unable to conclude, with the information available to me, that remediation of the identified faults, as opposed to partial or full reinstatement, could result in compliance with clauses B2 and E2. I consider that any final decisions on whether code compliance can be achieved by either remediation or reinstatement, or a combination of both, can only be made after a more thorough investigation of the issues in question. This will require a careful analysis by an appropriately qualified expert as to the correct remedial option to be followed. Once that decision has been

made, it should be submitted to the territorial authority for its comment and approval. If the territorial authority chooses to reject the proposal, then the owner is entitled to seek a further determination that will rule on whether the proposed remedial work will comply with the requirements of clauses B2 and E2.

7.4 I note that effective maintenance of monolithic claddings is important to ensure ongoing compliance with clause B2 of the building code. That maintenance is the responsibility of the building owner. The code assumes that the normal maintenance necessary to ensure the durability of the cladding is carried out. For that reason clause B2.3.1 of the building code requires that the cladding be subject to "normal maintenance". That term is not defined and I take the view that it must be given its ordinary and natural meaning in context. In other words, normal maintenance of the cladding means inspections and activities such as regular cleaning, re-painting, replacing sealants, and so on.

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

8 THE DECISION

8.1 In accordance with section 20 of the Act, I hereby determine that the monolithic cladding systems do not comply with clauses B2 and E2 of the building code. Accordingly, I confirm the decision of the territorial authority to refuse to issue a code compliance certificate.

8.2 I note that the territorial authority has not issued a Notice to Rectify. The territorial authority should do so and the owner is then obliged to bring the addition up to compliance with the building code. It is not for me to decide directly how the defects are to be remedied and the cladding brought to compliance with the building code. Those are matters 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.

8.3 The cladding has now been in place for 7 years, and its 15-year durability performance requirement will start once the code compliance certificate is issued. Continuing maintenance of the cladding will therefore 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 12 April 2005.

John Gardiner
Determinations Manager