

Determination 2005/21

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 19

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 applicants are the two joint building owners (referred to throughout this determination as “the owner”), and the other party is the territorial authority. The application arises from the refusal by the territorial authority to issue a code compliance certificate for a 7-year old house and attached garage unless changes are made to their monolithic cladding systems.

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 house and garage 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 Building Act or the building code have been considered in this determination.
- 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 buildings consist of a single-storey house and an attached garage, situated on a level site in a low wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house is of conventional light timber frame construction on a timber piled and framed ground floor. The garage is of similar construction but is built over a concrete ground floor slab. All the external walls and gables of the buildings are lined with a monolithic cladding, with the exception of one long elevation of the house that is faced with a stonework veneer. The house is of a simple shape, with the main house roof being pitched and covered with a proprietary “self-seal” cladding laid over a 17.5mm thick plywood substrate. The flat roof to the rectangular shaped garage is covered with a butyl-rubber membrane laid over a 17.5mm thick plywood substrate, and this roof in part adjoins the main pitched roof. A 2300mm wide timber framed terrace runs the full length of one long house elevation, and this is widened to form a 6000mm long x 3500mm wide end extension. A 2300mm wide timber-framed flat roof runs the full length of the terrace supported on 100 x 100mm laminated posts. This roof has a butyl-rubber membrane laid over a 17.5mm thick plywood substrate and adjoins the main pitched roof for its full length. The terrace extension has a timber-framed balustrade to three sides that is faced with weatherboards. The house has eaves and verge projections that are 300mm wide, but the garage has no roof projections
- 2.2 The specification calls for Boric treated timber to be used for the external wall framing. However, the expert engaged by the Authority noted that the garage wall framing was a mixture of New Zealand Douglas Fir and untreated timber. Apart from this, I have not received any documentation to confirm the treatment, if any, of the house external wall framing.
- 2.3 Apart from the one stone veneered wall, the external walls of the house and garage are clad with what is described as monolithic cladding. In this instance it incorporates 7.5 mm thick fibre-cement backing sheets fixed through the building wrap directly to the framing timbers and finished with a spray-applied textured finish. An agent of the manufacturer has applied the sealing, jointing plaster and textured finish.
- 2.4 The builder issued a Producer Statement, dated 20 July 1997, covering the cladding backing sheets, and the system applicator, who is also the building owner, issued a Producer Statement, dated 10 December 1997, covering the sealing, jointing and textured finish to the cladding.

Sequence of events

- 2.5 The territorial authority issued a building consent on 25 October 1996.
- 2.6 The owner notified the territorial authority on 27 April 2004 that the house was complete.
- 2.7 The territorial authority wrote to the owner on 30 April 2004, listing items that needed attention before the territorial authority could issue a code compliance certificate. The specific references to the cladding were:

The major issue as we have already discussed, is Council policy at this stage relating to withholding Code Compliance Certificates on monolithic clad structures where there is no provision for moisture management behind the system. This policy has been in place since approximately November 2003 in support of requiring moisture management provision behind monolithic cladding system since the release of the Hunn report towards the end of 2002...

...a Warranty/Producer Statement will be needed from the cladding substrate applicator that it satisfies the product supplier installation requirement relating to control joints, location of cladding junctions, sealing penetrations etc. The same statement will be necessary from the jointing and coating system applicator. Considerations from a visual inspection around the outside were:

1. External corner junctions in the north west/east corners seem to be simple butted into each other.
2. Cladding overhang for the garage slab only seems to be 10-15 mm particularly in the south/east corner area.
3. Head flashing/cladding junctions in some areas of the garage do not seem to have been sealed.

- 2.8 The territorial authority wrote again to the owner on 9 July 2004, listing items still requiring the owner's attention. These included a reference to the cladding issues of ground clearance, floor slab overlap, and control joints. A Notice to Rectify, dated 9 July 2004, was attached to the letter and the "Particulars of Convention" noted:

The building work described in the attached Notice to Rectify Building Work does not satisfy the following provisions of the New Zealand Building Code.

E2 "External Moisture" in that the installation of the cladding system can not be established as meeting ground clearances, floor slab overhang, control and other jointing criteria.

- 2.9 The owner applied for a determination on 23 July 2004.

3 THE SUBMISSIONS

- 3.1 The owner in a covering letter dated 23 July 2004, stated
- That the house was clad in 1997 and the owner had been an applicator of the cladding finishes used on the house since 1997;

- The builder and the owner had kept all wall areas under 25 square metres to eliminate relief or control joints;
- The house was in a sheltered area in what is believed to be a low wind zone;
- While it was conceded that the garage cladding did not have a 50mm base overhang, it did have more than a 20mm ground clearance; and
- That the garage perhaps needed to be reclad, and/or a H3 treated bottom plate should replace the Oregon specified and used. In this respect, I note that the specification does not describe Oregon for these particular timbers.

3.2 The owner provided copies of:

- The building plans and specifications;
- The building consent;
- The Notice to Rectify;
- The correspondence with the territorial authority;
- The manufacturer's instructions;
- The two producer statements described in paragraph 2.4; and
- A set of photographs illustrating aspects of the house.

3.3 The territorial authority did not make a submission.

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 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 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 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 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; 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 removed small areas of the cladding to establish moisture readings and to identify points of moisture ingress. The expert’s report made the following specific comments on the cladding:

- There are no vertical control joints in the walls, and the dimensions of the north eastern wall are such as to require such a joint to meet the manufacturer’s recommendations;
- No membrane had been installed where the cladding adjoined the stone veneer at the south west corner of the house;

- The junction between the house and garage roofs was inadequately finished and water was entering the building at this point;
- The cladding on the gable walls is not sealed at the junction with the verge soffit lining;
- The head flashings to most of the exterior windows and doors do not overlap the frames sufficiently to meet the manufacturer's recommendations, and the ends of the head flashings were not sealed at the cladding junction;
- There are no jamb or sill flashings to the exterior windows and doors, and there are no sealing strips beneath the jamb flanges;
- The cladding was poorly finished above some window heads;
- There is insufficient ground clearance at the base of the cladding at the south eastern elevation and part of the south western elevation of the house;
- There is insufficient overlap at the base of the cladding to the garage past the finished floor level;
- The concrete rear steps have been cast directly against the cladding of the house, inhibiting drainage from this area; and
- The top of the meter box, the TV aerial fixings, and the gas bottle hood and bracket penetrations are not adequately sealed.

5.2 The expert took moisture readings throughout the house and garage at the interior of the external walls using a non-intrusive meter, and all the readings were at an acceptable level. The expert then took non-invasive readings at the exterior of the buildings and a number of readings were in excess of acceptable levels. The expert finally took further readings with an intrusive meter, and the readings over 18% were as follows:

- Readings of 19.0% and 22.3% at the left hand sill of the dining room window;
- A reading of 22.9% at the north east garage wall bottom plate;
- A reading of 24.8% at the left hand sill of the living room window; and
- A reading of 36.0% at the garage roof timbers where they adjoin the house wall.

Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. The expert also observed moisture on the building paper where the cladding had been cut out below the living room window, and also some water stained timbers in the garage.

5.3 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 house and garage:

- Have 300mm wide eaves and verge projections to the house that provide minimal protection to the main cladding areas, but no projections to the garage. The terrace roof only affords additional protection to the stone veneered wall of the house;
- Are in a low wind zone;
- Are one storey high;
- Have flashings to the heads of the exterior doors and windows, but these are too short in most instances, however, there are no jamb or sill flashings or sealant strips to the jambs;
- Have junctions between the pitched and flat roofs;
- Have no decks adjoining the cladding; and
- Have external wall framing that I accept is not treated and will not 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 one vertical control joint, insufficient ground clearance and base overlap, the lack of adequate flashings and jamb sealing strips to the exterior windows and doors, inadequately sealed cladding junctions and penetrations, and the concrete steps poured hard against the cladding. 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 water stained timber in the garage and also of moisture on the building wrap.

- 6.9 I note that all the elevations of the buildings demonstrate a low 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 E2.3.2 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 territorial authority for their 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 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 territorial authority 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 territorial authority, bearing in mind that the nature of the advice, and the basis on which it is provided to the owner, are for the territorial authority 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 territorial authority to refuse to issue a code compliance certificate.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 25 February 2005.

John Gardiner
Determinations Manager