

Determination 2005/16

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 14

1 THE DISPUTE TO BE DETERMINED

1.1 This is a determination of a dispute referred to the Chief Executive of the Department of Building and Housing (“the Chief Executive”) under section 17 of the Building Act 1991 as amended by section 424 of the Building Act 2004 (“the Act”). The applicant is 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 most of the 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 2.5, and paragraph 8 sets out my decision.

2 PROCEDURE

The building

- 2.1 The building is a two-storey detached house with single storey attached garage and family room sections, situated on a sloping excavated 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 concrete block foundation walls. All the external walls, with the exception of some narrow Cedar weatherboard panels, are sheathed with monolithic cladding. The house is of a relatively simple shape with profiled steel roofs at two main levels and the lower roof having wall to roof junctions. The garage roof also has an internal butyl-rubber membrane lined internal gutter. The projecting roof soffits form the eaves and verges, and the soffits are supported on cantilevered joists that pass through the cladding.
- 2.2 A narrow section of flat roof extends along the south elevation and this is clad with a butyl-rubber membrane laid over plywood sarking. This roofing has integral gutters, is dressed over timber-framed parapet walls and turned up under the adjoining main roofing soffit. A small, similarly constructed, flat roof extends over the entrance. A 1050mm wide cantilevered canopy adjoins 2 elevations of the living room and this narrows to a 300mm width outside the dining room. The canopy is covered with a butyl-rubber membrane over plywood sarking and this is turned down at the exposed edges and turned up under the base of the wall cladding. A monolithic clad chimney projects from the west elevation wall, pierces the high level roofing, and has been fitted with 4 ventilation grilles. At the high-level roof, apart from the roofs with perimeter parapets, the eaves project 550 mm and the verges 800mm. At the low level roofs the reversed eaves project 800mm and the verges project 600 mm.
- 2.3 The specification calls for timber framing to be “Chemical Free”, and the owner confirmed to the expert that this type of timber was used to construct the exterior wall framing.
- 2.4 The cladding system is what is described as monolithic cladding. As specified in the manufacturer’s data sheets (“the manufacturer’s instructions”), the cladding to the walls of the house incorporates 40 mm thick expanded polystyrene (EPS) backing sheets fixed through the building wrap directly to the wall framing and finished with a reinforced sponge float finish and a further paint system. The system has been subject to an independent appraisal (“the appraisal”). The manufacturer’s instructions include details for flashings at various junctions and require PVC flashings to the heads, jambs and sills of exterior joinery units.

- 2.5 The supplier of the backing board plaster system provided a “Producer Statement” for the cladding system, dated 9 August 2004, and a “Material Components Guarantee” dated 22 January 2001 for a period of 15 years. The cladding installer provided a “Workmanship Guarantee” dated 22 January 2001 for a period of 5 years.

Sequence of events

- 2.6 The territorial authority issued a building consent on 1 May 2000.
- 2.7 The territorial authority made various inspections during the course of construction, and approved the “Preline Building Inspection” on 21 December 2000, and the “Post Line Inspection” on 24 January 2001. Four “Final Building Inspections” were carried out from 8 December 2003 to 12 July 2004. After the last of these, the territorial authority referred the cladding issues to its Code Compliance Resolution Team.
- 2.8 On 8 December 2003, the owner forwarded various producer statements to the territorial authority, including the cladding supplier’s “Material Components Guarantee” and the cladding installer’s “Workmanship Guarantee”.
- 2.9 In a letter dated 10 December 2003, the owner responded to a field memorandum issued after an inspection. In regard to the cladding issues, the owner identified the roofing material used on the house and noted that the roof/eaves/berge eaves/lintel detail had been constructed in accordance with the consented drawing details.
- 2.10 In a letter dated 24 December 2003, the territorial authority advised the owner that the cladding issue was being referred to its Code Compliance resolution Team. In a letter of 17 June 2004, the owner noted that no response had been received from the territorial authority. The territorial authority apologised for the delay in a letter of 6 July 2004, and noted that the matter would be undertaken urgently.
- 2.11 On 21 July 2004, the territorial authority wrote to the owner, stating that it had undertaken a complete weathertightness inspection. The territorial authority also noted:

We would advise that before Council can issue a code compliance certificate, we must ensure that all building work meets the NZ Building Code requirements. In particular, the building code specifies that building work must remain durable for specific periods of time after the code compliance certificate is issued.

You will be aware of the current weathertightness issues often reported in the media. These issues have highlighted the care that must be taken to establish that all building elements, but particularly cladding, is durable before any CCC can be issued.

As your building is face fixed (monolithic) construction with no cavities we are unable to verify that it fully complies with the Building Code requirements, manufacturer’s details application (*sic*) at the time and that it will remain durable for the required period. Areas of concern/risk are

1. Envelope complexity
2. Roof/wall intersection design

3. In general the sill flanges of the joinery are sealed to the cladding. [Named Supplier] did not show a sill tray in their technical data until August 2001, so there is no reason to have a gap. However, no sill tray or cavity adds to risk if there is a joinery leak
4. No knowledge of backflashing to weatherboard/EIFS junction
5. No sign of flashing to reverse sloping soffits
6. "Ledges" at external corners, between rafters – flat area on top of cladding
7. Exposed, reverse sloping soffits with only foam strip weathering
8. End exposed rafters against cladding
9. Chemfree external wall framing

The territorial authority also listed defects that had to be remedied prior to a further inspection, which in summary were:

- Retaining walls to be clear of the cladding;
- Repairs to three hairline cracks;
- A better turndown of the internal gutter into the rain water head;
- Re-fixing of loose weatherboards;
- Additional fixings to the roofing;
- Sealing around an electrical cable;
- Cladding ground clearances;
- Displaced foam roof seals; and
- Waterproofing to flat areas of cladding.

The territorial authority also requested a Producer Statement Construction (PS3) from the cladding supplier. The territorial authority went on to say:

There has been recent information and knowledge that face sealed cladding systems without an adequate drainage and ventilation cavity will cause irrevocable damage to structural elements in the event of leakage and/or the effect of residual moisture.

Council cannot be satisfied that the cladding system as installed on the above building will meet the functional requirements of Clause E2 External Moisture of the New Zealand Building Code and is therefore unable to issue a code compliance certificate...

- 2.12 The territorial authority did not issue a Notice to Rectify as required under section 43(6) of the Act.
- 2.13 The owner applied for a determination on 24 August 2004.

3 THE SUBMISSIONS

3.1 In a covering letter to its submission, dated 11 October 2004, the territorial authority set out a brief summary of its involvement with the construction of the house, and how the owner had been informed why a code compliance certificate could not be issued. The territorial authority also repeated the specific issues raised in their letter to the owner of 21 July 2004.

The territorial authority went on to say:

It is noted that monolithic cladding systems are being continuously tested, improved and detailing revised. New knowledge indicates that monolithic systems should have a drainage cavity to perform its function meeting durability requirements of the Building Code. The issues such as high risk design, installation by licensed installers, selection of approved coating system, coating application by licensed applicators, quality control systems of suppliers, installers and applicators, specific independent inspections during installation have further complicated compliance verification process. New E2 document confirms the importance of the above issues.

In regards to this application for a determination, specifically in this case the matter of doubt are:

- Whether the installed cladding system complies with clauses B2.3.1 and E2.3.2 of the Building Code.

3.2 The territorial authority also supplied copies of:

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

3.3 Under the "Matter of Doubt or Dispute", the owner set out the sequence of events leading up to the application for this determination, and also supplied copies of:

- The plans and specifications;
- The consent documentation;
- A list of consultants and subcontractors involved in the house construction;
- The territorial authority's inspection documentation;
- The correspondence with the territorial authority; and
- The cladding guarantees and the producer statements.

3.4 The owner wrote to the Authority on 21 September 2004, enclosing copies of letters from the construction manager and the architect.

3.5 The letter from the construction manager, dated 19 September 2004, noted that the working documents, including the plans and specifications were well presented and provided a high level of detail. As such, there would be no need for the contractor to compromise the building envelope. The construction manager also

listed the primary contractors and subcontractors involved in the construction and described their trade associations.

3.6 The letter from the architect, dated 20 September 2004, noted that the house was designed to comply with the requirements of the territorial authority and the building code. The house was built to a high standard by a certified builder, and had been regularly inspected by the architect. There are no signs that the structural integrity of the house has been compromised by its very construction. The architect commented on some of the issues raised by the territorial authority and the comments are summarised as:

- The building envelope is not particularly complex and was designed with particular regard to roof detailing and the junctions of the various external claddings. The architect was present at crucial meetings with the relevant subcontractors. The architect described the construction of the parapets and noted that there would have to be significant ground movement for them to fail;
- The roof/wall intersections have either butyl-rubber membrane or metal flashings and the plaster cladding is stopped 50mm above the roof surfaces. Where the roof returns to the exterior wall there is a 400mm wide under flashing with an upstand. All roof framing and nogginns are H3 treated;
- A plastic corner flashing was installed at the weatherboard/plaster junctions;
- The 8% roof pitch ensures that a minimum of precipitation meets the reverse sloping eaves, and the underlay, which is cut around the rafters and folded over the wall wrap ensures that condensation will fall interrupted to the exterior. The skillion roof construction provides ventilation to the roof cavity and the compressed foam vermin protection does not inhibit ventilation and reduces the possibility of moisture ingress; and
- The exposed rafters are H3 treated, are well ventilated and are unlikely to rot.

3.7 The copies of the submissions 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 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. The relevant provisions of the building code provide:

Clause B2—DURABILITY

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

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

- (i) Those building elements (including floors, walls, and fixings) provide structural stability to the building, or
 - (ii) Those building elements are difficult to access or replace, or
 - (iii) Failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.
- (b) 15 years if:
- (i) Those building elements (including the building envelope, exposed plumbing in the subfloor space, and in-built chimneys and flues) are moderately difficult to access or replace, or
 - (ii) Failure of those building elements to comply with the building code would go undetected during normal use of the building, but would be easily detected during normal maintenance.

Clause E2—EXTERNAL MOISTURE

- E2.1** The objective of this provision is to safeguard people from illness or injury, which could result from external moisture entering the building.
- E2.2** Buildings shall be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.
- E2.3.2** Roofs and exterior walls shall prevent the penetration of water that could cause undue dampness, or damage to building elements.

4.2 There are no Acceptable Solutions 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.
- 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 Authority 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 13 December 2004. It noted that the “general appearance of the cladding finish is being compromised by some coating cracking in some parts”. The expert removed the textured coating at two locations to reveal the

flashing details of the dining room window, and noted that the window flashings appear to be compliant. The expert also made the following comments regarding the cladding:

- There is cracking in the wall cladding at several locations;
- There is cracking where the base of the cladding abuts the solid plaster of the foundation wall at the lounge room corner on the north elevation;
- Some of the contoured foam infill between the roofing soffit and the wall structure is out of position, and the infilling is missing along the family room section;
- There are flat unsealed ledges where the cladding adjoins the roofing soffit;
- The stop ends of the apron flashings at some locations are not returned fully beyond the wall cladding;
- There is insufficient ground clearance to the base of the cladding over the paving to the left-hand side of the garage door;
- The floor level drainage thresholds between the outside ground levels are not strictly in accordance with E2 of the building code;
- Two small retaining walls are not clear of the cladding;
- One electrical cable on the rear garage wall is inadequately sealed;
- The 2 chimney vent grilles are not designed for open exposed locations and are also heat damaged. One of the grilles has fallen out of position;
- The roofing membrane is not adequately finished into the rainwater head above the front door entry; and
- The rainwater head between the kitchen and family room is not attached securely, and the roofing membrane has not been extended to meet the head following repairs to remedy a previous water leak.

The expert also noted that there is a deficiency in the positioning and quantity of fixings along the bottom ends of the steel roofing and that no fascia boards have been fitted to accommodate roofing fixings. The expert commented that the folded wrap does not prevent water ingress occurring behind the cladding. The expert also observed that some of the nail fixings to the Cedar weatherboard panel between the kitchen and family room have been removed.

5.2 The expert took non-invasive readings to identify moisture related areas and also took invasive moisture readings through the exterior of the cladding. The expert obtained the following higher readings:

- Readings of 22% and 38% below the apron flashing over the front door entry; and
- Readings of 22%, 24%, and 32% in the chimney wall above and below the canopy roof junction.

Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure.

5.3 Copies of the expert's report were provided to each of the parties. The territorial authority informed the Department on 19 January 2005 that it did not wish to make any comments on the report. In a letter to the Department dated 19 January 2005, the owner made the following summarised comments:

- No plumbing pipework passed through the cladding;
- The cladding was sealed and painted prior to the construction of the retaining walls; and
- An inspection has confirmed that there is no internal heat damage to the chimney linings and the damaged chimney grilles have been replaced.

6 DISCUSSION

General

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

Weathertightness risk

6.2 Recent research and experience, both internationally and locally, indicates that the impact of weathertightness problems in monolithic clad houses can be minimised if good and effective design and construction practices are followed.

6.3 The installation of exterior cladding to manufacturer's specifications and to 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:

- Has, apart from the flush parapet walls, eaves projections 800mm wide and verge projections 550mm and 600mm wide that provide excellent protection to the lower cladding;
- Is built in a low wind zone;
- Is two storeys high;
- Is relatively simple on plan, having roofs at two levels with some roof to wall junctions and internal gutters;
- Has fully flashed external windows and doors;
- Has no decks or balconies;
- Has external wall framing constructed with untreated timber that is likely to 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:

- The cracking in the wall cladding in several locations;
- The cracking where the base of the cladding abuts the solid plaster of the foundation wall at the lounge room corner on the north elevation;
- The displaced contoured foam infill between the roofing soffit and the wall structure to some locations, and the missing infilling along the family room section;
- The flat unsealed ledges where the cladding adjoins the roofing soffit;
- The stop ends of the apron flashings at some locations not being returned fully beyond the wall cladding;
- The insufficient ground clearance to the base of the cladding over the paving to the left-hand side of the garage door;
- The floor level drainage thresholds between the outside ground levels not being strictly in accordance with E2 of the building code;
- The 2 small retaining walls not being clear of the cladding;
- The inadequately sealed electrical cable on the rear garage wall;
- The 2 heat damaged chimney vent grilles not being designed for open exposed locations;
- The roofing membrane not being adequately finished into the rainwater head above the front door entry; and
- The inadequately attached rainwater head between the kitchen and family room and the roofing membrane not being extended to meet the head.

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 in a low wind zone;
- The windows and external doors are fully flashed; and
- The house has no balconies or decks.

- 6.10 I consider that these factors adequately 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.
- 6.11 The territorial authority has queried the adequacy of the junctions between cladding and the weatherboard panels. As the expert has identified flashings at these junctions and has not raised any concerns about these connections, I do not consider that any rectification is required at these locations.
- 6.12 The expert has expressed concern regarding the positioning and quantity of fixings along the bottom ends of the steel roofing and that no fascia boards have been fitted to accommodate roofing fixings. While these concerns are outside the ambit of this determination, I would suggest that these issues be further investigated and if considered necessary remedial work be carried out.
- 6.13 The expert's report describes the heat damage caused to the two chimney vent grilles above the roof. I suggest that the question of heat build-up within the chimney be investigated to ensure that there is no fire risk relating to the chimney.
- 6.14 I note that two elevations of the house demonstrate a medium weathertightness risk rating, and that two elevations of the house demonstrate a high weathertightness risk rating using the E2/AS1 risk matrix. The matrix is an assessment tool that is intended to be used at the time of application for consent, but must be supplemented at the time of issuing a code compliance certificate by careful inspection of the building as actually built.

7 CONCLUSION

- 7.1 I am satisfied that the current performance of the cladding is not adequate because it is allowing water penetration into the wall framing at several locations at present. Consequently, I am not satisfied that the cladding system as installed complies with clause E2.3.2 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 house to remain weathertight. Because the cladding faults in the house are allowing the ingress of moisture in the future, the house does not comply with the durability requirements of clause B2.3.1. of the building code.
- 7.3 I consider that, because the faults that have been identified with this cladding occur in discrete areas, I am able to conclude that satisfactory rectification of the items outlined in paragraph 6.8, together with the re-nailing of any loose weatherboards, is likely to result in the building being weathertight and in compliance with clauses B2.3.1 and E2.3.1, notwithstanding the lack of a ventilated cavity
- 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 It is emphasised that each determination is conducted on a case-by-case basis. Accordingly, 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 Building Act 1991, I hereby determine that the cladding system as installed does not comply with clause E2 of the building code. There are also a number of items to be remedied to ensure that the house remains weathertight and thus meet the durability requirement of the code. Consequently, I find that the house does not comply with clause B2. Accordingly, I confirm the territorial authority’s decision to refuse to issue a code compliance certificate.
- 8.2 I also find that rectification of the items outlined in paragraph 6.8, together with the re-nailing of any loose weatherboards, to the approval of the territorial authority, along with any other faults that may become apparent in the course of that work, is likely to result in the house being weathertight and in compliance with clauses B2 and E2, notwithstanding the lack of a ventilated cavity.
- 8.3 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 house 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. That 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 14 February 2005.

John Gardiner
Determinations Manager