

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 44

1 THE DISPUTE TO BE DETERMINED

- 1.1 This is a determination by the Building Industry Authority (“the Authority”) of a dispute referred to it under section 17 of the Building Act 1991 (“the Act”). The applicants are the owners of the property (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 nearly new house unless a determination is obtained that the cladding system meets the requirements of the building code.
- 1.2 The Authority’s task in this determination is to consider whether it is satisfied on reasonable grounds that the external wall cladding as installed (“the cladding”), which is applied to the walls, entrance columns and chimneys of this house, complies with the building code (see sections 18 and 20 of the Act). By “external wall cladding as installed” we 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 In making its decision, the Authority has not considered any other aspects of the Act or the building code.
- 1.4 The house itself is described in paragraphs 2.1 to 2.3, and paragraph 8 sets out the Authority’s final decision.

2 PROCEDURE

The building.

- 2.1 The building is a detached house that is mainly single-storey, with a small central two-storey portion. It is situated on a very large level site in a medium wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house is of conventional light timber frame construction, built on concrete and concrete block foundation walls with a concrete floor slab. Windows are aluminium and external walls are sheathed entirely with a monolithic cladding. The house shape is not complex, despite having several varying roof levels. The roof is made up of a series of gables at 30° pitch, and is clad with pre-finished pressed metal tiles. The master bedroom in the second storey has a small deck supported by one exterior wall and two monolithic clad columns that continue up to support the gable roof projection above. The deck has a waterproof membrane covered floor and timber framed balustrades to each end faced with monolithic cladding on external faces and tops,

and plastered fibre-cement cladding on the inner face. The front of the deck has a metal balustrade fixed on top of the base upstand. There are two monolithic clad chimneystacks, one of which is set into a low-level roof, and the other passes through a low-level roof and is then inset into the high-level roof. The eaves generally have 300 mm projections, although there are some 600 mm eaves to the north and west elevations.

- 2.2 The framing in the external walls is H3 LOSP treated, supported by invoices supplied by the owner.
- 2.3 The cladding is a proprietary monolithic cladding system described as EIFS (exterior insulating and finishing system). As specified in the technical information (“the manufacturer’s instructions”), the cladding consists of 60 mm thick polystyrene sheets fixed through the building wrap directly to the framing timbers, and finished with a thin coat of plastic mesh reinforced, modified cement coating. The backing sheets incorporate grooves cut into the back face of the sheets to allow for drainage of moisture from behind the cladding. The manufacturer’s instructions include technical data sheets and installation details. The manufacturer administers a system of licensed contractors for installing the cladding system. An independent organisation carried out an appraisal of the system, in 2000.
- 2.4 The owner has provided technical and maintenance data for the plaster products used on the house, along with a “Materials Component Guarantee” dated 26 August 2002 providing a warranty for a period of 15 years for the plaster system. Also provided is a separate “Producer Statement” dated 6 August 2002 for the paint system.

Sequence of events:

- 2.5 The territorial authority issued a building consent on 7 November 2001. None of the “Consent Requirements” attached to the consent referred to the cladding.
- 2.6 The territorial authority made various inspections during the course of construction, and on 31 March 2004, carried out a final inspection that identified matters requiring attention. On 6 April 2004, the territorial authority wrote to the owner describing current concerns in regard to weathertightness problems involving buildings with monolithic claddings, and pointing out that the territorial authority had to ensure that all building work meets the building code requirements. As regards the cladding, the letter stated:

In regard to the monolithic cladding applied to your dwelling, and notwithstanding the approval in your building consented plans and specifications, recent information has indicated that monolithic claddings that do not have appropriate drainage, adequate ground clearance, reinforcing, control joints, and external joinery weather flashings will, in the event of leakage and/or residual moisture, cause irrecoverable damage to the structural elements of the building. Doubt has arisen to the extent that monolithic claddings that do not have all these features may not meet the requirements of Clauses B2 and E2 of the NZ Building Code.

As the monolithic cladding system fixed to your building has been identified as being such a cladding, Council needs to be assured that it meets the requirements of the NZ Building Code before a final building code compliance certificate can be issued. If you made an application to the Building Industry Authority for a determination on this issue under Section 17 of the Building Act 1991, it would decide the matter.

- 2.7 The territorial authority did not issue a Notice to Rectify as required under section 43(6) of the Act.
- 2.8 The owner applied for a determination on 23 June 2004.

3 THE SUBMISSIONS

- 3.1 In a letter, dated 26 May 2004, the owner asked that the following points be considered, and which are paraphrased as being:

At all times during the planning and investigation of materials for our house we were considering the possible implications of requirements that could be placed on the building with respect to leak prevention...

At the time of planning in 2001 we...were assured that by utilising H3 treated timber for the frame and the [EIFS] system with its drainage channels that we were in fact significantly exceeding the permit and compliance requirements. This was borne out by the discussions that the builder had had with [the territorial authority] Inspectors.

At the time of cladding inspection and then later completion and occupancy in September 2002 our building standard still well exceeded the standard that was required for code of compliance...

[H]ad we applied for a partial code of compliance at the time of occupancy, the cladding system would not have been a problem, especially in the light of the system we used and the treated timber frame.

The owner concluded:

It is difficult for us as owners to understand how we could have a cladding system approved at planning stage, construction stage and at all inspections only to have a retrospective decision that negates those approvals...

I have every confidence in the quality of my building and the craftsmanship carried out by my builders, whose reputation is well recognised in this area...

- 3.2 The owner also provided copies of:

- The drawings and specifications;
- The building consent documentation;
- The cladding manufacturer's specification;
- Correspondence with the territorial authority; and
- The various guarantees, warranties and producer statements.

- 3.3 The owner also provided copies of a letter from the builder, dated 22 June 2004, and a letter from the designer, dated 15 June 2004. Both letters verified some of the aspects of the construction and design of the house.

- 3.4 The territorial authority did not make a submission, nor did it comment on the owner's submission.

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

5 THE EXPERT'S REPORT

5.1 The Authority commissioned an independent expert ("the expert") to inspect and report on the cladding. The expert inspected the building and furnished a report, which noted that the general layout and construction appeared to correspond with the consent drawings. Removal of a small section of plaster confirmed that window flashings appear to be installed according to the manufacturer's instructions. The finish to the cladding appeared to generally be of a good standard with no indication of cracking, flaking or inadequate cover. No control joints in the cladding were evident, but the expert noted that wall dimensions are within the limits set by the manufacturer as requiring such joints. The ground clearances to the base of the cladding generally appeared adequate. The expert's report made the following specific comments on the cladding:

- Has gutters that butt against or penetrate the cladding of adjacent walls, with the adjacent end of the roof apron flashing lacking a turn-up to direct water away from the cladding surface;
- The top of the balustrade to two sides of the second storey deck has been formed using the cladding, without a separate superimposed capping or evidence of a saddle flashing;
- The deck to the second storey is covered with a waterproofing membrane, with the deck surface at an appropriate level in relation to the internal floor level and adequate fall away from the wall;
- One side of the second storey deck has an open handrail with balusters. The membrane on this side has not been turned down over the outer edge of the deck structure, and the handrail supports have been fixed through the deck membrane into the framing below; and.
- Penetrations through the cladding for electrical and telephone wiring appeared not to be sealed against moisture penetration.

5.2 The expert took a number of non-invasive moisture content readings, as well as invasive moisture readings through holes drilled through the exterior cladding. The latter were taken at 9 different locations and included zones considered to be potentially vulnerable, such as walls below gutter/wall junctions, windows, and the second storey deck.

5.3 Of the invasive moisture readings, three locations recorded readings of 20% and above. The maximum reading was beyond the scale of the moisture meter. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. There was evidence of moisture ingress at three readings:

- 22.3% at the bottom plate at the side of the entrance;
- 31.5 % east elevation chimney below the fascia/gutter; and
- A reading that was high enough to be off the scale at the west elevation chimney below the fascia/gutter.

Readings at all other locations recording low levels of moisture, and the expert also commented:

- Although there was no way of confirming the presence of waterproofing membrane or other flashings under the cladding at the balustrade to wall junction, or the top of the balustrade, there was currently no evidence of the presence of moisture in walls associated with these areas.
- Indicative readings taken throughout the interior of the building showed no evidence of elevated moisture level in the wall cavities.

5.4 Copies of the expert's report were provided to each of the parties and neither party commented on the report.

6 THE AUTHORITY'S VIEW

General

6.1 The Authority has considered the submission of the owner, the expert's report and the other evidence in this matter. The Authority's approach in determining whether building work complies with clause 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 New Zealand data 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 shows 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, the Authority believes 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 to directly penetrate 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. The Authority believes 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, the Authority believes 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 Authority finds that this house:

- Is in a medium wind zone;
- Has an overall envelope that may be described as of medium level complexity;
- Has a two storey section over a limited portion of the ground floor area;
- Has one small deck at the upper level, which is sheltered by a roof overhang and is not constructed over a living space;
- Has grooves in the back face of the cladding that will facilitate drainage from behind the cladding, even though the cladding is face fixed;
- Has external walls constructed with H3 LOSP treated timber, which will provide good resistance to decay;
- Has 600 mm eaves over a limited number of walls that provide good protection to the cladding, but has limited eaves projections of 300 mm over other walls; and
- Has gutters that abut or penetrate the cladding of adjacent walls, with the bottom of the roof apron flashing without a turn-up to direct water away from the cladding surface.

Weathertightness performance

- 6.8 The Authority finds that in most respects, the cladding appears to have been installed according to good trade practice and to the manufacturer's instructions. However, this does not apply to a limited number of localised areas, where the cladding has been ineffective to date in preventing penetration of water into the wall structure.
- 6.9 The areas of current moisture penetration are associated with the gutters that butt against or penetrate the cladding of adjacent walls, and with the bottom of the roof apron flashing without a turn-up to direct water away from the cladding surface. There is also another defect associated with the deck, as set out in paragraph 5.1 which, if not remedied, may eventually allow the ingress of moisture behind the cladding. This defect is the lack of a turndown of the deck membrane over the cladding on one side of the deck perimeter.
- 6.10 The Authority considers that, if the limited number of faults causing, or likely to cause, moisture penetration through the cladding are remedied satisfactorily, the cladding will comply with the relevant requirements of the building code. These faults are associated with:
- The gutters that abut or penetrate the cladding of adjacent walls, with the bottom of the roof apron flashing lacking a turn-up to direct water away from the cladding surface;
 - The lack of an effective waterproof membrane protection to the top of the solid balustrade and the possible lack of saddle flashings;
 - The lack of membrane cover over the cladding at the outer edge of the deck floor structure;
 - The lack of sealing to penetrations of electrical and telephone cables; and
 - The inadequate sealing of the metal deck balustrade fixings.
- 6.11 Notwithstanding the fact that the polystyrene sheets are fixed directly to the timber framing, so restricting ventilation behind the cladding, the Authority finds that there are compensating provisions that assist the performance of the cladding in this particular case. These are:
- Apart from the items outlined in paragraph 6.10, the cladding generally appears to have been installed according to good trade practice and to manufacturer's instructions;
 - The building demonstrates a moderate weathertightness risk in terms of the E2/AS1 risk matrix
 - The grooves at the back of the polystyrene sheets facilitate drainage;
 - The exterior wall framing has been treated to H3 LOSP, which will provide good resistance to decay; and
 - Apart from the areas outlined in paragraph 6.10, there is no current evidence of moisture in the external wall cavities.

- 6.12 The Authority considers that these provisions adequately compensate for the lack of a drained and ventilated cavity and can allow the house to comply with the weathertightness and durability provisions of the building code.
- 6.13 The Authority believes that the grooves cut into the back of the backing panels could enable moisture that has come through the external cladding to drain away. The Authority, however, has not seen any evidence to conclude that the grooves provide adequate ventilation to allow the framing to dry out in all situations.
- 6.14 The Authority finds that when assessed against the risk matrix incorporated in the Acceptable Solution E2/AS1, this house presents a risk of weathertightness failure that is moderate on two elevations and high on the other two elevations. 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 The Authority is satisfied that the performance of the cladding has been reduced because it is currently allowing water penetration into the wall framing at a number of locations. Consequently, the Authority is not satisfied that the cladding system as installed complies with clause E2.3.2 of the building code.
- 7.2 The Authority finds that, because the faults that have been identified with this cladding occur in discrete areas, it is able to conclude that satisfactory rectification of the items outlined in paragraph 6.10 is likely to result in the building being weathertight and in compliance with clauses B2 and E2, notwithstanding the lack of a ventilated cavity
- 7.3 The Authority notes the importance of the owner's responsibility for ongoing maintenance to the cladding, in particular with reference to the items outlined in paragraphs 6.11 and 6.12. The code assumes that normal maintenance necessary to ensure the durability of the cladding, is carried out and thus clause B2.3.1 of the building code requires that the cladding be subject to "normal maintenance". That term is not defined, so that the Authority takes 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. The Authority recognises 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 any comments or advice provided by the territorial authority to the owner are likely to be accompanied by appropriate disclaimers.
- 7.4 The Authority emphasises 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.
- 7.5 The Authority declines to incorporate any waiver or modification of the building code in its determination.

8 THE AUTHORITY'S DECISION

- 8.1 In accordance with section 20 of the Building Act 1991 the Authority hereby determines that the cladding system as installed does not comply with clause E2.3.1 of the building code. There are also a number of items to be remedied to ensure that the building remains weathertight and thus meet the durability requirement of the code. Consequently the Authority finds that the house does not comply with clause B2. Accordingly, it confirms the territorial authority's decision to refuse to issue a code compliance certificate.
- 8.2 The Authority finds that because the faults that have been identified with this cladding occur in discrete areas, it is able to conclude that rectification of the items outlined in paragraph 6.10 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 building being weathertight and in compliance with clauses B2 and E2, notwithstanding the lack of a ventilated cavity.
- 8.3 The Authority notes 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 the Authority 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 Authority for another determination.
- 8.3 The Authority considers that the cladding on the building will require on-going maintenance to ensure its continuing code compliance.

Signed for and on behalf of the **Building Industry Authority** on 19 October 2004.



John Ryan
Chief Executive