

*Determination 2004/73****Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 56*****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 applicant is the territorial authority and the other party is the building owner. The application arises from the refusal by the territorial authority to issue a code compliance certificate for a 2-year old house unless changes are made to its monolithic cladding system.
- 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 and columns 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 part three-storey high detached house situated on an excavated sloping site. The Authority accepts for the purpose of this determination that the house is in a high wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house is of conventional light timber frame construction, built on concrete block foundation walls and a concrete ground floor slab, or piled timber-framed floors. The external walls and the Tanalised timber post columns supporting the roofs and the decks are sheathed with monolithic cladding. The house is of a fairly complex shape, with the various tiled pitched roofs set at two main levels complete with numerous wall to roof junctions. There is an open deck to one elevation at the second floor level, which is partially built over a living space and is partially cantilevered. A larger stepped deck is also partially built over a living space on two elevations of the first floor level. The decks are timber framed, supported on beams and either bare or monolithic clad posts. The lower deck is open boarded, but part of this deck and the whole of the upper deck have floors lined with

Tanalised plywood covered with a butyl-rubber overlay. Where the decks are butyl rubber clad, the exposed soffits are also lined. The lower deck has a powder coated aluminium and glass balustrade to all exposed faces. The upper deck has a similar balustrade to part of its front face; timber framed monolithic clad balustrades to the part of the front face and to the two ends, and tiles over the membrane. A flat roof supported on a monolithic clad corner column and lined with a liquid applied membrane is built over the main entrance and has a low upstand formed to the exposed edges. A small butyl rubber clad flat roof has been formed over the wardrobe of bedroom 2, and a narrow tiled lean-to roof is constructed against the northwest elevation supported on two monolithic clad corner columns. The eaves, including the spouting width, have 540 mm wide projections. The Authority notes that, while both the PIM and the bracing calculations designate the wind zone for this building as “low”, the territorial authority in its correspondence has referred to the wind zone as “V/high” wind zone (exposed)”. The Authority, assesses for the purposes of this determination, that as the site is elevated and exposed and is relatively close to the sea, the wind zone is “high”.

- 2.2 The specification calls for timber to be “treated to the appropriate hazard classification depending on its use, as specified in MP 3640: 1992. However, the Authority has not received any evidence confirming whether the external wall framing was treated. In a minute dated 8 April 2004, as described in paragraph 2.8, the territorial authority noted, “the exterior framing is not treated”.
- 2.3 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 main building incorporates 40 mm thick expanded polystyrene (EPS) backing sheets fixed through the building wrap directly to the wall framing and finished with a textured 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. There has not been any confirmation that the jointing, sealing, sponge finished coating and painting system used in this instance is one of those systems referred to in the appraisal. The Authority notes that the specifications for the house do not in fact describe the cladding system that is to be installed.
- 2.4 The coating systems supplier has advised that the cladding was applied by a licensed applicator. However, no guarantee has been issued to cover the cladding system.

Sequence of events:

- 2.5 The territorial authority issued a building consent on 13 September 2002. The “Building Consent Requirements” attached to the consent made only one reference to the cladding. This was in connection with the notice required by the territorial authority prior to carrying out the prelining inspection.
- 2.6 The territorial authority made various inspections during the course of construction, and on 18 December 2002 approved the “Preline Building Inspections” without any comment regarding the cladding. A final building check was carried out on 14 July 2003 and the only comments concerning the cladding were in relation to ground clearances.
- 2.7 The owner in an e-mail to the territorial authority, dated 10 September 2003, queried whether a code of compliance could be signed off even though there were two outstanding items involving a deck and a handrail.

- 2.8 The minutes of the territorial authority's CCC/Weathertightness Committee meeting of 8 April 2004 stated that:

[An official] said he had spoken to [another official] who had advised that he had sent information to [the owner], exterior framing is not treated and it appeared unlikely that [the owner] will get a maintenance programme. [An official] thinks it will be relatively high risk...

- 2.9 Following a weathertightness inspection on 14 April 2004, the territorial authority wrote to the owner on 23 April 2004, explaining the territorial authority's position. The letter stated:

Before the 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 given 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. Visual inspection has also highlighted the following areas of concern

High wind zone area (subject to high winds)

2 levels of decks (upper floor deck cantilevered with rail system with through the top metal handrail posts)

Ground floor deck open, wall plates bolted through cladding/wall framing

Some evidence of cladding/framing movements (shadowing etc)

Chem free exterior timber framing

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...

- 2.10 The territorial authority did not issue a Notice to Rectify as required under section 43(6) of the Act.
- 2.11 The territorial authority applied for a determination on 20 July 2004.

3 THE SUBMISSIONS

- 3.1 In a covering letter to its submission, dated 15 July 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 stated that:

The following are the major risk factors identified in this dwelling

1. External timber frame treatment unknown.
2. Direct fixed EIFS system, no warranty for the installation system or workmanship.
3. High-risk design- 3-storey house, exposed location, complex roof/wall junctions.
4. Decks at two levels over habitable spaces. Deck barriers enclosed and top fixing handrails.
5. Non complying cladding clearance in tiled areas.
6. Evidence of some cladding/framing movements noted.

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...

In regards to this application for a determination, specifically in this case the matter of doubt is whether the installed cladding system does comply with clauses B2.3.1 and E2.3.2 of the Building Code.

- 3.2 The territorial authority also supplied copies of:

- The plans and specifications;
- The consent documentation;
- The territorial authority's inspection documentation;
- Correspondence with the owner;
- The minutes of the territorial authority's CCC/Weathertightness meeting, and
- A set of photographs that showed aspects of the building.

- 3.3 The owner made a submission in a letter dated 29 July 2004, and explained that all outstanding building code requirements had been met following the September 2003 final inspection. However, due to a resource consent issue, a code compliance certificate was not issued at that time. The owner considered it to be unjust to apply new retrospective rules to the house after it had been signed off by the territorial authority following the final inspection. The owner had paid particular attention to

potential weathertightness problems, considered the house to be soundly constructed, but had been unaware that the framing timber was untreated. The owner was familiar with the importance of maintenance and provided that the manufacturer's guidelines were followed, the house should meet its durability requirements.

- 3.4 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 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; 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 inspected the building and furnished a report. It noted that the quality of finish was generally good. The plaster finish was smooth and the coating was uniform, and well adhered, with no evidence of discolouring. The expert was of the opinion that construction joints were not required to the polystyrene backed cladding to this house. There was no evidence of cracking or stress in the cladding arising from the absence of joints. The expert cut away the cladding to expose a jamb/sill intersection of one window and this inspection revealed the presence of flashings and soakers to the jambs and sills of the window. The expert also made the following comments regarding the cladding:

- There is no horizontal relief joint between the base of cladding and the plastered block foundation wall, with the coating being continuous over both elements;
- There is insufficient ground clearance to the cladding at the entrance door and at the southeast and northeast walls and doors of the garage. However, these locations are under the cover of either decks or canopies;
- There was no outlet to drain the ground floor deck, and the water that is discharged over the deck edge passes behind the timber fascia. The soffit below the fascia was water stained;
- The issues evident in the upper level deck were:
 - The slope to the top of the timber-framed balustrades is insufficient,
 - Fixings for the handrail penetrate the balustrade top and the wall cladding, and are inadequately sealed,
 - The weathertightness of the junction at the exposed edge at the top of the tiled upstand and the cladding beneath it was inadequate, although the deck membrane at this location may provide a line of weatherproofing behind the tiles,

- The clearance between the base of the cladding and the tiling was 30mm instead of the 40mm recommended by the manufacturer, and
- The outlet and overflow should have been formed with purpose made outlets and not from uPVC downpipes.
- The issues evident in the canopy flat roof were:
 - The applied membrane appeared to be inadequate, as evidenced by the nail positions and the plywood decking joints being visible through the coating,
 - The wall cladding adjoining the roof is carried hard down onto the membrane and water ponding is evident,
 - The monolithic clad capping is flat so does not meet the recommended 15 degree slope and the detail itself did not comply with the manufacturer's details, and
 - No overflow has been installed.
- The butyl rubber clad flat roof over the wardrobe of bedroom 2 has a back fall and there is evidence of moisture ponding; and
- Some cladding penetrations are not properly sealed.

The expert also noted that there was inadequate sub floor ventilation under the kitchen and family room floors, and that no compensatory measures such as a membrane to cover the subsoil, had been installed.

- 5.2 The expert also took non-invasive readings at the interior linings of the external walls throughout the house and all the readings were within the “safe” range. The expert also took 9 invasive moisture readings of the external walls with the highest reading being 18.2% at a floor joist under the kitchen. While moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure, the Authority considers that a reading of 18.2% is not indicative of any significant moisture entry.
- 5.3 Copies of the expert’s report were provided to each of the parties.

6 THE AUTHORITY’S VIEW

General

- 6.1 The Authority has considered the submissions of the parties, the expert’s report and the other evidence in this matter. The Authority’s 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, 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:

- Has 540 mm total wide eaves projections;
- Is in a high wind zone;
- Is a maximum of three storeys high;
- Has fully flashed exterior joinery units;
- Has an overall envelope that is fairly complex on plan, with roofs at two main levels that have numerous junctions with the cladding.
- Has two open decks, both partially built over living spaces; and
- Has external walls constructed with untreated timber, which 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 and to the manufacturer's instructions, and the Authority considers that the cladding has been effective to date in preventing the penetration of water. There are, however, some defective areas, which if not remedied, will eventually allow the ingress of moisture behind the cladding. These are set out in below:

- The lack of a horizontal relief joint between the base of cladding and the plastered block foundation wall;
- The prevention of water accumulation on the ground floor deck soffit linings;
- The issues evident in the upper level deck including the balustrade top, the handrail fixings, the junction and clearance of the cladding at the tiling, and the poorly formed outlet and overflow;
- The issues evident in the canopy flat roof including the inadequate membrane, the junction with the cladding, the base of the capping cladding being too close to the roofing and the non-sloping top, and the lack of an overflow;
- The backfall on the flat roof over the wardrobe of bedroom 2; and
- The inadequately sealed cladding penetrations.

The Authority also considers that the question of adequate sub floor ventilation under the kitchen and family room floors should be investigated.

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, the Authority finds

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 and to manufacturer's specifications;
- The exterior joinery units are fully flashed;
- The house has reasonably wide eaves projections; and
- There is no moisture evident at this time in the external wall cavities.

- 6.10 The Authority considers that these factors adequately compensate for the lack of a drainage and ventilation cavity and can allow the house to comply with the weathertightness and durability provisions of the building code, notwithstanding the lack of a drained and ventilated cavity.
- 6.11 The Authority accepts that neither horizontal nor vertical control joint are required for this cladding. In addition, while there is insufficient ground clearance to the cladding at the entrance door and at the southeast and northeast walls and doors of the garage, as these locations are protected by either a deck or a canopy, the Authority accepts that these areas do not require remediation.
- 6.12 The Authority notes that one elevation of the extension demonstrates a high weathertightness risk rating and that the other elevations demonstrate a medium 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.
- 6.13 While it does not form part of this determination, the Authority notes that the flight of timber steps leading up to the deck on the northeast elevation of the house lacks an effective handrail and terminates at an unsafe height. The Authority therefore suggests that the territorial authority investigate and take any action that it considers appropriate.

7 CONCLUSION

- 7.1 The Authority finds the expert's report establishes that there is no evidence of external moisture entering the building. Accordingly the Authority finds that the cladding on this building at this time does comply with clause E2.
- 7.2 However, the building is also required to comply with the durability requirements of clause B2. Clause B2 requires that a building continues to satisfy all the objectives of the building code throughout its effective life, and that includes the requirement for the house to remain weathertight. Because the cladding faults in this house are likely to allow the ingress of moisture in the future, the house does not comply with the durability requirements of clause B2.
- 7.3 The Authority also finds that because the faults in this cladding occur in discrete areas, it is able to conclude that rectification of the identified faults is likely to bring the cladding into compliance with the code. Once the cladding faults listed in paragraph 6.8, including the sub floor ventilation, have been satisfactorily rectified, this house should be able to remain weathertight and thus comply with both clauses E2 and B2.

- 7.4 The Authority 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 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 the nature of the advice, and the basis on which it is provided to the owner, are for the territorial authority to decide.
- 7.5 The Authority emphasises that each determination is conducted on a case-by-case basis. The fact that a particular cladding system has been established as being code compliant in relation to a particular building does not necessarily mean that the same cladding system will be code compliant in another situation.
- 7.6 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, the Authority determines that the extension is weathertight now and, therefore, the cladding complies with clause E2. However, as there are a number of items to be remedied to ensure it remains weathertight and thus meet the durability requirements of the code, the Authority finds that the house does not comply with clause B2. Accordingly, it confirms the territorial authority’s decision to refuse to issue the code compliance certificate.
- 8.2 The Authority finds that once the items of non-compliance that are listed in paragraph 6.8, including the sub floor ventilation, are rectified to the approval of the territorial authority, together with any other instances of non-compliance that become apparent in the course of rectification, the cladding as installed on the extension will comply with the building code, notwithstanding the lack of a drainage 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.
- 8.4 The Authority considers that the cladding will require on-going maintenance to ensure its continuing code compliance.

Signed for and on behalf of the **Building Industry Authority** on 29 November 2004.

John Ryan
Chief Executive