Determination 2004/80

Refusal of a code compliance certificate for a building with a "monolithic" cladding system: House 63

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 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 2-year old major extension to an existing house ("the extension"), 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 monolithic wall cladding as installed to the some of the ground floor external walls of the new extension ("the cladding"), complies with the building code (see sections 18 and 20 of the Act). By "external monolithic 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 Building 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 two-storey extension to an existing detached house situated on a slightly sloping excavated site in a low wind zone in terms of NZS 3604: 1999 "Timber framed buildings". The extension is of conventional light timber frame construction on concrete block foundation walls. All the upper floor external walls of the extension are sheathed with cedar bevel back weatherboards and the lower floor walls are sheathed with monolithic cladding. The extension is of a moderately complex shape. An entrance porch consists of a landing and flight of steps adjoining a concrete block foundation wall and a monolithic clad timber framed continuation over it. The roof is extended over the porch and is supported on monolithic clad columns, and a metal balustrade has been installed between the columns to one side of the steps and landing. A balcony with a weatherboard-clad balustrade is constructed over the garage. The deck of the balcony is covered with a

black bituminous membrane. The extension has 750mm wide eaves projections with the spoutings providing an additional 125 mm projection.

2.2 The specification calls for all non-heart timber to be "treated", but no evidence has been provided as to what treatment, if any, was applied to the exterior wall framing.

2.3 Some of the lower-level external walls of the extension are clad with a stucco system that is described as monolithic cladding. In this instance it incorporates fibre-cement backing sheets fixed through the building wrap directly to the framing timbers, reinforcing mesh spaced off the backing and a 21mm minimum thickness of solid plaster. The plaster in turn is finished with a 100% acrylic high-build paint system. The manufacturer's instructions also give details of the jointing and flashing systems that are to be used. No information has been given as to what jointing, plaster and paint systems were applied to the extension.

Sequence of events:

2.4 The territorial authority issued a building consent on 15 May 2001.

2.5 The territorial authority carried out various inspections during the course of construction. The plastering inspection was passed on 4 February 2002 and the plastering items of the final check were passed on 21 March 2002. The territorial authority carried out a further inspection, 21 May 2004, and in a letter to the owner, dated 23 June 2004, stated that it had inspected the house, regretted that it may not comply with the building code in a number of respects, and described the territorial authority's current concerns as regards weathertightness problems involving monolithic clad buildings The territorial authority also stated that it had instituted a new inspection regime. A Notice to Rectify, dated 23 June 2004, was attached to this letter.

The "Particulars of Contravention" attached to the Notice to Rectify noted that in regard to the cladding:

1. The following have not been installed per the manufactures [sic] specifications

    - Control joints at a maximum of 4.0 [metre] centres vertically from internal and external corners and horizontally at floor joist level are required. Control joints appear have not been installed (*sic*), confirmation is required that horizontal and vertical control joints have been installed.

    - A 6mm gap (horizontally) is required between the backs of the cladding and the foundation wall. This has not been achieved

    - The bottom edge of the cladding system is to finish a minimum of 100mm above paved surfaces and 175mm above unpaved surfaces. The cladding has been taken closer than these measurements.

2. The following items have not been installed per accepted trade practice

    - Penetrations through the cladding system shall be as waterproof as the cladding itself. There are a number of penetrations through the cladding that should be protected with rubber flanges and silicon.

    - Sill flashings are to be taken 30mm past the edge of the window joinery. This has not been achieved.

    - Head flashings above windows to be taken 30mm past the edge of the window joinery. This has not been achieved.

- Drip edges are required to prevent surface water drips off the cladding, preventing capillary action, gravity or wind pressure. Drip edges have not been installed.

- Horizontal junction between timber frame and concrete masonry, supporting the fibre cement boards, a continuous flashing is required. This flashing has not been installed.

- The junction between the window head flashing and bottom edge of the cladding should be left unsealed with 20mm gap. This junction has been sealed.

3. Ventilated cavity system

    - The Council has recently received information which shows that monolithic cladding systems without a drainage plane/cavity, provision for adequate ventilation, drainage and vapour dissipation will, in the likelihood of leakage and/or the effects of residual moisture, cause irrevocable damage to the structural elements of the building.

The territorial authority also noted:

> The Council cannot be satisfied that the above building meets the performance requirements of Clauses B1 Structure, B2 Durability, E2 External Moisture, E3 Internal Moisture, G4 Ventilation and H1 Energy Efficiency Provisions of the Building Code…This is in breach of Sections 7(1), of the Building Act 1991…

Also that the owner was required to:

1. Provide adequate ventilation to the monolithic cladding and into the wall frame space by means of either a ventilated cavity or alternative approved system, and ensuring all issues related to the above are resolved.

2. Lodge with the council an application, within 28 days from the date of this notice, for an amended building consent, and provide all necessary information that may be requested to allow this consent application to be processed, alternatively.

3 Confirm to council, within 28 days from the date of this notice, your intention to apply to the Building Industry Authority for a determination in accordance with the Building Act 1991

The territorial authority also provided a set of photographs relating to the cladding.

2.6 The owner applied for a determination on 28 June 2004.

3 THE SUBMISSIONS

3.1 The owner made a submission, dated 28 June 2004, in a covering letter sent with the owner's documentation. This set out details of the inspections carried out by the territorial authority and that experts and experienced tradespersons had been employed for the project. The owner listed some of the weathertight features of the extension and stated that the house had shown no signs of moisture ingress in the two plus years since the building was erected. The owner then commented on some aspects of the Notice to Rectify.

3.2 The owner also provided copies of:

- The building plans and specifications;

- The building consent documentation;
- The territorial authority's inspection notes;
- The Notice to Rectify;
- The manufacturer's instructions;
- The correspondence with the territorial authority; and
- A 3-year guarantee from a building members organisation.

3.3 The territorial authority made a submission in the form of a letter dated 28 July 2004.This stated:

> During the inspection of the property on 14 June 2004 it was [discussed] with the owner that vents could be installed into the wall framing of the exterior garage walls. This would provide ventilation to the wall framing without compromising the thermal envelope (as the garage is outside the envelope) Council would accept this as addressing concerns regarding ventilation.
>
> By providing ventilation into the wall framing a number of other issues would no longer be of concern, and Council would only require the following to be determined:
>
> 1. The cladding closer than 100mm to the paving.
> 2. The front entry area where the plaster and blockwork meet horizontally without a flashing.
> 3. Confirming that the front entry stairs have been poured against the blockwork and not the timber framing and plaster.

3. 4 Copies of the submissions and other evidence were provided to each of the parties.

3.5 Following the issue of the draft determination, the owner wrote to the Authority on 24 November 2004. The owner indicated acceptance of the draft, providing that two issues were addressed. These were:

- There was only one unsealed penetration through the cladding; and
- The balcony does in fact have an independent overflow and the territorial authority did not raise the question of an overflow

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. 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 current Acceptable Solution, E2/AS1, allows for solid plaster systems with fibre cement backing sheets, but requires that they be fixed on battens to create a 20mm cavity between the sheet and the framing. The previous acceptable solution E2/AS1, which was in force when this consent was issued, allowed for mesh reinforced solid plaster to be applied to fibre cement backing sheets that were face fixed to the framing. The cladding is not currently accredited under section 59 of the Act. The Authority is therefore of the opinion that the cladding system as installed must now 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. It stated that the

quality of finish was generally good and while the paint system was sound, it was discoloured in some areas. All walls longer than 4000mm have vertical control joints. The expert removed a small section of the plaster to examine a sill/jamb intersection of one exterior joinery unit, and found the jamb flashing correctly installed to discharge any moisture over the sill flashing, but that the sill flashing lacked a raised stop end. A further investigation was made of a vertical control joint and the expert was of the opinion that the detail, which consisted of a scratched out groove filled with sealant, was close to one of "the many methods used to form control joints" that were described in a recognised stucco plaster guide. The Authority accepts that these exposed details are likely to be representative of the remaining control joints and joinery unit flashings. The expert's report made the following specific comments on the cladding:

- At some of the control joints under the sides of the windows; fine cracks in the outer plaster layer were visible, indicating that these particular joints were operating efficiently;

- There are no head flashings above the garage windows and the vehicle and garden door heads. However, these areas are protected by the closer batten to the weatherboards over them. This, in the expert's opinion, provided similar protection to a flashing

- There are flashings to the heads, jambs and sills of the exterior joinery units, but there are no raised stop ends to the sill flashings. However, the expert considered that as the jamb flashing was positioned in front of the sill flashing, which itself had a reasonable fall to the outside, that the flashings as installed are adequate;

- The base of the cladding did not incorporate a drip feature and for much of the perimeter the plaster was finished tight to the foundation, with no clearance to allow drainage from the wrap;

- There was insufficient clearance to the base of the cladding at the vehicle or garage doors; and

- One penetration through the cladding was not sealed.

5.2 The expert also carried out an investigation of the deck, which although it was clad with weatherboards, was constructed directly above some of the monolithic cladding. The expert noted that there was no cracking of the finishes, popping of nails, or any other evidence of moisture ingress. There were no excessive moisture levels in the adjoining ceilings or walls. The expert commented that as the handrail fixings probably penetrated the balustrade capping, the sealing of the fixings should be periodically maintained to prevent future leakage to the framing below.

5.3 The expert carried out a series of moisture tests of the interior linings of the exterior walls throughout the building using a non-invasive meter and all the readings were in the "safe/air dry" range. The expert took invasive readings at a total of 5 locations and these ranged from 11% to 13.3%. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure.

5.4 The expert also commented on the territorial authority's "Particulars of Contravention". The expert agreed with the territorial authority assessment of ground clearances, the lack of a drip edges and the sealing of projections. The expert noted that there was no requirement in E2/AS1 for 6 mm gap between the back of the cladding and the foundation

wall but there was a requirement "to leave open to drain". The expert made other specific comments, which are generalised as follows:

- There were no weathertight issues regarding the sill flashing projections and the lack of head flashings;
- The absence of a horizontal flashing between the blockwork foundation wall and the cladding over at the entry steps and landing had not resulted in moisture ingress or cracking and the location was relatively sheltered by the canopy and the eaves. Any remedial work could lead to failure instead of preventing moisture ingress; and
- The unsealed gap between the weatherboard closer batten and the window head flashings provided a drainage path from the wrap above it.

5.5 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 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 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 extension:

- Has, including the spoutings, eaves projections 875mm wide that provide excellent protection to the cladding;

- Is built in a low wind zone;

- Is two stories high;

- Is moderately complex on plan;

- Has one high-level balcony constructed over the garage; and

- Has external walls 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 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 gap where the base of the cladding adjoins the blockwork foundation wall;

- Insufficient clearance to the base of the cladding at the vehicle or garage doors; and

- The unsealed penetration through the cladding.

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 house is in a low wind zone and has very 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.

6.11 The Authority accepts that the vertical control joints that have been installed in the plaster are adequate and that a horizontal control joint is not required for this cladding.

6.12 The Authority accepts the expert's opinion that the flashings to the exterior joinery units as installed adequately cope with any water ingress around the units and that there is adequate protection to the heads of the garage windows, vehicle door and garden door heads. The Authority also notes that the plaster finishes over the ends of the sill flashings to the windows. However, the Authority considers that this detail is acceptable, as the plastered polystyrene moulding encasing the flashing is planted onto the outside the face of the main plaster surface and the sill flashing discharges water outside the 21mm thick stucco plaster.

6.13 The territorial authority has suggested that the owner installs a series of vents to provide ventilation to the garage walls, but the Authority is not aware that the owner is prepared to follow this course of action. It is not a matter that the Authority can rule on, and it is over to the parties to agree on matters of rectification.

6.14 The Authority notes that the entry steps are constructed against a plastered block foundation wall and not against the cladding as claimed by the territorial authority. It also considers that a flashing need not be installed at the junction of the block wall and the narrow height timber-framed monolithic clad wall constructed above it, adjacent to the front steps.

6.15 The Authority notes that elevations of the extension demonstrate a low to moderate 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 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 particular 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 extension to remain weathertight. Because the cladding faults in this extension are likely to allow the ingress of moisture in the future, the extension 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 have been satisfactorily rectified, this extension 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.

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, therefore, finds that once the items of non-compliance that are listed in paragraph 6.8 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 issued a Notice to Rectify requiring provision for adequate ventilation, drainage and vapour dissipation. Under the Act, a Notice to Rectify can require the owner to bring the house into compliance with the building code. The Authority has already found in a previous determination (2000/1) that the Notice to Rectify cannot specify how that compliance can be achieved. A new Notice should be issued that requires the owner to bring the cladding into compliance with the building code, without specifying the features that are required to be incorporated. It is not for the Authority to dictate how the defects described in paragraph 6.8 are to be remedied. How that is done 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