

# ***Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 53***

## **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, acting through the builder as their agent (referred to throughout this document 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 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 monolithic wall cladding as installed (“the cladding”), to the south elevation walls and associated return walls of this house, 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-detached house with a narrow single storey extension, situated on a level site in a high wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. However, the walls in question are situated on the more sheltered southern elevation. The house, which is of conventional light timber frame construction on a concrete block foundation wall, is of a relatively simple shape. The main roof and the roof over the ground floor extension are to a curved shape. The majority of the external framing is sheathed in a H3 treated plywood and batten cladding. The south elevation walls, and their adjoining maximum 2000mm long return walls, are sheathed with monolithic cladding. The narrower high-level returns are formed from 20 mm thick polystyrene sheets fixed over the plywood cladding and finished with the plaster and paint systems. There is a boarded timber deck at the first floor level adjacent to one plywood-clad wall. The verges

above the monolithic cladding at both levels project 170mm and are supported on “dummy” rafters. The lower level roof also has a secondary soffit forming a canopy over part of the lower level wall, which affords additional protection to the cladding below it. The Authority notes that the lower wall configuration that forms this canopy differs from the flush wall that is shown on the consent drawings.

- 2.2 The owner forwarded a “Producer Statement” from the timber supplier, dated 31 May 2004. This confirms that the bottom plates to the exterior walls are H3 LOSP treated and the remainder of the external wall framing is H1+ LOSP treated.
- 2.3 The cladding system on the south elevation, which is the subject of this determination, is what is described as monolithic cladding. As specified in its manufacturer’s June 1997 data sheets (“the manufacturer’s instructions”) and a subsequent independent appraisal, it incorporates 90 mm thick expanded polystyrene (EPS) backing sheets fixed through the building wrap directly to the framing timbers and finished with a multi-coat, fibreglass mesh reinforced polymer modified cement plaster system. (The Authority notes that the manufacturer’s instructions as supplied by the owner show a 140 thick polystyrene backing sheet). Incorporated in the system are a series of purpose made plastic extrusions that reinforce and waterproof the corners, edges and joinery unit surrounds. The plaster thickness on this house has been increased to accommodate the “adobe” finish.
- 2.4 The owner forwarded a “Material Component Guarantee” and a “Workmanship Guarantee” for the system, both of which were dated 8 April 2004. The “material Component Guarantee” contains the following requirement for it to be valid;

The system must be painted in a colour of not less than 40% LRV, properly maintained and subjected to no more than normal conditions of exposure.

The Authority notes that the walls in question are painted a dark colour but they face the more sheltered southern aspect of the site.

### Sequence of events

- 2.5 The territorial authority issued a building consent on 28 March 2001.
- 2.6 The territorial authority made various inspections during the course of construction, and passed the “Plaster Exterior Cladding” inspection on 6 August 2002. A final code compliance certificate inspection took place on 10 December 2003, but the TA’s Field Sheet records “Inspected but not signed off.”
- 2.7 The territorial authority issued a Notice to Rectify, dated 18 December 2003, and the “Particulars of Convention” were:

Monolithic cladding systems without a 20 mm cavity, provision for adequate ventilation, drainage, and vapour dissipation will, in the event of leakage and/or the effect of residual moisture, cause irrecoverable damage to the structural elements of the building

As you have used a cavity system that has not had the required system of inspections: -

You are required to:

- Remove the monolithic cladding and replace with an approved cladding system which has been subjected to the Council’s recently adopted inspection system.

- Lodge with (the) Council an application for and amended building consent and provide all necessary information that may be requested to allow this consent application to be processed.”

2.8 The owner applied for a determination on 29 April 2004.

### 3 THE SUBMISSIONS

3.1 The owner under the “Matter of Doubt or Dispute” in its application stated that only one wall of the house had monolithic cladding. The owner pointed out that the same builder using the same cladding subcontractor had built an exact copy of the house just prior to the one in question. The replica house, which had been completed in November 2002, compared with December 2003 for this house, had received a code compliance certificate. The owner stated that a cavity had not been asked for at the time of inspection and that a territorial authority inspector had given the impression that he was “happy with the construction but would not pass it because of the lack of a 20 mm cavity”.

3.2 The owner provided copies of

- The building plans;
- The building consent;
- The Notice to rectify;
- The TA’s “Field Sheets”, recording the inspections of the building;
- The cladding system manufacturer’s Material Components Guarantee;
- The approved cladding system installation contractor’s Workmanship Guarantee;
- The cladding system appraisal issued by an independent appraisal organisation;
- The timber supplier’s “Producer Statement”;
- Two sketches depicting the junction of the monolithic and plywood claddings at the upper level; and
- An “Independent Moisture Check Report” from a consultant engaged by the owner. The consultant took random readings at all the internal walls, using a non-invasive meter. The findings were as follows:

Readings recorded to the front [Cladding] wall behind all flashings, at all joinery junctions and at bottom plate level are as follows:

- Stairwell and upper levels revealed a constant reading of 8–10%.
- Lower levels including garage and under the stairwell storage area revealed a constant reading of 8–10%

- Checks were also made to the board and batten areas around windows and ranchslider on the upper levels as a comparison and these readings were also 8–10%.
- In no areas were there found any cause to be concerned with moisture ingress at this time.

The consultant was also of the opinion that no moisture had ingressed into the framing structure and that all manufacturer's specifications had been adhered to.

- 3.3 The territorial authority made a submission in the form of a letter, dated 3 May 2004, which confirmed that a building consent had been issued for the cladding and also stated:

The cladding was installed with a cavity but was not the subject of the changed inspection procedures implemented by this Council as a consequence of a [Named] adjudication.

In the absence of the additional inspections implemented as a consequence of those changed inspection procedures, the Council does not believe it is able to be satisfied, on reasonable grounds, that the cladding applied to this dwelling will achieve the functional requirements of Clause E2.2, or the performance requirements of E2.3.2, of the Building Code.

- 3.4 The copies of the submissions and other evidence were provided to each of the parties and neither party made a further response.

#### **4 THE RELEVANT PROVISIONS OF THE BUILDING CODE**

- 4.1 The dispute for determination is whether the territorial authority's decision to refuse to issue a code compliance certificate because it was not satisfied that the cladding complied with clauses B.3.1 and E2.3.2 of the building code (First Schedule, Building Regulations 1992) is correct. Those provisions of the building code provide:

##### **Clause B2—DURABILITY**

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

- (a) The life of the building, being not less than 50 years, if:
- (i) Those building elements (including floors, walls, and fixings) provide structural stability to the building, or
  - (ii) Those building elements are difficult to access or replace, or
  - (iii) Failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.
- (b) 15 years if:
- (i) Those building elements (including the building envelope, exposed plumbing in the subfloor space, and in-built chimneys and flues) are moderately difficult to access or replace, or
  - (ii) Failure of those building elements to comply with the building code would go undetected during normal use of the building, but would be easily detected during normal maintenance.

## Clause E2—EXTERNAL MOISTURE

**E2.1** The objective of this provision is to safeguard people from illness or injury, which could result from external moisture entering the building.

**E2.2** Buildings shall be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.

**E2.3.2** Roofs and exterior walls shall prevent the penetration of water that could cause undue dampness, or damage to building elements.

4.2 There are no Acceptable Solutions that have been approved under section 49 of the Act that cover this cladding. The cladding is not accredited under section 59 of the Act. 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 Because the information provided by the parties contained insufficient detail on how the building had been constructed, 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 the increased thickness of plaster to give the adobe appearance, which had a consistent smooth finish free of defects. The paint finish has a consistent dense finish that was also free of defects. The expert noted the dark paint colour would be subject to a greater thermal movement than a lighter shade. There are flashings to the heads, jambs and sills of the exterior joinery units and while the flashings are completely sealed and the plaster is in contact with the head flashing, this is in accordance with the manufacturer's recommendations. The expert cut away a section of the cladding at a window sill/jamb junction in order to check the flashings. The expert's report made the following specific comments on the cladding:

- There is no control joint in the upper main wall, which exceeds the dimensions set out in the manufacturer's recommendation, and endorsed by an independent appraisal certificate, to provide joints where walls exceed 4 square metres in area and 6 metres in length;
- The ground clearances at the base of the cladding are inadequate;
- Where the cladding joins the plywood and battened linings at the upper level return walls, the bottom edge of the cladding over the plywood is poorly finished and creates a water trap;

- The junctions of the concave roof soffits and the wall cladding are inadequately sealed; and
- The “dummy” rafters are inadequately sealed where they penetrate the cladding.

The expert also noted that there is ponding of water close to the base of the cladding, apparently because the paving has an inadequate fall towards the drainage sump.

- 5.2 The expert took moisture readings throughout the house at the interior linings of the external walls using a non-intrusive meter and no readings in the “damp” range were recorded. The expert also took 4 further readings with an intrusive meter, and none of these was over 16 %. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure.
- 5.3 The Authority notes that the expert’s report has not established the presence of a cavity that is referred to in the territorial authority’s letter to the owner of 3 May 2004.
- 5.4 Copies of the expert’s report were provided to each of the parties and neither party made a response.

## **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/AS1 and E2.3.2, is to examine the design of the building, the surrounding environment, the design features that are intended to prevent the penetration of water, the cladding system, its installation, and the moisture tolerance of the external framing.

### **Weathertightness risk**

- 6.2 International and local research and experience indicates that the impact of weathertightness problems in monolithic clad houses can be minimised if good and effective design and construction practices are followed.
- 6.3 The installation of exterior cladding to manufacturer’s specifications and to accepted good trade practice is an important but not the only requirement to ensure good weathertightness performance.
- 6.4 The next priority is to reduce the ability of moisture to get through the cladding by using design measures that minimise the effects of the rain impacting on the walls:
- 6.5 Important matters for consideration are:
- Data show a strong relationship between the width of the eaves and the incidence of wall leaks. An effective deflection mechanism, such as eaves greater than 600 mm wide, has been shown by Canadian data to manage more than 90% of rain incidence;

- While most reported leaks are substantially caused by defects in the cladding that require little or no wind pressure differential, 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 170mm wide verge projections that provide virtually no protection to the main cladding areas, although the lower level canopy recess protects the cladding around the entry;
- Is in a high wind zone;
- Is two stories high;
- Has flashings to the heads, sills and jambs of the exterior joinery units;
- Has an overall envelope that is very simple on plan;
- Has an no attached decks or balconies that adjoin the monolithic cladding; and

- Has in the external walls:
  - Timber bottom plates that are H3 LOSP treated and which are very effective in delaying the onset of decay, and
  - The balance of timber that is H1+LOSP treated, which is moderately effective in delaying the onset of decay.

### **Weather-tightness performance**

- 6.8 The Authority considers that the cladding has been effective to date in preventing the penetration of water. There are, however, a number of discrete defects as set out in paragraph 5.1, which if not remedied, will eventually allow the ingress of moisture behind 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:
- The cladding appears to generally have been installed according to good trade practice and to manufacturer's specifications;
  - All openings are properly flashed;
  - At this time, there is no evidence of external moisture ingress;
  - The timber in the external walls is treated to a minimum of H1+ LOSP, which is moderately effective in delaying the onset of decay.
- 6.10 The Authority considers that these other factors adequately compensate for the lack of a ventilation cavity and can allow the house to comply with the weather-tightness and durability provisions of the building code.
- 6.11 The Authority is concerned that the cladding is finished with a dark colour, which may have a higher LRV rating than that stipulated for the validation of the "Material Component Guarantee" provided by the cladding manufacturer. Accordingly, the Authority requires this matter to be investigated and suggests that a lighter replacement colour be substituted if required when the cladding is repainted under a maintenance regime.
- 6.12 The Authority notes that the Notice to Rectify incorrectly states that the house has a "cavity system that has not had the required system of inspections". The monolithic cladding used on this house is fixed directly to the wall framing and there is no cavity. The Authority is also concerned with the lack of details on the plans supplied with the documents for this determination. The Authority would expect that plans of a more detailed nature were provided for the purposes of obtaining a consent for the house in question.
- 6.13 The Authority notes that elevation of the building that is monolithic clad demonstrates a medium weather-tightness risk rating, as calculated 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 building to remain weathertight. Because the cladding faults in this building are likely to allow the ingress of moisture in the future, the building does not achieve 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. In addition to these faults, the Authority also finds that measures to prevent the ponding of water adjoining the cladding should be taken to ensure the clearance between the cladding and wet ground surfaces is maintained to ensure the watertight integrity of the house. Once the cladding faults listed in paragraph 5.1 and the water ponding have been satisfactorily rectified, this house should be able to remain weathertight and thus comply with both clause 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 house 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 5.1, plus the water ponding, 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 house 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 5.1 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 12 November 2004.



**John Ryan**  
Chief Executive