

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 16

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 builder acting on behalf of the building owner. The other parties are the territorial authority and the building certifier. The application arises from the refusal by the territorial authority to issue a code compliance certificate for a new 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 cladding as installed (“the cladding”) on 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 coatings) as well as the way the components have been installed and work together.
- 1.3 The house itself described in paragraphs 2.1 to 2.4, and paragraph 9 sets out the Authority’s final decision.

2 PROCEDURE

The building.

- 2.1 The building is a detached house with two floor levels on a level excavated site in a low wind zone in terms of NZS 3604: 1999 “Timber framed buildings. The building is of conventional light timber frame construction and is of a relatively complex shape. Eaves overhangs are generally 170 mm wide, with the sputings extending a further 140 mm. There are several complex wall/roof intersections, particularly on the eastern elevation with the junction between the gable roofed garage and the 2 storied main structure behind it. The roof is clad in asphaltic shingles.
- 2.2 Framing in external walls is kiln dried untreated timber.
- 2.3 The building is clad with what is described as monolithic cladding, with projecting polystyrene feature blocks, or quoins on some corners. As detailed in an Appraisal Certificate (“the Appraisal”), it incorporates 40 mm thick expanded polystyrene (EPS) backing sheets fixed through building wrap directly to framing timbers and finished with a 3 to 6 mm cement plaster reinforced with fibreglass mesh. The plaster is finished with a

100% external acrylic paint system. The Appraisal describes the sealing and plaster application and finishing. It also refers to the requirement that flashings are required to heads, jambs and sills to openings as set out in the manufacturer's "Installation Manual".. The coating system used comprises a fibreglass mesh reinforced adhesive render basecoat covered with a medium sponge finish top plaster coat.

- 2.4 The Authority notes that the cladding system as fixed to the house differs from that shown on the consent documentation.
- 2.5 The coating system supplier has issued to the applicator a warranty covering both the coating system materials and their application. The warranty states that the work has been carried out by a licensed applicator.

Sequence of events:

- 2.6 The territorial authority issued a building consent on 8 April 2002, based on a certificate issued by a building certifier. The consent was subject to "Conditions 1 and 2 for the Issue of Building Consent". Neither of these conditions related to the cladding.
- 2.7 The building certifier made various inspections in the course of construction, but due to a change to its statutory approval, it was unable to certify claddings that were outside those specified in the acceptable solution E2/AS1. The certifier, therefore, was required to ask the territorial authority to inspect and certify the outer cladding and the final plaster coatings. On 7 January 2004, the building certifier made a final inspection of the building and issued a building certificate that stated:

The Building Certifier is satisfied on reasonable grounds that the building work complied with the listed provisions of the building code on the date of certification as detailed in the Scope of Building Certifiers Engagement No [Given Number].

The only exclusions being "New Zealand building code E2 alternative solution ([Named] cladding) NSCC to issue CCC.

- 2.8 The building certifier informed the territorial authority on 23 January 2003 that it was no longer able to inspect the building. The territorial authority visited the building site and concluded from an external inspection that the cladding appeared to have serious defects associated with it.
- 2.9 Following the inspection the territorial authority issued a "Schedule of Defects", dated 25 February 2003. This listed 11 main defects that the territorial authority considered made the cladding non-compliant, as well as 3 other areas of concern that did not involve the cladding.
- 2.10 The territorial authority sent a letter to the owner on 17 March 2003, which stated

The council has considered all documentation relating to your building consent, which is available to it. Unfortunately, the available documentation has not provided the council with reasonable grounds to believe that the installed cladding system complies with the relevant clauses of the building code.

Of particular concern to the council is the method of cladding installation on your building. It appears that a licensed installer did not install the cladding system as intended by [an appraisal]. The council's external inspection has obvious serious defects associated with it. (*sic*)

The council was not involved in the inspection process prior to the completion of the cladding installation and has been provided with insufficient information to

enable it to assess the extent of all possible defects, which may be associated with the cladding and its installation. Consequently, the council is unable to issue a code compliance certificate or a notice of rectification with respect to the cladding.

- 2.11 The letter also noted, among other matters, that the cladding system to the house had been changed from that shown on the consent documents without an amendment being obtained as required by clause 6 of the Building Regulations 1992. The territorial authority also stated that due to the large number of defects, it could not accept the producer statement relating to cladding installation, nor the warranty given for the coating system.
- 2.12 The territorial authority stated that it was unable to issue a notice to rectify as required by section 43 of the Act because it could not identify all the potential issues and defects in the installed cladding system.
- 2.13 The owner applied for this determination on 6 April 2003.

3 THE SUBMISSIONS

- 3.1 The owner did not provide a detailed submission, but did forward:
- A set of plans for the building;
 - The building consent documentation; and
 - A set of photographs, which showed the exterior of the building.
- 3.2 The territorial authority provided a comprehensive submission with attached correspondence and photographs of the cladding areas that it considered were defective. The submission concluded that for the reasons provided in the submission, it was not “in a position where it can confidently, on the basis of the information available to it, issue a CCC or a notice to rectify in relation to the Dwelling”. Attached to the submission were:
- Copies of the building consent documentation;
 - Copies of correspondence from the building certifier, including its “Job Card” relating to inspections;
 - A copy of the territorial authority’s letter to the owner of 17 March 2003; and
 - A copy of the warranty for the coating system.
- 3.3 The building certifier in a letter dated 21 October 2003, set out the history of their involvement in the project and made various comments on the territorial authority’s submissions. In a letter to the Authority received on 6 November 2003, the building certifier stated:

[The building certifier’s] certificate covers up to but excluding the outer casing or final plaster coating is not an acceptable coating as the plaster coating is not an acceptable solution (E2/AS1). [The building certifier’s] certificate has been limited to E2/AS1 since 4 December 2002. The building wrap, (although not necessary) windows, flashings and substrate are all covered by the certificate under E2/AS1, 2.0.1, 3.1, 2.33 and NZS 3604 11.8.6.1

The building certifier also commented on the territorial authority's "Schedule of Defects" and copy of the territorial authority's letter to the owner of 17 March 2003.

- 3.4 Copies of the submissions, and other evidence were provided to each of the parties. Neither the applicant, nor the territorial authority, made any further submissions in response to the submissions of the other parties.

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 on the grounds that 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 made two visits to the site, and, during the second visit, carried out invasive testing to record internal moisture levels and to determine the extent of the window flashing details. The expert concluded that the cladding demonstrated a number of installation errors. Repairs had been attempted of some of these faults, but they were not well carried out. The expert's report made the following specific comments on the as built cladding details:

- There is some cracking to the cladding below 2 windows, and lime is leaching below another window where there is a fine crack and water staining below it;
- The cladding generally terminates correctly above the finished ground level, but in one area it is partially covered by landscaping stones and a fibre-cement backing;
- At the southern side of the building, the concrete foundation/slab projects past the face of the cladding by approximately 100 mm. While a Z-flashing is installed at this junction, the expert has doubts about its ability to prevent long term moisture ingress;
- The back face of the cladding is predominately hard against the foundation walls and there is generally a lack of a capillary break;
- On the eastern side of the building the cladding has been reduced in thickness to allow for a framing set-back;
- The window installations demonstrated a number of faults;
 1. There is no waterproof membrane at the external window sills, nor sill end soakers, as shown on the manufacturer's instructions and these issues in the expert's view, are "significant omissions" as water collected by the sill flashing will discharge directly into the polystyrene sheet material. These omissions have a greater effect where there are vertical joints in the cladding at the window situation,
 2. While a 5 mm gap is required between the joinery flange and the sill flashing, there is either no gap or an inadequate gap. Nor have the required gaps at the joinery head junction with the cladding been provided, and the gap between the joinery head flashing and the unit is oversized, and
 3. Some sealants that have been applied retrospectively to some window sill flange junctions will not achieve the required durability standard;
- The upper end of the fascia to the raking roof to the rear of the garage is poorly finished at the wall junction;
- A butyl-rubber overflashing adjacent to the front entry is not adhered to the shingle roof tiles and where the shingles are fixed over the building wrap membrane there could also be adherence problems;
- The downpipe saddle fixings have not been sealed where they penetrate the cladding, and anchors to a vent pipe have become dislodged; and

- The pipe penetration sealing is unsatisfactory, despite in some cases being repaired and there are no pipe seals, which would assist in making the penetrations waterproof;.

The expert stated that the exterior finish itself is generally is of quite good quality. The expert was not able to measure the thickness of the plaster, but the rigidity of the cladding system indicated that the plaster coating is of an appropriate thickness. With the exception of areas where the plaster has been repaired and sealing undertaken, the painting is of a good standard with no indication of pin holing or inadequate cover.

- 5.2 The expert initially used a non-invasive moisture meter applied to the internal face of external walls to detect areas of moisture ingress. The readings in this instance varied between 7.0% and 11.9%. The expert then took further non invasive readings below the ground floor windows and obtained four high moisture levels varying from 26% to 40%, which led the expert to conclude at that time that they indicated the presence of moisture behind the plaster surface. During a second visit to the building, the expert took a further series of invasive readings with a different resistance type meter at the four positions that had indicated high moisture levels in the previous visit. These readings ranged from 10% to 13%. The expert concluded that the previously conducted non-invasive testing was not reliable for this type of cladding and that they should be ignored. The final view of the expert is that, in accordance with later measurements, the house “appears to be currently waterproof”. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure and that there is a consequent risk of decay in the structural timbers. While a moisture reading of less than 18% does not of itself indicate that the cladding is code compliant, it is indicative of the efficiency of the cladding in preventing moisture ingress to date.
- 5.3 The expert also commented on the territorial authority’s “Schedule of Defects” and was unable to reach the same conclusions on the consequences of the majority of the defects raised by the territorial authority.
- 5.4 Copies of the expert’s report were provided to each of the parties. Neither party made any further comment on it.

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 to 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 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 a fundamental requirement to ensure good weathertightness performance.
- 6.4 The next priority is to reduce the ability of moisture to get through the cladding by utilising design measures that minimise the effects of the rain impacting on the walls.
- 6.5 The main areas 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 incidents;
 - While most reported leaks are substantially caused by defects in the cladding that require little or no wind pressure differential, the Authority believes that homes 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 out from the external walls are the most frequent location for water leaks.
- 6.6 Any penetration of moisture through the cladding can then be addressed by a combination of effective drainage, ventilation of the drainage cavity and moisture tolerance in the external wall framing timber. These factors are:
- 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 three 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 percent.
- 6.7 In relation to these characteristics, the Authority finds that this house:

- Has minimal eaves, that together with the spouting extension, total 310 wide, and which are considered to be only marginally effective in shielding the cladding;
- Is in a low wind zone;
- Is constructed to two levels;
- Has several wall/roof intersections and has an overall envelope that is relatively complex in shape, particularly around the garage;
- Has no decks or balconies;
- Has face-fixed cladding with no drainage cavity, and
- Has external walls that are constructed from non-treated timber, which will not delay the onset of decay.

Weathertightness performance

- 6.8 The Authority finds that the cladding does not appear to have been installed according to good trade practice and to manufacturer's instructions. Although it can be currently considered to be reasonably effective in preventing the penetration of moisture, there are significant defects that will, with time, allow the ingress of moisture behind the cladding. These include:
- The base of the cladding has inadequate ground clearance;
 - The Z flashing detail used to flash the cladding over the incorrectly cast floor slab is poorly designed and not likely to remain weathertight;
 - The junction between the cladding and the concrete slab in other areas does not allow for a capillary break;
 - There are defects to the jamb, sill and head flashings of the exterior window and door joinery;
 - There is a gap between one fascia and the wall cladding that will allow moisture into the structure;
 - Some wall/roof junctions have been incorrectly flashed; and
 - Pipe penetrations through the plaster have been poorly sealed, and some vent pipe brackets have become detached.
- 6.9 The Authority has insufficient detail to determine whether the internal gutter between the garage and the main structure will operate safely. The cross sectional area of the gutter should meet requirements set out in E2/AS1, and there should be provision for overflow if the downpipe is blocked without overflowing the top of the gutter.
- 6.10 In addition, the Authority finds that the design of this building shows a lack of those compensating factors that can assist in preventing moisture from entering the building. The Authority considers that the use of small eave projections, the use of complex and risky rainwater drainage details between the garage and the main structure and the lack of any decay resistant treatment to the exterior framing are significant factors that, when associated with the lack of a drainage cavity, increase the weathertightness risk. The Authority finds that these risks are not sufficiently offset by other alleviating factors.

7 CONCLUSION

- 7.1 The Authority, therefore, finds that as at the time of this determination there is no evidence of external moisture entering the building and that the cladding on this particular building complies with clause E2.
- 7.2 While the building does not show any signs of water ingress at the present time, this building will also have to comply with the durability requirements of clause B2. B2 requires that a building continue to satisfy all the objectives of the code throughout its intended 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 B2.
- 7.3 In the circumstances, the Authority also declines to incorporate any waiver or modification of the building code in its determination.

8 WHAT IS TO BE DONE?

- 8.1 It is not for the Authority to finally decide how the cladding is to be 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.
- 8.2 The Authority suggests that the Council and the owner together examine options that could improve the performance of the cladding. Clearly the faults in the cladding will need to be addressed to maintain the weathertightness of the building. The owner may decide to remove and reinstate sufficient of the cladding and windows to address the faults, and reapply for a code compliance certificate. If the owner does not wish to apply for a code compliance certificate, we would strongly recommend that the faults be remediated and that an agreed regular monitoring and maintenance program be put in place to extend the life of the building by identifying and remediating new leaks before they cause damage. If the territorial authority issues a notice to rectify requiring that the cladding be made compliant, the owner is required to rectify the building work not done in accordance with the code.

9 THE AUTHORITY'S DECISION

- 9.1 In accordance with section 20 of the Building Act, the Authority determines that the cladding as installed does not comply with clause B2.3.1 of the building code. Accordingly, it confirms the territorial authority's decision to refuse to issue the code compliance certificate.

Signed for and on behalf of the **Building Industry Authority**
on 11 June 2004

A handwritten signature in black ink, appearing to read 'J. Ryan', with a large, stylized flourish underneath.

John Ryan
Chief Executive