

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 33

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 of the property 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 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 wall cladding as installed (“the cladding”), and which is applied to some wall areas 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 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 single-storey detached house situated on a level site, which is in a low wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house is of conventional light timber frame construction on a concrete block foundation wall. The external walls to one elevation are sheathed entirely in a monolithic cladding. The remainder of the external walls are sheathed with monolithic cladding above a 800 mm high brick veneer. The house is of a relatively simple shape but the concrete tile roof, which is at two levels, is reasonably complex. There is one roof/cladding junction where the lower level roof abuts a gable wall. The house has one large timber framed and floored deck on the eastern elevation, which is constructed below the line of the cladding. The Authority notes that this deck is not shown on the consented plans. The eaves, apart from two small bays, have 600 mm wide projections.
- 2.2 As confirmed by invoices supplied by the owner, the framing in the external walls is H1 Boric treated timber.

- 2.3 The cladding system is what is described as monolithic cladding. As specified in its manufacturer's July 1998 technical information manual ("the manufacturer's instructions"), it incorporates fibre-cement backing sheets fixed through the building wrap directly to the framing timbers and finished with a choice of joint and coating systems. The manufacturer's instructions include details for flashings at various junctions (but not all of the junctions actually present in the house). For the purposes of this determination, the manufacturer of the fibre-cement sheets and the flashing kit is regarded as the manufacturer of the system, despite the fact that each of the joint and coating systems is itself proprietary to one of other manufacturers. The manufacturer's instructions identify the joint and coating systems by reference to an independent appraisal but give no other information about them. The coating in this instance is a coloured acrylic spray textured finish. The Authority notes that the plans and specification call for a cladding supplied by a different manufacturer than that used, but the territorial authority has not queried this departure from the plans and specification.

Sequence of events:

- 2.4 The territorial authority issued a building consent on 19 April 2002.
- 2.5 The territorial authority made various inspections during the course of construction, and approved the plaster cladding inspection on 28 June 2002. The completion inspection was "ticked off" on 9 December 2003,
- 2.6 On 22 December 2003, the territorial authority forwarded a letter to the owner stating:

An inspection of your new dwelling was carried out on 9th December 2003. It identified the following matters that require your attention before a final building code compliance certificate can be issued:

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

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

- 2.7 The territorial authority did not issue a Notice to Rectify as required under section 43(6) of the Act.
- 2.8 The owner applied for a determination on 12 February 2004.

3 THE SUBMISSIONS

3.1 The owner did not make a submission but provided copies of:

- The drawings and specifications;
- Some calculations relating to the consent;
- The territorial authority's inspection sheet; and
- The 22 December 2003 letter from the territorial authority.

3.2 The territorial authority wrote a letter dated 29 April 2004 to the Authority as its submission. This letter included the following statements:

The dwelling is partly clad in a fibre cement monolithic cladding material that has been fixed directly to the framing without a drainage cavity. A final inspection was carried out on 9 December 2003.

As a result of a [Named] adjudication the [territorial authority] has doubts as to the complying nature of the monolithic cladding that has been fixed to the dwelling— in particular, compliance with Building Clause E2 – External Moisture - to the extent that it believes it should not now issue the final code compliance certificate unless it is satisfied on reasonable grounds that it should do so.

The owners however, believe the monolithic cladding does comply, and that the [territorial authority] has a duty to issue the code compliance certificate forthwith.

3.3 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 clause 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 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, which noted that the exterior finish is generally of good quality. However, there is some minor cracking evident. The plaster coating appears to have been applied in accordance with good trade practice and both the plaster coating and painting is of a good standard except where noted. The expert noted that, with the exception of the wall with full-height cladding, 50 x 50 mm packers had been fixed to the studs behind the backing sheet above the brick veneer, to ensure that the cladding overlapped the brick sill under. This was a departure from the consented documents but the expert noted this had been discussed with the territorial authority's inspector who verbally agreed the variation. The expert's report made the following specific comments on the cladding:

- There are no vertical control joints to six walls with dimensions that require them in accordance with the manufacturer's instructions and some of the cracking that is evident may be due to these omissions;
- The bottom edge of the full-height cladding is not sealed or coated;
- There is no head flashing over the garage door opening;
- There are no vertical flashings or air gaps where adjoining claddings meet vertically or where the cladding adjoins the brick sills under;
- No sill flashings are installed to the exterior joinery units, and inseals have not been installed before the units were fixed in position;
- The junction between the exterior joinery unit jambs and the built out cladding had been flashed with malthoid, a flashing method typically used where such jambs abut brickwork;
- There is minor cracking around joinery units and on some external corners;
- The cladding is not coated behind the spouting at the front entry above the study and lounge area nor behind downpipe fixings;
- There is no clearance between the bottom edge of the cladding at the gable wall and the roofing material;
- There are no flashings or scribes around the meter box;
- The downpipe bracket screw fixings are not sealed; and
- The clothesline, outdoor lights and TV aerial are fixed directly into the cladding.

5.2 The expert took moisture readings of the external wall cavities through the interior linings around the skirting line and under joinery units, using a non-intrusive meter. The readings recorded ranged from 15.3% to 30%. The expert then used an invasive type moisture meter with 32 mm probes to investigate 5 at-risk locations, and readings of 13.9%, 14.4%, 15.6%, 21.6% and plus 30% were recorded. The expert attributed the two highest readings, which were located in the master bedroom, to a leak caused by a loose tile above this area. After the removal of a full length of Gibraltar board the expert noted that while the framing timber was wet, there was no evidence of decay. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. The expert recommended that the area in the master bedroom should be left to dry out and be checked by the territorial authority before remedial work is completed.

5.3 The expert also supplied copies of:

- A detail of a section through an external wall showing the brick veneer and the cladding over;
- The manufacturer's instructions; and
- The invoice from the timber supplier verifying the treatment of the external wall framing.

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

Weathertightness risk

- 6.2 Recent New Zealand data and experience indicates that the impact of weathertightness problems in monolithic clad houses can be minimised if good and effective design and construction practices are followed.
- 6.3 The installation of exterior cladding to manufacturer's specifications and to accepted good trade practice is an important but not the only requirement to ensure good weathertightness performance.
- 6.4 The next priority is to reduce the ability of moisture to get through the cladding by using design measures that minimise the effects of the rain impacting on the walls:
- 6.5 Important matters for consideration are:
- Data shows a strong relationship between the width of the eaves and the incidence of wall leaks. An effective deflection mechanism, such as eaves greater than 600 mm wide, has been shown by Canadian data to manage more than 90% of rain incidence;
 - While most reported leaks are substantially caused by defects in the cladding that require little or no wind pressure differential, the Authority believes that buildings in high and very high wind zones (as defined by NZS 3604) are likely to experience wind pressure differentials and thus a higher risk of water ingress;
 - Taller buildings result in an effective increase in the catchment area of the wall. Available data suggests a clear correlation between higher number of storeys and an increased incidence of leaking;
 - Complex roofs and overall envelope shapes where the roofs frequently intersect with the walls on upper floors create opportunities for leaks to directly penetrate into the wall; and
 - Recent data also shows that decks and balconies that are exposed in plan and/or cantilevered from the external walls are the most frequent location for water leaks.
- 6.6 Any likely penetration of moisture through the cladding can then be countered by a combination of effective drainage, ventilation of the drainage cavity and moisture tolerance in the external wall framing timber, and 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, apart from two small lengths, 600 mm wide eaves that reasonably protect the cladding;
- Is in a low wind zone;
- Is one storey;
- Has head flashings to the exterior joinery units, but not at the garage door;
- Has only one wall/roof intersection;
- Has an overall envelope that is simple on plan, but with a relatively complex roof formation;
- Has one deck at the ground floor level and which is below the level of the cladding;
- Has, where the cladding is set out on 50 mm battens above the brick veneer, a cavity that allows for some ventilation and drainage; and
- Has external walls constructed with H1 Boric treated timber (equivalent to what is now H1.2 treatment), which will delay the onset of decay.

Weathertightness performance

6.8 The Authority accepts the expert's view that the ingress of moisture into the external walls of the master bedroom is due to a loose roofing tile. Accordingly, the Authority finds that the cladding (which is the subject of this determination), can be considered to be effective in preventing the penetration of water. Generally, the cladding appears to have been installed to a good standard. There are some defects as set out in paragraph 5.1, which if not remedied will, in the opinion of the Authority, eventually allow the ingress of moisture behind the cladding.

6.9 The Authority considers, on the basis of the expert's report, that the cladding demonstrates a number of installation faults. Those faults relate primarily to the lack of vertical control joints, lack of flashings where the cladding adjoins the brickwork and over the garage door opening, lack of sealants and coatings in some areas, and the lack of clearance at the bottom edge of the gable wall cladding and the roofing.

- 6.10 The Authority accepts that, as the full-height cladding is situated over a blockwork foundation with more than adequate ground clearance, the lack of seal behind it and a lack of a coating to the bottom edge of the cladding will not result in water ingress.
- 6.11 The Authority notes that this manufacturer's instructions require flashings to the jambs and sills of the exterior joinery units. The new E2/AS1 acceptable solution requires that sill and head flashings be installed for exterior joinery face fixed to fibre cement sheets. It requires that the jambs be sealed using sealant behind the jamb flange so that it is protected from UV attack. The Authority considers that the malthoid detail used to flash these window jambs will not provide the required level of weathertightness.
- 6.12 The Authority considers that the detail between the cladding and the sloping brick sill will prevent the ingress of moisture without the need for a flashing along the joint because the cladding has been set out from the framing and because the sill itself is on an adequate slope.
- 6.13 The Authority notes the expert's comments on the need for vertical control joints in this house and is satisfied that these walls will require control joints to achieve the durability requirements of the code.
- 6.14 Notwithstanding the fact that the backing sheets are fixed directly to the framing on one elevation, the Authority finds that there are compensating provisions that assist the cladding to comply with the weathertightness and durability provisions of the building code in this particular case. These are:
- Generally, the cladding appears to have been installed according to good trade practice and to manufacturer's specifications; and
 - The building has few of the risk factors that can attribute to the ingress of moisture;
 - There is no evidence that the cladding itself is allowing the ingress of moisture; and
 - The majority of the cladding is fixed to battens secured to the timber wall framing, which provides a cavity space that can provide some ventilation and drainage behind the cladding sheets.
- 6.15 The Authority also notes that all elevations of this house demonstrate a low weathertightness risk rating as measured by the risk matrix in E2/AS1.

7 CONCLUSION

- 7.1 The Authority accepts that the expert's report establishes that there is no evidence of external moisture entering the building via the cladding. The Authority finds that the cladding on this particular building complies with clause E2. However, the house itself does not comply with the requirements of clause E2, because the loose roofing tile allows the ingress of moisture.
- 7.2 The cladding must also comply with clause B2 on durability. B2 requires that a building continue to satisfy all the objectives of the code throughout its effective life, and that includes the requirement for the building to remain weathertight. Because the cladding faults are likely to allow the ingress of moisture in the future, this house does not achieve the durability requirements of clause B2.

- 7.3 The Authority 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 these faults, which are detailed specifically in paragraph 5.1 and qualified in paragraphs 6.10, 6.11 and 6.12, have been satisfactorily rectified, the house should be able to remain weathertight and will thus comply with clauses E2 and B2.
- 7.4 The Authority notes the importance of the owner's responsibility for ongoing maintenance to the cladding. The code assumes that normal maintenance, which is necessary to ensure the durability of the cladding, is carried out and accordingly, clause B2.3.1 of the building code requires that the cladding be subject to "normal maintenance". That term is not defined, so that the Authority takes the view that it must be given its ordinary and natural meaning in context. In other words, normal maintenance of the cladding means inspections and activities such as regular cleaning, re-painting, replacing sealants, and so on.
- 7.5 The Authority emphasises that each determination is conducted on a case-by case basis. Accordingly, the fact that a particular cladding system has been established as being code compliant in relation to a particular building does not necessarily mean that the same cladding system will be code compliant in another situation.
- 7.6 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 as the house is not weathertight now it does not comply with clause E2. The Authority notes that the failure to comply is not due to any current failure of the wall cladding, but it is the result of a failure in the roof cladding system. 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 cladding 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 because of the compensating factors in this case, the lack of a drained cavity behind certain areas of the cladding is not, on its own, sufficient grounds to withhold a code compliance certificate.
- 8.3 The Authority, therefore, finds that once the items of non-compliance that are listed in paragraph 5.1, and qualified in paragraphs 6.10, 6.11 and 6.12, 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 fully effective drainage cavity behind all the cladding.
- 8.4 The Authority notes that the territorial authority has not issued a Notice to Rectify. However, if the territorial authority chooses to do so, the owner is 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.

- 8.5 The Authority considers that the cladding will require on-going maintenance to ensure its continuing code compliance, and that this maintenance programme should be undertaken after consultation with the territorial authority. While the Authority emphasises the importance of all ongoing cladding maintenance and particularly with fibre-cement monolithic claddings such as this, the owner is advised to give special attention to parts of the south wall, which lack any form of a cavity or eaves protection.

Signed for and on behalf of the **Building Industry Authority** on 13 September 2004.

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

John Ryan
Chief Executive