

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 19

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 building 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 monolithic cladding as installed (“the cladding”) on this house complies with the building code (see sections 18 and 20 of the Act). By “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 The house itself is described in paragraphs 2.1 to 2.3, and paragraph 9 sets out the Authority’s final decision.

2 PROCEDURE

The building.

- 2.1 The building is a two-storey detached house on a sloping, partly excavated site that is in a low wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. It is of conventional light timber frame construction over concrete block foundation walls and has a relatively simple shape. The house has one large tiled deck to the upper level supported on timber posts to one side and attached to the building on the other side. The tiles are laid over plywood with an underlying waterproofing membrane. There are only 2 short wall/roof intersections and the eaves projections are 450 mm wide with the spouting providing a further 120 mm extension.
- 2.2 The framing in external walls is specified as H1 boric treated timber.
- 2.3 The external walls of the building are clad with what is described as monolithic cladding. As specified in its manufacturer’s February 1996 technical information manual (“the manufacturer’s instructions”), it incorporates 7.5 mm thick 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 the joint and texture coating systems are proprietary to other manufacturers. The manufacturer’s

instructions state that a list of separate reputable coating manufacturers is available but give no other information about them. However, there is a requirement that the joint and coating systems must be from the same manufacturer. The Authority has been unable to determine, from information submitted by the builder, whether the joint and texture coating system is one of those recommended by the manufacturer.

Sequence of events:

- 2.4 The territorial authority issued a building consent on 5 November 1996. There were 5 conditions attached to the consent but none of these referred to the cladding.
- 2.5 The territorial authority made various inspections in the course of construction and passed the preline inspection. After a final inspection undertaken on 9 July 1999, the territorial authority wrote to the owner and raised 4 points as requiring attention before the house could be finalised. One of the issues raised was:

Inspection of the wooden subfloor has revealed that moisture has penetrated through the exterior cladding/downpipe area and begun to effect (*sic*) the integrity of the subfloor timbers (i.e. : boundary joists/floor joists). This is particularly noticeable under the corner of the lounge and is brought on by the fact that the cladding/subfloor is buried in the surrounding garden. We require that the ground be removed away from this section of the dwelling and retained/drained separately. The cladding/subfloor materials will need to be inspected and any affected materials replaced.

This requirement also applies to the area of the garden adjacent to the study.

It was also noted at the time of the inspection that the joists/blockwork in the area under bedroom 2 are also damp and wet. The reason for this was not obvious as ground levels are lower at this point and it may be a drainage problem connected in part with the higher level garage floor (was this higher level sealed and drained correctly).

This problem is also to be rectified to Councils satisfaction and any affected materials replaced.

- 2.6 The territorial authority undertook a further final code compliance inspection on 19 December 2003 and the cladding failed this check. On the “Field Sheet” relating to this final inspection, the territorial authority officer noted:

Recheck of items on letter 13/7/99 checked subfloor dry at time of inspection.
(Polythene laid on ground and Retaining Wall added above house.)

- 2.7 On 19 December 2003, the owner wrote to the territorial authority and this letter included:

We understand that there have been some issues with monolithic cladding. This house is now about 7 years old and is showing no signs of any of the problems experienced by the water tightness issue.

The other factor is that the timber used in the house was dry framed, but predates the introduction of chemical-free timber, so therefore would have H1 boric treatment rating.

The eaves on the dwelling are a standard width of 450mm...

The dwelling was purpose built as a family home. It was not built as a spec. project, so cost cutting was never an issue in the construction. The construction has been cleared by past inspections.

- 2.8 The territorial authority wrote to the owner on 10 February 2004 in response to the owner’s letter of 19 December 2003, and said:

Council has taken the position that it cannot be satisfied on reasonable grounds that Monolithic cladding without a cavity will perform satisfactorily for the

intended life of the building. On that basis, Council has no option but to refuse to the issuing of a Code Compliance Certificate.

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

2 THE SUBMISSIONS

- 3.1 The owner in a covering letter stated that

The house was constructed some 6½ years ago and has never had any problems with water damage as a result of the monolithic cladding. My son built the house for [us]. He is a qualified builder having his Trade Certificate and his Advanced Trade Certificate.

The owner also provided copies of:

- The plans and specifications;
 - The building consent documentation, and the territorial authority's inspection records and check lists;
 - The cladding manufacturer's instructions;
 - The owner's letter of 19 December 1999;
 - The territorial authority letters of 13 July 2003 and 10 February 2004; and
 - A statement by the builder, which set out his qualifications, and also noted the experience of his building partner and the coating subcontractor. The statement also confirmed that the cladding had been installed in accordance with the manufacturer's instructions.
- 3.2 The territorial authority made a submission in the form of a letter, which confirmed that a building consent had been issued for the cladding and also stated:
- Construction of the cladding was not the subject of the changed inspection procedures implemented by the Council as a consequence of a [Named] determination.
- In the absence of the additional inspections implemented as a consequence of those changed inspection procedures, and in the absence of a cavity as a first line of defence, 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.
- 3.3 The 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 party.

4 THE RELEVANT PROVISIONS OF THE BUILDING CODE

- 4.1 The dispute for determination is whether the territorial authority's decision to refuse to issue a code compliance certificate because it was not satisfied that the cladding complied with clauses B2.3.1 and E2.3.2 of the building code (First Schedule, Building Regulations 1992) is correct. Those provisions of the building code provide:

Clause B2—DURABILITY

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

- (a) The life of the building, being not less than 50 years, if:
 - (i) Those building elements (including floors, walls, and fixings) provide structural stability to the building, or
 - (ii) Those building elements are difficult to access or replace, or
 - (iii) Failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.
- (b) 15 years if:
 - (i) Those building elements (including the building envelope, exposed plumbing in the 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 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 stated that the quality of the cladding finish was generally good. There were no areas where joints were incompletely filled or where the coating was “conspicuously incomplete”. The expert cut away the textured coating at one window jamb/sill junction to ascertain the construction where the window adjoined the cladding. The expert also recorded the following specific faults and observations during the inspection:
 - There are no vertical control joints evident in the cladding. The main wall on the south elevation is approximately 13 metres long. The manufacturer currently

requires vertical control joints in walls longer than 5.4 metres long. The horizontal control joint in the two-storey section of wall on the south elevation has been formed without the recommended PVC “H” jointer flashing. The expert also noted that he did not see any evidence that the absence of vertical control joints or jointer flashing on the horizontal control joint had resulted in any failure to comply with E2 and noted that the modification of the joints could risk creation of a problem where there appears to be none at present.

- Minor repairable cracks are evident in some areas but none suggested significant movement;
- The bottom edge of the cladding in some areas has inadequate ground clearance;
- The elevated deck:
 - a) is fixed close to the interior ground floor level with no upstand to the cladding that would prevent water ingress between tiles and cladding;
 - b) Has deck balustrade post cladding that is constructed without an waterproofing upstand,
 - c) Allows rainwater to run over the edge of the tiles, which overlap the deck by approximately 20 mm, and thus allow water to enter the tile cement and thus the supporting deck timbers
 - d) Has framing which is painted with a black product, and thus the specified H3 treatment level of the timber could not be confirmed;
- The textured coating has been applied hard up to the edges of the face fixed external joinery and there are no flashings, compression seals or sealant installed to the jambs and sills of the exterior joinery;

- 5.2 The expert also used a non-invasive type moisture meter applied through the exterior cladding to detect areas of moisture ingress and no readings in the “damp range” were obtained. The expert undertook further invasive testing (involving inserting the probes through small holes drilled through the external cladding into the framing timber) at 19 locations, including 5 locations in the deck area. Excluding the deck the moisture readings ranged from 13.1% to 23.1%, averaging 16.8% over the 13 locations. The deck area readings ranged from 18.8% to 100%, averaging 57.8% over the 5 locations. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. The expert also noted that the mortar under the deck tiles remains wet for some time after rain and that some of the tile joints are weeping. Rot is also evident in one small area of the deck framing.
- 5.3 The expert also pointed out that the cladding ground clearances are not always compliant, and that resolution of this would conflict with access requirements. This is because “[t]he current access to the house is level and this is likely to be of increasing importance for the safety and convenience for the owners who are of advancing age”.
- 5.4 Copies of the expert’s report were provided to each of the parties. The owner commented that:
- The builder had stated “that in the locations where the cladding meets the deck and the tiles, the cladding was waterproofed to the extent of 150mm from the ground when it was installed”;
 - The tiles on the deck had been laid on 17mm tanalised plywood and a waterproofing membrane had been laid over the plywood. The Authority notes that the consent drawings specify that the deck tiles are laid on fibre cement sheets; and

- The house was constructed in a low wind zone, not the high zone assumed by the expert

The territorial authority made no comment on the expert's report.

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 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, consideration 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 incidences;
 - 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 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 likely 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. 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 eaves projections 450 mm wide, plus a 120 wide spouting, which should be reasonably effective in shielding the cladding;
- Is in a low wind zone;
- Is constructed to two levels;
- Has minimal wall/roof intersections;
- Has an overall envelope that is relatively simple on plan;
- Has one large deck one side of which is attached to the building;
- Has no drainage cavity where the cladding is face fixed; and
- Has timber to the external walls that is likely to be treated to an H1 boracic level, which is reasonably effective in delaying the onset of decay.

Weathertightness performance

6.8 The Authority finds that while the appearance of the cladding implies that it has been installed according to good trade practice, there are defects that have caused the penetration of the moisture that is already evident and also contribute to future moisture penetration. These include:

- The bottom edge of the cladding in some areas has inadequate ground clearance;
- The waterproofing membrane on the elevated deck is not adequately preventing the ingress of water between the underside of the protruding tiles and the perimeter beams and there is evidence of decay in the deck perimeter beams as a result.
- The elevated deck is fixed close to the interior floor level with no upstand to the cladding that would prevent water ingress between tiles and cladding;
- The deck balustrade post cladding is constructed without a waterproofing upstand,
- There are no flashings, compression seals or sealant installed to the jambs and sills of the exterior joinery;

6.9 The Authority notes that the south elevation has a 13m length of wall unbroken by any vertical control joint or other means of catering for movement in the wall plane. It notes the expert's assessment that he did not see any evidence that the absence of the joints had resulted in any failure to comply with clause B2. It also notes that the performance of this particular wall has been satisfactory over the 7 years that it has been in place. However it considers that effective and sufficient control joints in fibre cement panel walls are

important because foundation movement could impose high loads on the rigid fibre cement panels at any time during their required life. These loads are capable of cracking panels and thus allowing water ingress whenever those cracks occur away from control joints. The Authority therefore finds that, in this particular case, the southern facing wall is not compliant with B2 because it lacks appropriate control joints.

- 6.10 The Authority considers that the design of this house presents a relatively low risk of weathertightness failure. The simple building envelope and roof design, and the presence of eaves are such that face fixed cladding can meet the requirements of clauses B2 and E2 without requiring a cavity.
- 6.11 The Authority has previously issued a public warning about the dangers presented by balconies that have been affected by timber decay. The deck in this house has the potential to be unsafe. The Authority, therefore, strongly recommends that the territorial authority uses the powers available to it under section 65 of the Act to address any safety hazard presented by the balustrade and adjacent areas of the deck.

7 CONCLUSION

- 7.1 The Authority accepts that the expert's report establishes that the cladding complies in most respects with the manufacturer's instructions. Apart from the area in the vicinity of the deck, there is no other evidence of external moisture entering the building. Accordingly, with this exception, the Authority finds that the cladding on this particular building complies with clause E2.
- 7.2 While the building as a whole does not show any signs of water ingress at the present time, these areas of the 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 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 when the cladding faults have been satisfactorily rectified this house should be able to remain weathertight and will thus comply with clause B2. It is essential that all the required items of rectification which are detailed specifically in paragraphs 6.8 and 6.9, be competently carried out to ensure such compliance.
- 7.4 Clause B2.3.1 of the building code requires 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 such 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 WHAT IS TO BE DONE?

- 8.1 It is not for the Authority to decide directly how the defects listed in paragraphs 6.8 and 6.9 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.

9 THE AUTHORITY'S DECISION

- 9.1 In accordance with section 20 of the Building Act, the Authority determines that the house, with the exception of the deck area is weathertight now and therefore the cladding, with this noted exception, 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.
- 9.2 The Authority finds that because of the compensating factors in this case, the lack of a drained cavity behind the cladding is not, on its own, sufficient grounds to withhold a code compliance certificate.
- 9.3 The Authority, therefore, finds that once the items of non-compliance that are listed in paragraphs 6.8 and 6.9 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.
- 9.4 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.

Signed for and on behalf of the **Building Industry Authority** on 6 August 2004.

John Ryan
Chief Executive