

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 40

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 one of two building owners acting through the other co-owner, who is also the builder, 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 an approximately 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 wall cladding as installed (“the cladding”), which is applied to the majority of the walls 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 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 situated on a slightly sloping and partly excavated site, which is in a high wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house is of conventional light timber frame construction, built on a concrete block foundation wall. The ground floor external walls are sheathed with monolithic cladding above a 950 mm high brick veneer. The upper external walls are entirely sheathed in monolithic cladding. The house is of a relatively complex shape, with the roofs at two levels having numerous hip junctions, valley gutters and wall to roof junctions. The house has two cantilevered balconies, each partially built over living spaces with a membrane lining over 20 mm plywood sarking. One balcony is open with a metal balustrade to the front and timber framed balustrades to the ends. The other balcony has a roof over, supported on monolithic clad beams and columns, and a timber framed balustrade to all external faces. The timber-framed balustrades have their sides and the

sloping top faced with monolithic cladding and the northern balustrades to each balcony also have a metal capping. A lower level roof supported on 2 sets of double columns with their bases surrounded by a brick veneer covers the main entry area. A chimney, which is not shown on the plans, is situated at a wall intersection adjacent to the covered balcony. The windows have projecting surrounds formed to be integral with the cladding. The verges and gables have 300 wide projections.

- 2.2 No information has been given as to the treatment, if any of the timber used in the construction of the external walls. The owner has stated that “Tanalised timber has been used in areas of concern”, and told the expert engaged by the Authority that such timber was used for the balcony and balustrade framing. The Authority notes that there was no other evidence submitted by any of the parties to corroborate the owner’s statement.
- 2.3 The cladding system is what is described as monolithic cladding. As specified in its manufacturer’s June 1996 and 1997 data sheets (“the manufacturer’s instructions”) and a subsequent independent appraisal, it incorporates expanded polystyrene (EPS) backing sheets fixed through the building wrap directly to the framing timbers and finished with textured sponge float plaster and paint systems. The manufacturer’s instructions include details for flashings at various junctions and require pvc flashings to the jambs and sills of exterior joinery units. The sponge finished coating system used in this instance is one of those systems referred to in the independent appraisal. The Authority notes that, the plans show 60 mm thick polystyrene was used for the lower storey and 40 mm for the upper storey cladding. There is no detail showing the junction between the two thicknesses of polystyrene. However, the Authority has assumed that the upper cladding is face fixed to the framing and that no cavity has been formed to these areas.
- 2.4 The coating systems supplier issued a “Producer Statement” in respect of the cladding, for both 40 nm and 60 mm backing sheets, and a “Materials Components Guarantee” and a “Workmanship Guarantee” for the plasterwork. The guarantees contain qualifications that the proprietor will not accept responsibility for damage resulting from the use of untreated timber.

Sequence of events:

- 2.5 The territorial authority issued a building consent on 10 September 2001. None of the “Building Consent Requirements” attached to the consent referred to the cladding apart from noting the notice time for carrying out inspections.
- 2.6 According to the owner, the territorial authority made various inspections during the course of construction and these were all passed. However, no evidence has been produced regarding these inspections.
- 2.7 On 2 March 2004, the territorial authority wrote to the owner pointing out that the territorial authority had to ensure that all building work had to meet the building code requirements. The letter stated:

Before the council can issue a code compliance certificate, we must ensure that all building work meets the NZ Building Code requirements. In particular, the building code specifies that building work must remain durable for given periods of time after the code compliance certificate is issued.

You will be aware of the current weathertightness issues often reported in the media. These issues have highlighted the care that must be taken to establish that all building elements, but particularly cladding, is durable before any CCC can be issued.

There has been recent information and knowledge that face sealed cladding systems without an adequate drainage and ventilation cavity will cause irrevocable damage to structural elements in the event of leakage and/or the effect of residual moisture.

Council cannot be satisfied that the cladding system as installed on the above building will meet the functional requirements of Clause E2 External Moisture of the New Zealand Building Code and is therefore unable to issue a code compliance certificate.

- 2.8 The territorial authority did not issue a notice to rectify as required under section 43(6) of the Act.
- 2.9 The owner applied for a determination on 28 April 2004.

3 THE SUBMISSIONS

- 3.1 In a statement submitted with the application for a determination, the builder noted he was personally on the site all the time and closely monitored all aspects and was “particularly fussy” with weatherproofing. In addition, Tanalised timber was used in areas of concern and the brick veneer around the entire house offered a large measure of protection against water ingress.
- 3.2 The owner also provided copies of:
 - The drawings and four additional plans giving details of certain aspects of the cladding;
 - Some building consent documentation;
 - The correspondence with the territorial authority;
 - The manufacturer's instructions for the cladding and for the waterproof membrane applied to the cladding; and
 - The producer statements and guarantees.
- 3.3 The owner also supplied a copy of a report, dated 26 April 2004, relating to an inspection of the house by a consultant engineer engaged by the owner. The consultant found the wall cladding and brick veneer complied with the manufacturer's instructions at the time of its construction. The consultant also examined construction details for the eaves, windows, doors, junctions between the cladding and the veneer, and handrail details and was of the opinion that these were satisfactory and had been properly carried out during the construction process. There were no blemishes in any of the claddings, which appeared to be completed in a workmanlike manner.
- 3.4 The territorial authority did not make a submission.
- 3.5 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 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 inspected the building and furnished a report, which noted that the “quality of finish is extremely high”. The expert also noted some concerns regarding the cladding:
- There was no evidence of a pvc casing bead to the base of the cladding, which is resting hard down onto the brick sill and finished with a flexible sealant bead. The expert noted that there was softness in the lower section of the polystyrene, which was consistent with the breaking down of the polystyrene due to moisture. The expert was of the opinion that there may be wicking of moisture from the base and that moisture draining from the polystyrene and the sealant bead was trapping this. While the constructed detail followed the 2001 manufacturer's instructions, the expert considered that the manufacturer's revised 2004 detail would be more suitable at this position;
 - There are no sill flashings to the exterior joinery units as required by the manufacturer's instructions;
 - The balcony cap flashings do not have a drip edge to inhibit the entry of capillary driven moisture, nor do they have saddle flashings or adequately sealed end junctions;
 - The balcony drainage outfalls have not been connected to an appropriate stormwater system;
 - The lack of sill flashings mean that there would be little resistance to moisture ingress if the window mitres failed;
 - The bolts securing the balcony handrails to the sidewalls are not sealed; and
 - There is no drip edge to the chimney cap flashings.
- 5.2 The expert also took moisture readings through holes drilled through the interior linings throughout both levels of the building and all readings were well within acceptable levels. The exterior walls were then non-intrusively tested and apart from two locations, all readings were to an acceptable level. The expert noted that two areas adjoining a balcony were slightly elevated but considered that as this was surface water between the polystyrene and the plaster coating, no intrusive reading was justified. The two locations with the higher readings were adjacent to bedroom 5 and adjacent to the dining room. The expert took further invasive readings at these locations and recorded moisture readings of 14.9% and 15.7 % respectively. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. The expert also observed moisture seeping from the casing bead at the balcony soffit and attributed this to the incorrect balustrade fixings.
- 5.3 Copies of the expert's report were provided to each of the parties. The territorial authority did not respond and the owner responded by letter. The owner took issue with the expert on a number of issues, and in general, these were:
- There was no softness to the lower areas of the polystyrene, the polystyrene does not rest on the brick sill and the whole junction is in excellent condition;

- The balcony handrail fixings can be sealed;
- Only 6 upstairs windows would be “at risk” through not having sill flashings and if the window mitres failed, water would escape to the outside of the mitre;
- The balustrade cap flashings have been adequately sealed and as the decks have overhangs and the framing is Tanalised, these are additional safety factors;
- The balcony drainage outfalls have been connected to the stormwater outfalls; and
- The chimney cap flashing has never leaked.

The owner also attached a report from a representative of the cladding manufacturer, dated 30 August 2004, which stated that the writer had inspected the cladding. The representative refuted the expert’s comments on the junction between the base of the cladding and the brick sill and saw no merit in altering the existing detail to match the latest manufacturer’s detail. However, he advised that the windows that were not close to a brick cavity could be made safe by inserting a sill flashing.

The Authority has considered these observations in its deliberations.

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 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. 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 300 mm wide eaves projections that provide some protection to the cladding under them;
 - Is in a high wind zone;
 - Is two stories high;
 - Has exterior joinery units with head flashings, but with no sill or jamb flashings installed. However the projecting surrounds to the units provide additional protection against water ingress;
 - Has an overall envelope that is relatively complex on plan, with roofs at various levels that have many roof and wall/roof intersections;
 - Has two balconies at the upper level, each partially built over living spaces;

- Has external walls constructed with untreated timber, which would not be effective in preventing the onset of decay; and,
- Has a brick veneer to the lower part of the wall, which provide a cavity that will allow drainage and ventilation below the lower level windows that are fixed directly over the brickwork.

Weathertightness performance

- 6.8 Generally the cladding appears to have been installed according to good trade practice and to the manufacturer's instructions. It has been effective to date in preventing the penetration of water. There are, however, defects as set out in paragraph 5.1, which if not remedied, will eventually allow the ingress of moisture behind the cladding. Those defects that the Authority determines should be rectified are:
- The lack of sill flashings to the exterior joinery units that are not adjacent to the cavity of the brick veneer;
 - The lack of saddle flashings and proper sealant to the balustrade capping junction with the main wall cladding; and
 - Sealing the balustrade handrail fixings.
- 6.9 The Authority notes the submission from the owner, and verified by the representative of the manufacturer, that the detail of the junction between the base of the cladding and the brick sill is constructed in accordance with the manufacturer's instructions current at the time that it was installed. This submission rebuts the opinion of the expert. The Authority has considered these opposing interpretations, and taking into account the fact that the base of the cladding adjoins the cavity of the brick veneer and that there is no moisture evident at this detail, considers that this detail will meet the performance requirements of clause E2. It also notes that the detail will need to be subject to regular maintenance. The Authority also does not consider it necessary to amend the chimney cap flashing.
- 6.10 The Authority also notes that the sill detail at these windows varies from the detail provided. The as-constructed detail has no cladding between the sill and the brickwork under, while the original design showed the windowsill hard down on the brick sill. However, the Authority has not recommended that sill flashings be added to the windows immediately above the brick veneer as it considers that the veneer cavity will afford adequate drainage and ventilation to these locations.
- 6.11 Notwithstanding the fact that the backing sheets are fixed directly to the timber framing, thus inhibiting ventilation behind the cladding sheets, the Authority finds that there are compensating provisions that assist the performance of the cladding in this particular case. These are:
- Generally, the cladding appears to have been installed according to good trade practice and to manufacturer's specifications;
 - The brick veneer below the cladding will allow moisture to drain away; and
 - There is no moisture evident at this time in the external wall cavities.

- 6.12 The Authority considers that these other provisions adequately compensate for the lack of a ventilation cavity and can allow the house to comply with the weathertightness and durability provisions of the building code.
- 6.13 The Authority notes that two elevations of the building demonstrate a high weathertightness risk rating and two elevations of the building demonstrate a moderate weathertightness risk rating when calculated by 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 accepts that the expert's report establishes that the cladding complies in most respects with the manufacturer's instructions. In addition, as there is no evidence of external moisture entering the building, the Authority finds that the cladding on this particular building complies with clause E2.
- 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 have been satisfactorily rectified, the house should be able to remain weathertight and will, therefore, comply with clauses E2 and B2. The Authority also finds that because of the compensating factors in this case, the lack of a drained and ventilated cavity behind the cladding is not, on its own, sufficient grounds to withhold a code compliance certificate.
- 7.4 It is essential that all the required items of rectification, which are detailed specifically in paragraph 6.8, be competently carried out to ensure such compliance.
- 7.5 The Authority notes the importance of the owner's responsibility for ongoing maintenance to the cladding. The code assumes that normal maintenance necessary to ensure the durability of the cladding, is carried out and thus 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.
- 7.6 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.
- 7.7 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, it 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, and qualified in paragraph 6.8, are rectified to the approval of the territorial authority, along with any other faults that may become apparent in the course of that work, the cladding as installed will comply with the building code, notwithstanding the lack of a drained and ventilated cavity.
- 8.3 The Authority notes that the territorial authority has not issued a Notice to Rectify. Should it do so, then 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.
- 8.4 The Authority considers that the cladding on will require on-going maintenance to ensure its continuing code compliance.

Signed for and on behalf of the **Building Industry Authority** on 1 October 2004.



John Ryan
Chief Executive