

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 42

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 an existing 1920’s house that has been moved to a new site and renovated, unless changes are made to the monolithic cladding that replaced some of the original exterior linings.
- 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 on the house 5 years ago (“the cladding”), and which is applied to approximately 40 % of the 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 very exposed level site. The house, which was originally built in the 1920s, is of light timber frame construction, and was relocated on its present site in 1998. The house is installed on a timber-framed floor supported on timber piles. The existing exterior cladding has been removed and the main external walls are now either faced with a brick veneer or sheathed in monolithic cladding, in the proportions of approximately 60% and 40% respectively. The gable ends are finished with solid plaster over a solid timber backing and the gables between the two roof levels are sheathed with a fibre-cement cladding. The house is of a relatively simple shape and the corrugated iron roof is at two levels. There are two roof/cladding junctions where the lower level roof abuts the gable walls. The house has two timber framed and close boarded decks with access steps. The Authority notes that while these decks are not shown on the consented plans, the territorial authority has not raised this as an issue in the

correspondence forwarded to the Authority. The eaves and main verges have 450mm wide projections and the inter-roof verges have 100mm projections.

- 2.2 The existing external timber wall framing is untreated Rimu.
- 2.3 The external walls of the building are clad with what is described as monolithic cladding. In this instance it incorporates 40 mm thick polystyrene backing sheets fixed through the building wrap directly to the framing timbers and finished with a 25 mm thick stucco sand and cement plaster reinforced with mesh. The plaster in turn is finished with a 2-coat polymer paint system.

Sequence of events:

- 2.4 The territorial authority issued a building consent on 28 March 1998, based on a building certifier's certificate.
- 2.5 The building certifier carried out some inspections of the property and in a progress report to the territorial authority as at 21 October 2002, the building certifier found that the exterior plaster substrate did not comply with the building code. The territorial authority inspected the house on 24 March 2004, and in a letter dated 25 March 2004, informed the owner that, following this inspection, certain matters required attention. The items relating to cladding were:

- 4 Ground levels do not comply.
- 6 No record of brick veneer inspection and preline inspection not approved.
- 7 Ensure Ply cladding meets the durability requirements where ground levels are incorrect.
- 8 In regard to the monolithic cladding applied to your dwelling, and not withstanding 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 weather 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.

The Authority notes the territorial authority's reference to "Ply cladding", but is not aware of plywood being used as a cladding on this house

- 2.6 The territorial authority inspected the house again on 20 May 2004, and in a letter to the owner, dated 25 May 2004, repeated the comments set out in its previous correspondence to the owner. The territorial authority wrote again to the owner on 22 July 2004, again listing items requiring attention. These were:

- 1 This is to confirm that the outstanding item for the issue of the Code Compliance Certificate for the Dwelling is the Monolithic Cladding.

All other issues with this Building Consent have been resolved; and

- 2 A repeat of item 8 of the 25 March 2004 letter.

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 6 April 2004.

3 THE SUBMISSIONS

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

- The consent drawings and a drawing showing some larger scale details of the cladding;
- The building consent;
- The building certifier's progress report;
- The correspondence with the territorial authority; and
- Two photographs of the house.

3.2 The owner also forwarded a report from a consultant engaged by the owner to evaluate the wall cladding system of the house. The consultant described the property and the cladding and made the following general comments:

- PVC flashings have been used to all faces of the windows;
- Sealant is evident as an additional protection around all openings in the cladding;
- There is sufficient coverage and overlap where the cladding types adjoin and the gable cladding oversails the lower wall claddings by 50mm; and
- There is very little evidence of substrate movement and there are minor visual defects where the cladding types adjoin.

The Authority notes that the consultant states that the backing is 60mm thick polystyrene and the plaster is 15mm thick. The expert engaged by the Authority undertook some destructive investigations and has established that the backing is 40mm thick and the plaster 25mm thick. The Authority accepts the findings of the expert in these matters.

3.3 The territorial authority noted on the D2 form that was sent to the Authority that:

1. All inspections for this resited dwelling were carried out by [Named building certifiers].

The territorial authority also attached copies of the territorial authority's "Field Inspection Record" and its letter to the owner dated 25 March 2004.

- 3.4 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 current Acceptable Solution, E2/AS1, allows for solid plaster systems with polystyrene backing sheets, but requires that they be fixed on battens to create a 20mm cavity between the sheet and the framing. The previous acceptable solution E2/AS1, which was in force when this consent was issued, allowed for mesh reinforced

solid plaster to be applied to polystyrene backing sheets that were face fixed to the framing. The cladding is not currently accredited under section 59 of the Act. The Authority is therefore of the opinion that the cladding system as installed must now be considered to be an alternative solution.

4.3 In several previous determinations, the Authority has made the following general observations about acceptable solutions and alternative solutions:

- Some acceptable solutions cover the worst case, so that in less extreme cases they may be modified and the resulting alternative solution will still comply with the building code.
- Usually, however, when there is non-compliance with one provision of an acceptable solution, it will be necessary to add some other provision to compensate for that in order to comply with the building code.

5 THE EXPERT'S REPORT

5.1 Because the information provided by the parties contained insufficient detail on how the building had been constructed, the Authority commissioned an independent expert ("the expert") to inspect and report on the cladding. The expert inspected the building and furnished a report. It noted that the quality of the stucco finishing and the paintwork appears to be sound and evenly applied with no evidence of cracking, flaking or staining. The expert removed a section of cladding adjacent to one window jamb, one window jamb/sill junction, one door head/jamb junction and at the bottom plate/plaster junction at the west gable. The expert's report made the following specific comments on the cladding:

- The external joinery units have galvanised sills but there were no jamb or head flashings as detailed on the larger scale plan details. There are sealants to the jambs and heads and these are well applied and generally protected from direct sunlight. However, the galvanised metal strips installed at the jambs are ineffective as flashings;
- There is no drip edge applied to the plaster, as required by E2/AS1, at the base of the cladding at the walls and gables, nor over the external joinery units;
- The base junction to the cladding at the gable ends is not flashed or sealed;
- There are no "kick-outs" to the ends of the apron flashings at the inter-roof gables- and there are holes in the fibre-cement cladding at these junctions;
- The deck timbers are close-boarded and so do not provide a free-draining surface;
- The cladding is butted up to one deck edge and at the other deck the cladding extends behind the deck surface.
- There should be a 35 mm base clearance at the junctions with the deck and the bottom edge of the polystyrene should be supported on a metal angle; and
- The bottom end of the roof cladding in many areas does not overlap the gutter.

- 5.2 The expert took moisture readings of the external wall timbers by removing the cladding at three positions and using a moisture meter with extended electrodes. The readings recorded were 13.1%, 14.1% and 18.1%. Internal non-invasive readings were taken throughout the house and no elevated readings were recorded. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure.
- 5.3 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 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, 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 450mm wide eave and main verge projections that reasonably protect the cladding, but has only 100mm wide inter-roof verge projections that afford minimal protection;
 - Is on an exposed site;
 - Is one storey;
 - Has exterior joinery units with galvanised sill flashings, but have ineffective metal head and jamb flashings;
 - Has two wall/roof intersections;
 - Has an overall envelope that is relatively simple in plan;
 - Has two close-boarded decks at the ground floor level; and
 - Has external walls constructed with the original Rimu timber, which is untreated.
- 6.8 The Authority notes that the consultant engaged by the owner stated that there were pvc flashings to **all** faces of the exterior joinery units. However as the expert has carried out destructive testing to ascertain what was installed, the Authority accepts that the areas explored are indicative of what has been done throughout the house. Accordingly the Authority is prepared to accept the expert's opinion in this respect.

Weathertightness performance

- 6.9 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 ineffective head and jamb flashings to the existing timber exterior joinery units,
- The lack of drip edges to the base of the cladding plaster and over joinery openings;
- The lack of flashings and sealants at the junction of the cladding and the brickwork;
- The lack of flashings and sealants to the base junctions of the gable end claddings and the brick veneer below;
- The defective finish at the ends of the apron flashings and the holes at these areas;
- The inadequate clearances where the cladding is adjacent to the decks together with the lack of a base supporting angle; and
- The bottom edges of the roof cladding that are short of the gutter.

- 6.10 The Authority also notes that the expert considered that vertical control joints were not required for this building. However, the Authority is of the opinion that these are necessary in this type of cladding to allow for thermal and ground movement. Accordingly, the Authority determines that vertical control joints are to be formed in the two long north elevation walls to ensure effective weathertightness performance.
- 6.11 The Authority notes that the consent drawings submitted for this determination include details of the flashings specially designed for the existing timber external joinery for this house. It also notes that the invasive testing carried out by the expert indicated that none of these flashings had been installed.
- 6.12 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 presence of verge projections that afford some protection to the external joinery units; and
 - There is no moisture evident at this time in the external wall cavities.
- 6.13 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.
- 6.14 The Authority is concerned that the report given by the consultant engaged by the owner does not address many of the cladding defects identified by the expert engaged by the Authority. Assessments of houses for weathertightness must be rigorous and thorough, and the Authority considers that the consultant's report did not meet these standards.
- 6.15 The Authority notes that all elevations of the building demonstrate a low 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 paragraphs 6.9 and 6.10 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. The Authority recognises that a territorial authority does not have any statutory responsibility for the ongoing maintenance of a building. However, the maintenance programme adopted by the owner could be undertaken after consultation with the territorial authority, bearing in mind that any comments or advice provided by the territorial authority to the owner are likely to be accompanied by appropriate disclaimers.
- 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 further determines that once the items of non-compliance that are listed in paragraph 5.1, and qualified in paragraphs 6.9 and 6.10, 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 will require on-going maintenance to ensure its continuing code compliance.

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



John Ryan
Chief Executive