

Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 2

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. The other party is a 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 cladding as installed (“the cladding”) on this house complies with the building code (see sections 18 and 20 of the Act). By “external wall cladding as installed” we mean the components of the system (such as the backing sheets, the flashings, the joints and the coatings), as well as the way the components have been installed and work together.

2 PROCEDURE

Sequence of events:

- 2.1 The territorial authority issued a building consent on 15 October 2002. The consent was subject to 1 page of standard “Conditions of Building Consent”, which did not relate specifically to the subject of this determination.
- 2.2 The house was not constructed pursuant to the building consent in as much as the cladding installed differs from that described on the consent drawings.
- 2.3 The territorial authority made various inspections in the course of construction. The territorial authority declined to make a final inspection of the building work. And on 12 December 2003, issued a notice to rectify as required by section 43(6). This was accompanied by a “Particulars of Contravention” notice, which stated:

Monolithic cladding systems without a 20 mm cavity, provision for adequate ventilation, drainage, and vapour dissipation will, in the event of leakage and/or the effect of residual moisture, cause irrecoverable damage to the structural elements of the building

You are required to:

- Provide adequate ventilation to the monolithic cladding and into the wall frame space by means of either a ventilated cavity or alternative approved system; or
- Remove the monolithic cladding and replace with an approved cladding system and;

Determination 2004/02

- Lodge with Council an application for and amended building consent and provide all necessary information that may be requested to allow this consent application to proceed.”

2.4 The territorial authority made no other comment on the cladding as built details in its notice to rectify.

2.5 On 15 December 2003, the territorial authority sent a letter to the applicant relating to its refusal to issue a code compliance certificate. In this letter, it was stated that

Council has concluded that it is not possible to be satisfied on reasonable grounds, that monolithic cladding without a cavity behind will perform satisfactorily for the intended life of the building.

2.6 The owner applied for this Determination on 15 December 2003.

3 THE SUBMISSIONS

3.1 The owner provided:

- Copies of the manufacturer’s instructions;
- The building consent documentation;
- The territorial authority inspection reports;
- The 12 December 2003 “Notice to Rectify”;
- The 15 December 2003 letter from the territorial authority, referring to its refusal to issue a code compliance certificate;
- A schedule of timber priced for the contract, along with a producer statement from the timber supplier on the treatment levels of the supplied timber; and
- Details of aluminium joinery along with an invoice for flashings supplied to the contract.

3.2 The owner also summarised the sequence of events leading up to the refusal of the territorial authority to issue a code compliance certificate.

3.3 In addition, the owner also submitted:

- Individual producer statements for the waterproofing, cladding backing and solid plastering systems, and
- A warranty for the roofing and waterproofing system.

3.4 The territorial authority submission related to the timing of the work and the fact that the house had not been subject to the higher level of inspection that is now utilised on houses with monolithic cladding.

3.5 The Authority notes that on one drawing (A12) of the set that was approved by the territorial authority for the building consent, the external cladding system is described as being a different system to that which was eventually installed on the building. The owner has advised the Authority that both he and the builder discussed the change on site with the territorial authority building inspector and that the inspector accepted the change. There appears to be no documentation recording that agreement or the specification to which the new cladding was to be installed.

Building Industry Authority 2 18 March 2004 Determination 2004/02

3.6 The Authority commissioned an independent expert to inspect and report on the cladding.

3.7 Copies of the submissions, expert's report and other evidence were provided to each of the parties. While the applicant commented on the expert's report, the territorial authority did not. Neither the applicant, nor the territorial authority, made any further submissions in response to the submissions of the other parties.

4 THE RELEVANT PROVISIONS OF THE BUILDING CODE

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

Clause E2—EXTERNAL MOISTURE

OBJECTIVE

E2.1 The objective of this provision is to safeguard people from illness or injury, which could result from external moisture entering the building.

FUNCTIONAL REQUIREMENT

E2.2 Buildings shall be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.

PERFORMANCE

...

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 The cladding in this situation has not been approved under section 49 of the Act as an acceptable solution. Nor is the cladding 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 AUTHORITY'S VIEW

5.1 The Authority has considered the submissions of the parties, the expert's report and the other evidence in this matter. The Authority's approach to determining whether building work complies with clauses E2.3.2 is to examine the design of the building, the surrounding environment, the design features that are intended to prevent the penetration

Building Industry Authority 3 18 March 2004 Determination 2004/02
of water, the cladding system, its installation, and the moisture tolerance of the external framing.

The building.

5.2 The building is a detached house with two floor levels on a partly sloping site. It is of conventional light timber frame construction and a relatively simple shape, incorporating some balconies and wall-roof intersections. Eaves overhangs are generally 600 mm. It is in a medium wind zone in terms of NZS 3604: 1999 "Timber framed buildings".

5.3 Framing timber in external walls is H3LOSP treated.

5.4 The cladding is known as a monolithic cladding system. As specified in its manufacturer's data sheets ("the manufacturer's instructions"), it incorporates rigid fibre-cement backing sheets fixed through building wrap directly to framing timbers and finished with a solid plaster coating system. The plaster is applied in 3 coats over a continuous mesh reinforcing, spaced off the backing sheets.

5.5 The manufacturer's details show a plaster coating on mesh reinforcing applied over the building paper, which has been fixed over the backing board. The backing board is fixed directly to the external wall framing. The joints are detailed with a polyethylene backing rod, polyurethane flexible sealant and galvanised control members. The manufacturer's instructions include details for flashings at various junctions (but not all of the junctions actually present in the house). Amongst the components that make up the installed cladding system, only the backing sheets and its fixings are described in any detail. The manufacturer does not supply the joint, flashing, plaster or coating systems

5.6 The manufacturer has issued a Producer Statement stating that the backing sheets have been installed in accordance with its information details and meet the requirements of clause E2; External moisture. However, there is no indication that this Statement includes the jointing or flashing materials or their installation. The plaster appears to be 20 to 25 mm thick and has been applied in 3 coats, with the plaster mix being 5 parts sand to 1 part cement and 1 part lime. The plasterer has stated that it offers a warranty of 15 years on the system and 5 years its workmanship. The plaster has been coated with a waterproofing membrane, which the expert describes as appearing "to have adequate coverage with no indication of pinholes or voids".

5.7 The expert's report made the following comments on the as built cladding details:

- Horizontal control joints have not been provided;
- The cladding generally terminates above the finished ground level, however, it extends to below ground/paved level in some limited areas;
- In some locations the stucco plaster extends down to and over both head flashings and the lower concrete masonry wall. This obstructs the drainage path that should be established to drain any water from behind the plaster;
- There are no apparent stop-ends to the joinery sill flashings;
- There is no capillary gap between the sill flashing and the unsealed plaster behind;
- It was not possible to verify whether jamb flashings have been fitted;

- The cladding abuts a timber retaining wall at one location without any apparent means of weatherproofing the junction; and
- There is no indication that a waterproof membrane has been applied to the plaster at the balcony upstand, either before or after it has been painted;

5.8 The expert also used a non-invasive moisture meter applied to the inside face of external walls to detect areas of moisture ingress. His figures indicated that moisture levels were below 14%. The expert also carried out a further series of external invasive tests which gave results that indicated moisture levels varying from 17% to 40%. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure and that there is a consequent risk of decay in the structural timbers. While a moisture reading of less than 18% does not of itself indicate that the cladding is code compliant, it is indicative of the efficiency of the cladding in preventing moisture ingress to date.

5.9 The applicant commented on the expert's report, stating

- Control joints had been constructed in the bulkhead feature but the plaster had not been cut as no cracks had formed.
- Levels at the base of the cladding can be reduced in certain areas to increase clearances. He felt that it was not relevant where the cladding was fixed above blockwork.
- The 100sq timber columns supporting the deck were H4 treated;
- Jamb flashings had been installed to all doors and windows, and
- A waterproof membrane was continued over the balcony/deck upstands and 100 mm up the wall to form a flashing under the backing sheets.

Weathertightness risk

5.10 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.

5.11 Installation of exterior cladding to manufacturers specifications and to accepted good trade practice is a fundamental requirement to ensure good weathertightness performance.

5.12 The next priority is to reduce the ability of moisture to get through the cladding, by a combination of design measures that minimise the effects of the rain impacting on the walls:

5.13 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 600mm wide, has been shown by Canadian data to manage more than 90% of rain incidents;
- While most reported leaks are substantially caused by defects in the cladding that require little or no wind pressure differential, the Authority believes that homes in high and very high wind zones (as defined by NZS 3604) are likely to experience wind pressure differentials and thus a higher risk of water ingress;

Building Industry Authority 5 18 March 2004 Determination 2004/02

- Taller buildings result in an effective increase in the catchment area of the wall. Available data suggests a clear correlation between increased number of storeys and an increased incidence of leaking;
- Complex roofs and overall envelope shapes where roofs frequently intersect with walls on upper floors create opportunities for leaks to directly penetrate into the wall; and
- Recent data also shows that decks and balconies that are exposed in plan and/or cantilevered out from the external walls are the most frequent location for water leaks.

5.14 The inevitable penetration of moisture through the cladding can then be addressed by a combination of effective drainage, ventilation of the drainage cavity and moisture tolerance in the external wall framing timber. These factors being:

- 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 20mm 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%.

5.15 In relation to these characteristics, the Authority finds that this house:

- Has eaves that are generally 600mm wide, and which are considered to be reasonably effective in shielding the cladding;
- Is in a medium wind zone;
- Is constructed partly to one and partly to two levels;
- Incorporates relatively few complex wall/roof intersections and has an overall envelope that is relatively simple in shape;
- Includes a number of decks that are exposed in plan, although not cantilevered out from the structure;
- Has face fixed cladding with no drainage cavity, and
- Has external walls constructed from H3 treated timber, a treatment level considered effective in delaying the onset of decay.

Weathertightness performance

5.16 Generally, the cladding appears to have been installed according to good trade practice and to manufacturer's specifications and is considered reasonably effective in preventing the penetration of water. However the expert's report indicates there are some problems with

Building Industry Authority 6 18 March 2004 Determination 2004/02

its installation that may detract from its performance. The Authority believes that these defects are responsible for the high moisture levels and can be remedied in situ. The Authority notes with some concern that the as built defects that were highlighted in the expert's report were not brought to the owner's notice during the course of the territorial authority's regular inspections. Remediation is clearly more practical if it is carried out during construction, not afterwards.

5.17 The acceptable solution, E2/AS1, which covers stucco constructed over a rigid backing sheet, has recently been amended to require a cavity. The cladding on this house largely meets the requirements of the previous acceptable solution that was in force when the building consent was issued. The new E2/AS1 reflects the Authority's view that an acceptable solution must accommodate the worst-case situation. In assessing this cladding constructed without a cavity, the Authority is applying the principles outlined in 4.3 above. An alternative solution that diverges from an acceptable solution can comply with the building code if it includes

compensating provisions (particular to that situation) that the acceptable solution may not have.

5.18 In this case, the Authority finds that there are compensating provisions that assist the performance of the cladding. These are:

- Apart from the decks that are exposed in plan, the building does not display to any significant extent any of the other weathertightness risk factors;
- The waterproofing membrane coating system, which appears to have been installed to manufacturer's specification, affords an additional degree of protection to the cladding system. If it is properly maintained, it will assist in the prevention of water ingress and afford protection to the joint sealant from the affects of UV radiation and the weather; and
- The external wall framing is H3 LOSP treated, affording an increased resistance to the effects of any moisture that may penetrate the cladding;

5.19 The Authority considers that these additional provisions adequately compensate for the lack of a drainage cavity.

5.20 The Authority notes the importance of effective ongoing maintenance of the cladding and particularly of the coating system, given its importance in sealing the stucco and in protecting joint sealants against UV.

6 CONCLUSION

6.1 The Authority accepts that the expert's report establishes that the cladding as installed complies in most respects with the manufacturer's instructions.

6.2 The Authority is concerned that the moisture readings obtained by intrusive testing are above acceptable limits. It believes that the ingress of this moisture can be minimised if:

- All sources of moisture entry are identified and investigated.
- The items of non-compliance that are listed in the expert's report (and any others that may subsequently become apparent) are rectified; and
- Moisture levels are reduced to an acceptable level as a result of these measures.

Building Industry Authority 7 18 March 2004 Determination 2004/02 Building Industry Authority 8 18 March 2004
The Authority believes that if moisture ingress can be demonstrated to have ceased, the cladding will be code compliant because of the compensating factors listed above in 5.18. The Authority believes that while in this situation a drainage cavity is advisable, it is not necessary for code compliance in this instance.

6.3 The Authority declines to incorporate any waiver or modification of the building code in its determination.

7 WHAT IS TO BE DONE?

7.1 It is not for the Authority to decide how the cladding is to be brought to compliance with the building code. That is a matter for the owner to propose and for the territorial authority to accept or reject, with either of the parties entitled to submit doubts or disputes to the Authority for another determination.

8 THE AUTHORITY'S DECISION

8.1 In accordance with section 20 of the Building Act, the Authority determines that the cladding, which is unable to adequately prevent the ingress of moisture, does not comply with the building code. 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 and ventilated cavity behind the backing sheets 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 the expert's report and any other sources of moisture ingress are rectified to the approval of the territorial authority, the cladding as installed on the house would comply with the building code, notwithstanding the lack of a drainage cavity.

Signed for and on behalf of the Building Industry Authority on this 18th day of
March 2004

John Ryan Chief Executive