

## *Determination 2005/48*

# *Refusal of a code compliance certificate for a building with a “monolithic” cladding system: House 41*

## **1 THE DISPUTE TO BE DETERMINED**

- 1.1 This is a determination of a dispute referred to the Chief Executive of the Department of Building and Housing (“the Chief Executive”) under section 17 of the Building Act 1991 as amended by section 424 of the Building Act 2004 (“the Act”). The applicant is the building owner 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 4-year old house unless changes are made to its monolithic cladding system.
- 1.2 The question to be determined is whether on reasonable grounds the monolithic wall cladding as installed to all the timber-framed external walls of the house (“the cladding”), complies with the building code (see sections 18 and 20 of the Act). By “the monolithic wall cladding as installed” I 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 This determination is made under the Building Act 1991, subject to section 424 of the Building Act 2004. That section came into force (“commenced”) on 30 November 2004, and its relevant provisions are:
- “ . . . on and after the commencement of this section,—
- “(a) a reference to the Authority in the Building Act 1991 must be read as a reference to the chief executive; and
- “(b) the Building Act 1991 must be read with all necessary modifications to enable the chief executive to perform the functions and duties, and exercise the powers, of the Authority . . . ”

It should be noted that the new legislation does not amend the determination process set out under the 1991 Act, other than to transfer the power to make a determination from the Building Industry Authority (“the Authority”) to the Chief Executive.

- 1.4 This determination refers to the former Authority:
- (a) When quoting from documents received in the course of the determination, and
  - (b) When referring to determinations made by the Authority before section 424 came into force.
- 1.5 In making my decision, I have not considered any other aspects of the Act or the building code.
- 1.6 The house itself is described in paragraphs 2.1 to 2.3, and paragraph 8 sets out my decision.

## **2 PROCEDURE**

### **The building**

- 2.1 The building is a single-storey house situated on a slightly sloping site in a low wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The house is of conventional light timber frame construction, built partly on concrete masonry foundation walls and partly on timber framed floors. All the external walls are sheathed with monolithic cladding. The house is of a relatively simple shape with the corrugated steel covered roofs at varying levels having several roof to cladding junctions. A continuous timber-framed open-boarded deck adjoins two part elevations and this is fitted with timber handrails supported on timber balusters. Two small timber-framed pergolas, supported on beams and columns, are constructed outside the dining room and the entrance. The house has no eave projections to the front elevation, and only 100mm to 250mm eaves projections elsewhere. The verge barges are fixed directly over the cladding.
- 2.2 The specification calls for the timber used to construct the timber-framed walls to be H1 “Group A” treated, but I have not received any evidence, by means of invoices or other documentation, as to the framing timber purchased for the house construction.
- 2.3 The building is clad with what is described as monolithic cladding. The cladding is a particular proprietary product, installed in accordance with the manufacturer’s instructions, which include flashings to heads, jambs, sills, trims and corners. As detailed in that manufacturer's instructions (“the instructions”), it incorporates 7.5 fibre-cement backing sheets fixed through building wrap directly to framing timbers and finished with a textured coating and a final paint system. The system has been subject to an appraisal certificate from an independent testing organisation.

### **Sequence of events**

- 2.4 The territorial authority issued a building consent in October 1998.

- 2.5 The territorial authority carried out various inspections during the course of the completion of the house, and passed the “Post Lining” inspection on 2 May 2000. The house failed 3 “Final Inspections” on 23 and 28 July 2003, and on 4 September 2003.
- 2.6 The territorial authority carried out a site inspection on 4 May 2004, and in a letter to the owner dated 14 May 2004, regretted that the building may not comply with the building code in a number of respects. The territorial authority attached a Notice to Rectify, also dated 24 May 2004, together with a set of photographs illustrating items of non-compliance. The “Particulars of Contravention” attached to the Notice to Rectify noted:

A site inspection of [the] property carried out on the 4 May 2004 revealed that the exterior cladding of the new building constructed at the above address is a monolithic cladding system (Plaster on [Named] sheeting)) with no provision for ventilation of the wall space. Furthermore the exterior claddings have been installed otherwise than in accordance with, the acceptable solutions of the building code and accepted trade practices as detailed below.

1. The following have not been installed per the manufacturer's specifications
  - The bottom edge of the cladding system is to finish a minimum 100mm above paved surfaces and 175mm above unpaved surfaces. The cladding has been taken closer than these measurements.
  - The minimum finished floor level to finished ground level is 150mm to paved surfaces, and 225mm to unprotected ground. These clearances have not been achieved.
2. The following items have not been installed per the acceptable solutions of the building code, (no alternative solutions have been applied for)
  - The distance between finished floor level and finished paving of 150mm has not been achieved.
  - The junction between the bottom edge of the window joinery and the wall cladding is to have a sill flashing installed and the junction is to remain open. This junction has been sealed and no sill flashing appears to have been installed.
3. The following items have not been installed per accepted trade practice
  - All flashings are to be installed in such a way as to direct water away from the building, and prevent ingress of moisture. At the junction of the garage gable (spouting) the skirt flashing is required to have kick out to direct water away from the building and into the internal gutter. This has not been achieved.
  - Penetrations through the cladding system shall be as waterproof as the cladding itself. There are a number of penetrations through the cladding that should be protected. The Pergola has been fixed to the building directly through the exterior cladding. Council can not be fully satisfied that these penetrations have been adequately sealed.

- Decking and the like are to remain clear (horizontally) 10mm of the cladding. The timber decks to the north and western sides of the dwelling have been installed against the cladding.
- Drip edges are required to prevent surface water drips off the cladding, preventing water transference by capillary action, gravity or wind pressure. The top edge of the garage door entry has been installed with out a flashing or a drip edge.

#### 4 Ventilated cavity system

- The Council has recently received information which shows that monolithic cladding systems without a drainage plane/cavity, provision for adequate ventilation, drainage and vapour dissipation will, in the likelihood of leakage and/or the effect of residual moisture, cause irrevocable damage to the structural elements of the building.

The Council cannot be satisfied that the above building meets the performance requirements of Clauses B1 Structure, B2 Durability, E2 External Moisture, E3 Internal Moisture, G4 Ventilation and H1 Energy Efficiency Provisions of the Building Code...This is in breach of Sections 7(1), of the Building Act 1991...

Also that the owner was required to:

1. Provide adequate ventilation to the monolithic cladding and into the wall frame space by means of either a ventilated cavity or alternative approved system, and ensuring all issues related to the above are resolved.
2. Lodge with the council an application, within 28 days from the date of this notice, for an amended building consent, and provide all necessary information that may be requested to allow this consent application to be processed, alternatively.
3. Confirm to council, within 28 days from the date of this notice, your intention to apply to the Building Industry Authority for a determination in accordance with the Building Act 1991

2.7 The owner obtained a report from a firm of property consultants (“ the consultants”) based on an inspection of the house undertaken on 9 March 2004. In this report the consultants noted that they had taken out moisture meter tests on all the exterior joinery openings of the house and no sign of water ingress was detected. The exterior of the building showed no sign of leakage areas, and the joinery was well sealed. The property is generally well maintained and tidy with only the site and landscape development to be finished.

2.8 The owner applied for a determination on 21 July 2004.

### 3 THE SUBMISSIONS

3.1 The territorial authority forwarded a lengthy submission. The bulk of the submission was a general comment on monolithic cladding, although some of the material related to this particular extension, and stated that:

- The principle design and current construction methods for the wall assembly do not provide for ventilation and a drainage plane. In the event of a failure of any of the claddings deflection methods moisture will enter and accumulate in the wall framing hereby breaching (*sic*) the Building Act.
- Secondly the building materials in the wall assembly are inadequate to withstand moisture accumulation as there is no allowance or compensatory factors in the design to allow for the consequence of failure of the system components or the system as a whole. The inevitable failure to keep water out will wet the timber frame meaning conditions will exist in the wall likely to cause the timber and other materials in the wall to degrade and be incapable of lasting 50 years as required by the Building Act. This is in part due to the design of the wall not having a drying mechanism other than the natural condition of drying by diffusion through the paint coatings which experience shows is too slow to avoid moisture growth. Where moisture ingress continues or is greater than the natural drying forces moisture accumulation occurs which affects the durability of the timber and plasterboard.
- The third failure of the cladding system is that it is inadequately designed to allow for the expected movement associated with timber frame construction, and thereby cracks will form and sealants tear letting water in. Work in excess of normal maintenance will be required to keep the [NAMED] FIBRE-CEMENT (FC) system, its jointing system and sealants watertight such that moisture will enter and accumulate in the framing, fibreglass insulation and plasterboard such that mould will grow.
- Fourthly the wall cladding system is inadequately insulated and does not manage or control the climatic conditions expected at this buildings location such that condensation can occur and breach (*sic*) the code.
- [The TA] points out that there are already numerous defects in the cladding envelop meaning the building is already in contravention of the Building Act and that even if these items were rectified the building will remain in breach of the code due to the above reasons. Attempts at rectification or directing the responsibility to the homeowner under the title maintenance are in the Councils opinion unfair as these were not pointed out to the Council when the permit issued.

3.2 The submission also included a copy of the Notice to Rectify, and a set of photographs illustrating some of the territorial authority's concerns.

3.3 The territorial authority felt that it must refuse to issue a code compliance certificate on the grounds that there was insufficient scientific evidence on the performance of these building elements.

3.4 In a subsequent letter to the Authority dated 23 August 2004, the territorial authority elaborated on its original submission and stated that its areas of concern were those itemised in the Notice to Rectify and then listed them in detail. The territorial authority, using the risk matrix contained in the revised Acceptable Solution E2/AS1, calculated the weathertightness risk to the house to be high. Apart from further generalised comments, the territorial authority commented on the report supplied to the owner by the consultants. The territorial authority considered that this report

supplied only minimal information, and as such, could not be relied on to provide anything of value for the purposes of this determination.

3.5 The owner in a letter to the territorial authority of 25 August 2004, a copy of which was forwarded to the Authority, responded to the territorial authority's letter of 23 August 2004. In summary, the owner stated that:

- There are no fungi, nor dampness, damp smells or cracking inside or outside of the building after over 4 years of construction, and the territorial authority's inspection had not found otherwise. Penetrations through the cladding had not resulted in water ingress;
- The consultants inspected the house in order to show its sound construction, the quality of workmanship involved, and whether there was any water ingress. The consultants had verbally confirmed that the house is well made and finished better than most properties inspected by them;
- As regards the territorial authority's Notice to Rectify, the owner noted that a drain takes all the water adjacent to the garage door, and the concrete is contoured to discharge water into the drain. With respect to the other issues raised, there is no evidence that moisture is getting into any walls of the house; and
- The risk matrix prepared by the territorial authority emphasised the lack of eaves width, but the issues raised by the territorial authority do not impact on the eaves.

3.6 The owner also provided copies of:

- The building plans and part of the specifications;
- Some building consent information;
- The Notice to Rectify;
- The inspection records from the territorial authority;
- The correspondence with the territorial authority; and
- The consultants' report relating to the 9 March 2004 inspection.

3.7 Copies of the submissions and other evidence were provided to each of the 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 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. The relevant 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. I am 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, which in my view remain valid in this case, 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 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 dated January 2005. The expert stated that the cladding finish, including the textured coating, is of a good standard through out and no visible cracking was evident. The expert noted that only one wall of the house exceeds the length that would require a vertical control joint as recommended by the manufacturer. However, as this wall only exceeded the maximum length requirement of 5400 mm by 100mm, the expert was of the opinion that this was a marginal consideration and thus unlikely to have any detrimental effect. The expert's report made the following specific comments on the cladding.

- Appropriate ground clearance has not been achieved to the base of the cladding on the front north elevation garage walls;
- There are no jamb or sill flashings, jamb sealant, or in seal strips installed to the external windows and doors;
- There is no drip detail or flashing above the recessed garage door installation;
- No kick outs have been installed to the ends of the apron flashings;
- There is inadequate clearance between the base of the cladding and the finished deck surface. In addition, a deck joist is skew nailed directly through the cladding;
- There is no textured coating behind the gutter installation at the rear pitched roof abutment; and
- No horizontal flashing is installed over the top of the meter box.

5.2 The expert carried out a series of moisture tests of the interior and exterior of the external walls using a non-invasive meter. No raised moisture levels were recorded. The expert then took a total of 6 invasive moisture readings at various locations of the exterior cladding and only one raised reading of 22% was recorded at a deck baseplate. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure.

5.3 The expert also noted that issues raised by the territorial authority in its Notice to Rectify had been covered in the expert's report.

5.4 Copies of the expert's report were provided to each of the parties.



## 6 DISCUSSION

### General

6.1 I have considered the submissions of the parties, the expert's report and the other evidence in this matter. The 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 research and experience, both internationally and locally, 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 I consider that the important matters for consideration are:

- Data show 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, it is believed 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 suggest 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 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. It is believed 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, I consider 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, I find: that the house:

- Has minimal eaves projections and no verge projections, so there is little protection to the lower cladding;
- Is built in a low wind zone;
- Is single-storey;
- Is basically simple on plan, with roofs at various levels;
- Has one deck at ground level;
- Has external windows and doors that lack jamb and sill flashings as well as jamb sealants or inseals; and
- Has external wall framing that is likely to be constructed of timber that is unlikely to resist the onset of decay if it absorbs and retains moisture.

### **Weathertightness performance**

6.8 I have carefully considered the principal points in the territorial authority's main submission (and outlined in paragraph 3.1).

6.9 The territorial authority's general submission effectively questions the technical basis of a number of the benchmarks for assessing the likely code compliant performance of timber-framed construction in New Zealand and proposes that an alternative (and more conservative) benchmark be used to assess likely building code compliance for monolithically-clad buildings within its jurisdiction. The Authority considered and commented on these issues in determination No 2004/41. In essence, the Authority determined that the performance of building elements as installed in a house should be based on code compliance benchmarks established in the new external moisture acceptable solution E2/AS1, together with observations of the current state of the building, and not on the higher performance levels suggested by the territorial authority. I have followed the Authority's approach in this determination.

- 6.10 Generally the cladding appears to have been installed according to good trade practice, but some junctions, edges, and penetrations are not well constructed. These areas are:
- The lack of jamb and sill flashings and jamb sealant/ inseal strips to the external windows and doors;
  - The lack of a drip detail or flashing above the recessed garage door installation;
  - The lack of kick outs to the ends of the apron flashings;
  - The inadequate clearance between the base of the cladding and the finished deck surface, and the skew nailing of a deck joist directly through the cladding;
  - The lack of a textured coating behind the gutter installation at the rear pitched roof abutment; and
  - The lack of a horizontal flashing over the top of the meter box.
- 6.11 Notwithstanding the fact that the backing sheets are fixed directly to the timber framing, thus inhibiting drainage and ventilation behind the cladding sheets, I find that there are compensating factors 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;
  - The house is single storey and is situated in a low wind zone; and
  - The moisture evident at this time is only at one location.
- 6.12 I consider that these factors adequately compensate for the lack of a full drainage and ventilation cavity and can allow the house to comply with the weathertightness and durability provisions of the building code.
- 6.13 I also accept that the wall that has an overall dimension of 5500 mm does not require a vertical control joint.
- 6.14 I note that two elevations of the house demonstrate a low weathertightness risk rating, and the other two elevations demonstrate a medium weathertightness risk rating using 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 I am satisfied that the current performance of the cladding is not adequate because it is allowing water penetration into the wall framing at one location at present.

Consequently, I am not satisfied that the cladding system as installed complies with clause E2.3.2 of the building code.

- 7.2 In addition, the building is also required to comply with the durability requirements of clause B2. Clause B2 requires that a building continues to satisfy all the objectives of the building code throughout its effective life, and that includes the requirement for the house to remain weathertight. Because the cladding faults in the house will allow the ingress of moisture in the future, the house does not comply with the durability requirements of clause B2.3.1 of the building code.
- 7.3 I consider that, because the faults that have been identified with this cladding occur in discrete areas, I am able to conclude that satisfactory rectification of the items outlined in paragraph 6.10 is likely to result in the building being weathertight and in compliance with clauses B2.3.1 and E2.3.1, notwithstanding the lack of a ventilated cavity
- 7.4 I note that effective maintenance of monolithic claddings is important to ensure ongoing compliance with clause B2 of the building code. That maintenance is the responsibility of the building owner. The code assumes that the normal maintenance necessary to ensure the durability of the cladding is carried out. For that reason clause B2.3.1 of the building code requires that the cladding be subject to “normal maintenance”. That term is not defined and I take the view that it must be given its ordinary and natural meaning in context. In other words, normal maintenance of the cladding means inspections and activities such as regular cleaning, re-painting, replacing sealants, and so on.
- 7.5 It is emphasised 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 I decline to incorporate any waiver or modification of the building code in this determination.

## **8 THE DECISION**

- 8.1 In accordance with section 20 of the Building Act 1991, I hereby determine that the cladding system as installed does not comply with clause E2 of the building code. There are also a number of items to be remedied to ensure that the house remains weathertight and thus meet the durability requirement of the code. Consequently, I find that the house does not comply with clause B2. Accordingly, I confirm the territorial authority’s decision to refuse to issue a code compliance certificate.
- 8.2 I also find that rectification of the items outlined in paragraph 6.10 to the approval of the territorial authority, along with any other faults that may become apparent in the course of that work, is likely to result in the house being weathertight and in compliance with clauses B2 and E2, notwithstanding the lack of a ventilated cavity.
- 8.3 I note that the territorial authority has issued a Notice to Rectify requiring provision for adequate ventilation, drainage and vapour dissipation. Under the Act, a Notice to Rectify can require the owner to bring the house into compliance with the building

code. The Authority has already found in a previous determination (2000/1) that the Notice to Rectify cannot specify how that compliance can be achieved. A new Notice should be issued that requires the owner to bring the cladding into compliance with the building code, without specifying the features that are required to be incorporated. It is not for me to dictate how the defects described in paragraph 6.10 are to be remedied. How that is done 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 Chief Executive for another determination.

- 8.4 Finally, I consider that the cladding will require on-going maintenance to ensure its continuing code compliance.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 15 April 2005.

John Gardiner  
**Determinations Manager**