Determination 2005/18

Refusal of a code compliance certificate for a building with a "monolithic" cladding system: House 16

1 THE DISPUTE TO BE DETERMINED

1.1 This is a determination by 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-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 5-year old house unless changes are made to its monolithic cladding system.

1.2 My task in this determination is to consider whether I am satisfied on reasonable grounds that the external monolithic wall cladding as installed ("the cladding") to the walls of the house complies with the building code (see sections 18 and 20 of the Act). By "external 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 No other aspects of the Act or the building code have been considered in this determination.

1.6 The house itself is described in paragraphs 2.1 to 2.3 and paragraph 8 sets out the decision.

2 PROCEDURE

The building

2.1 The building is a part single-storey and part two-storey house situated on a excavated sloping site in a medium wind zone in terms of NZS 3604: 1999 "Timber framed buildings". The house is of conventional light timber frame construction on a concrete slab supported by blockwork foundation walls. The timber-framed external walls of the building are lined with a monolithic cladding. The house is of a relatively simple shape, and has the metal tiled roofs at two main levels. The recessed aluminium windows have plastered planted thicknessings at the sills. A timber-framed deck is constructed along one elevation, supported on steel columns and timber beams. The deck is lined with a butyl-rubber membrane over a plywood substrate that discharges into formed gutters at each end. The deck has timber-framed balustrades that are covered on top and both faces with the cladding and finished with side-fixed tubular handrails. There are 450mm eaves projections, with the exception of a short length over the entrance, which is 1650mm wide. There are no projections at the verges. I note that the roof perimeter details and the window layout vary from the consented plans. These changes have not been raised as issues by the territorial authority and there is no evidence that consents, where required, have been obtained for the amended building works.

2.2 No evidence has been produced as to the treatment, if any, of the timber used in the construction of the exterior walls.

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 and sills of the external doors and windows. As detailed in that manufacturer's instructions ("the instructions"), it incorporates 40 mm thick expanded polystyrene (EPS) backing sheets fixed through building wrap directly to framing timbers and finished with a proprietary mesh reinforced product plaster system supplied by the manufacturer of the backing sheet system.

Sequence of events

2.4 The territorial authority issued a building consent on 16 December 1996.

2.5 The owner engaged a home inspection company to check the house for moisture levels and quality of weathertightness, and Structural integrity. The inspection took place on 20 May 2004, and in a report under the heading "Results of Inspection", the inspection company noted:

- **Moisture Test**

All areas tested showed no excessive moisture levels.

The seals and flashings around the window and door joinery were to a good standard, providing good weathertight seals.

It can be confidently concluded that this house does not suffer the "leaky home syndrome".

- **Structural Check**

  There is no visual evidence of structural failure in any part of the building.

  A visual inspection in the ceiling space revealed that treated timber was used. However not all framing could be seen and it could not be definitely determined that no untreated timber was used in the external framing.

2.6 The territorial authority made various inspections during the course of construction, and carried out 2 "Final code compliance certificate Building" inspections. The second of these was carried out on 9 June 2004, and the "Field Sheet" for this inspection noted:

> Failed: L.O.T.I.
>
> Building OK note mono cladding letter to send. .

2.7 The territorial authority issued a Notice to Rectify, dated 9 June 2004, and the "Particulars of Contravention" were:

> 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
> - 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 be processed.

2.8 The owner applied for a determination on 23 June 2004.

3 THE SUBMISSIONS

3.1 The owner provided copies of:

- The building plans;
- The consent documentation;

- The inspection company's report;
- The Certificate of Title;
- The Notice to Rectify;
- Some of the territorial authority's inspection sheets; and
- The correspondence with the territorial authority.

3.2 In a covering letter to its submission, dated 11 October 2004, the territorial authority set out a brief summary of its involvement with the construction of the house, and how the owner had been informed why a code compliance certificate could not be issued. The territorial authority also repeated the specific issues raised in their letter to the owner of 21 July 2004, which were:

1. Envelope complexity
2. Roof/wall intersection design
3. In general the sill flanges of the joinery are sealed to the cladding. [Named Supplier] did not show a sill tray in their technical data until august 2001, so thee is no reason to have a gap. However, no sill tray or cavity adds to risk if there is a joinery leak.
4. No knowledge of back flashing to weatherboard/EFS junction.
5. No sign of flashing to reverse sloping soffits.
6. "Ledges" at external corners, between rafters – flat area on top of cladding.
7. Exposed reverse sloping soffits with only foam strip weathering.
8. End exposed rafters against cladding.
9. Chemfree external wall framing.

The territorial authority went on to say:

> It is noted that monolithic cladding systems are being continuously tested, improved and detailing revised. New knowledge indicates that monolithic systems should have a drainage cavity to perform its function meeting durability requirements of the Building Code. The issues such as high risk design, installation by licensed installers, selection of approved coating system, coating application by licensed applicators, quality control systems of suppliers, installers and applicators, specific independent inspections during installation have further complicated compliance verification process. New E2 document confirms the importance of the above issues.
>
> In regards to this application for a determination, specifically in this case the matter of doubt are:
>
> - Whether the installed cladding system complies with clauses B2.3.1 and E2.3.2 of the Building Code.

3.3 The copies of the submissions and other evidence were provided to each of the parties and neither party made a further response.

4 THE RELEVANT PROVISIONS OF THE BUILDING CODE

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

Clause B2—DURABILITY

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

(a) The life of the building, being not less than 50 years, if:

(i) Those building elements (including floors, walls, and fixings) provide structural stability to the building, or

(ii) Those building elements are difficult to access or replace, or

(iii) Failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.

(b) 15 years if:

(i) Those building elements (including the building envelope, exposed plumbing in the subfloor space, and in-built chimneys and flues) are moderately difficult to access or replace, or

(ii) Failure of those building elements to comply with the building code would go undetected during normal use of the building, but would be easily detected during normal maintenance.

Clause E2—EXTERNAL MOISTURE

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

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

E2.3.2 Roofs and exterior walls shall prevent the penetration of water that could cause undue dampness, or damage to building elements.

4.2 There are no Acceptable Solutions that have been approved under section 49 of the Act that cover this cladding. The cladding is not accredited under section 59 of the Act. I am 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, 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; and

- 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 dated December 2004. It stated that there was limited evidence of cracking but there was noticeable bowing evident in the cladding, particularly on the northern side of the house. The expert noted that there is no direct evidence at present of moisture penetration due to these defects. The paint finish remains in a fairly satisfactory condition. The expert cut out a section of cladding adjacent to a window to access the flashing arrangements for the external windows and doors. This investigation established that sill flashings had been installed, but there were no jamb flashings. However, the rear of the polystyrene had been sealed at the jambs by back wrapping. The expert's report made the following specific comments on the cladding:

- No movement or control joints were present in the cladding, or where the cladding adjoined masonry walls;
- There were 2 minor cracks above the French doors and on the external corners of the deck barrier capping;
- There is no provision for drainage between the bottom edges of the cladding and the masonry foundation walls;
- The cladding is hard down on the paving at some locations, and at other localised areas the landscaping is too close to the base of the cladding;
- There are no stop ends to the external window and door sill flashings and the front edges of these flashings are surface sealed onto the planted thicknessing;
- The head flashings over the external windows and doors are recessed within the window opening and the ends are buried into the cladding with no provision for drainage in each instance;
- The north facing laundry deck bolt fixings are not sealed where they penetrate the cladding;
- The tops of the deck balustrades are flat and lack a protective cover flashing. Cracking was evident to both external corners and there was no evidence of a suitable flashing where the balustrade adjoins the main wall cladding;
- The deck floor has virtually no fall, and there is some partial loss of adhesion at the membrane joints. The deck gutters also have no fall and the outlets have raised flanges that are not dressed into the downpipes. There is ponding on both the deck and the gutters; and

- The upstand to the butyl-rubber deck covering does not provide an effective flashing to the sill of the French doors.

5.2 The expert took 46 moisture readings throughout the house using an invasive meter. There were only 2 slightly raised moisture levels recorded – these being 18.2% and 18.6%. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. The expert pierced the planted sill moulding at several locations but no trapped water was located at these points.

5.3 Copies of the expert's report were provided to each of the parties and neither party made a response.

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 International and local research 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:

1. 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;

2. While most reported leaks are substantially caused by defects in the cladding that require little or no wind pressure differential, I believe 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;

3. 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;

4. 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

5. 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. I believe 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 believe 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:

- Generally has 450mm wide eave projections that provide some protection to the cladding areas below them;

- Has no projections at the verges that would provide protection to the cladding areas below;

- Is in a medium wind zone;

- Is a maximum of two-storeys high;

- Is of a relatively simple shape on plan;

- Has external windows and doors that lack adequate flashings;

- Has one deck fixed hard against the cladding; and

- Has external wall framing that I accept is not treated to a level that would prevent decay if it absorbs and retains moisture.

Weathertightness performance

6.8 Generally the cladding appears to have been installed according to good trade practice, and I consider it has been effective to date in preventing the penetration of water. There are, however, some defective areas of the house, which if not remedied, will eventually allow the ingress of moisture behind the cladding. These are set out below:

- The lack of movement or control joints in the cladding;
- The 2 minor cracks above the French doors and on the external corners of the deck barrier capping;
- The lack of drainage provisions between the bottom edges of the cladding and the masonry foundation walls;
- The fixing of the cladding hard down on the paving at some locations and the landscaping being too close to the base of the cladding;
- The lack of stop ends to the external window and door sill flashings and the front edge of these flashings being surface sealed onto the planted thicknessing;
- The head flashings over the external windows and doors being recessed within the window opening and the ends buried into the cladding;
- The unsealed north facing laundry deck bolt fixings where they penetrate the cladding;
- The lack of protective cover flashings to the flat tops of the deck balustrades and the lack of evidence that a suitable flashing has been installed where the balustrade adjoins the main wall cladding;
- The lack of falls to the deck floor and its associated gutters, the partial loss of adhesion at the membrane joints, and the outlets having raised flanges that are not dressed into the downpipes; and
- The upstand to the butyl-rubber deck covering not providing an effective flashing to the sill of the French doors.

6.9 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; and
- There is no moisture evident at this time in the external wall cavities.

6.10 I consider that these factors adequately compensate for the lack of a drainage and ventilation cavity and can allow the house to comply with the weathertightness and durability provisions of the building code.

6.11 I note that one elevation of the house demonstrates a low weathertightness risk rating, two elevations demonstrate a medium weathertightness risk rating and one elevation demonstrates a high 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 consider that the expert's report establishes there is no evidence of external moisture entering the house, and accordingly, that the monolithic cladding does comply with clause E2 at this time.

7.2 However, 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 are likely to allow the ingress of moisture in the future, the house does not comply with the durability requirements of clause B2.

7.3 I also consider that because the faults in the house cladding occur in discrete areas, I am able to conclude that rectification of the identified faults is likely to bring the cladding into compliance with the code. Once the cladding faults listed in paragraph 6.8 have been satisfactorily rectified, this house should be able to remain weathertight and thus comply with both clauses E2 and B2.

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 I emphasise that each determination is conducted on a case-by-case basis. 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 Act, I determine that the house 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, I find that the house does

not comply with clause B2. Accordingly, I confirm the territorial authority's decision to refuse to issue the code compliance certificate.

8.2 I find that once the items of non-compliance that are listed in paragraph 6.8 are rectified to the approval of the territorial authority, together with any other instances of non-compliance that become apparent in the course of rectification, the cladding as installed on the house will comply with the building code, notwithstanding the lack of a drainage cavity.

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 6.8 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 14 February 2005.

John Gardiner
Determinations Manager