Determination 2004/30

Refusal of a code compliance certificate for a building with a "monolithic" cladding system: House 20

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 applicants are the joint-owners of the property who are referred to throughout this Determination as the "owner". 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 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 wall 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 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 9 sets out the Authority's final decision.

2 PROCEDURE

The building.

2.1 The building is a single-storey detached house with an attached garage situated on a slightly sloping site, which is in a very high/Specific wind zone in terms of NZS 3604: 1999 "Timber framed buildings". The house is of conventional light timber frame construction faced with monolithic cladding constructed on a concrete block foundation wall, which extends at varying heights above ground floor level. It is of a relatively simple shape except for a five-sided dining room annexe, the roof of which is below the main roofline and thus has intersections with the cladding. The house has no decks or balconies and all eaves have 600 mm wide projections, with the exception of a small area where a chimney is located.

2.2 The framing in external walls is H1 Plus treated timber.

2.3 The cladding system is what is described as monolithic cladding. It is based on a proprietary system, which as specified in its manufacturer's July 1998 technical

information manual ("the manufacturer's instructions"), incorporates expanded polystyrene (EPS) backing sheets fixed through the building wrap directly to the framing timbers and finished with a choice of joint and coating systems. The manufacturer's instructions include details for flashings at various junctions. The cladding in this instance departs from the manufacturer's instructions in as much as the polystyrene sheets are 80 mm thick instead of the specified 40 mm thickness and the flashings are 40 mm rather than 20 mm wide as specified. These items were also purchased from alternative manufacturers. Both the jointing system and the coating system are one of those systems referred to in the manufacturer's instructions, the coating in this instance being a trowelled two-coat roughcast finished polymer-modified cement based plaster. The owner has advised that a sealer coat and two coats of acrylic paint were applied to the cladding.

2.4 The Plasterer, who is also a joint-owner, issued a "Cladding Producer Statement".

Sequence of events:

2.5 The territorial authority issued a building consent on 29 August 2000. There were no conditions attached to this consent

2.6 A firm of consultants was contracted by the territorial authority to carry out the inspection services in relation to the building, and this firm carried out various inspections in the course of construction.

2.7 Officers of the territorial authority carried out a final inspection on 21 October 2003. The "Field Advice Notice" relating to this inspection noted 3 items requiring action to be taken. One of these stated:

> Supply Producer Statement on cladding system from supplier, installation of plaster and windows.

2.8 A re-check inspection was undertaken on 22 December 2003 and the "Field Advice Notice" contained a note that "[C]ladding is monolithic without cavity".

2.9 On 22 December 2003, the owner provided a "Cladding Producer Statement" for the building in which the Plasterer stated that he had installed the exterior wall system in accordance with the instructions and recommended details of a Named Exterior Wall System with two exceptions. These were that:

- While the Plasterer had 20 years experience in solid plastering, dry wall and alternative plasters, he was not a licensed applicator for the system; and
- 80 mm thick polystyrene had been used rather than the 40 mm recommended by the manufacturer and 40 mm flashings rather than the recommended 20 mm.

2.10 On 6 January 2004, the territorial authority issued an interim code compliance certificate which stated:

> This is an interim code compliance certificate in respect of part only, as specified in the attached particulars, of the building work under the above building consent.

The particulars were:

> This Interim Code Compliance Certificate excludes all Exterior Wall Cladding.

2.11 On 4 February 2004, the territorial authority wrote to the owner stating that the territorial authority was unwilling to issue a code compliance certificate. The reason being that all inspections prior to the final one were carried out by a consultant and there was insufficient information on the inspection sheets for the territorial authority to evaluate parts of the cladding system not visible at the final inspection. The letter went on to say:

> Further to the above the exterior cladding was not applied by a recognised installer and no previous work record is available. There are still a number of non-compliance issues with the exterior cladding:
>
> - Non-sealed penetrations of plaster
> - Ground clearance to cladding insufficient
> - High risk widow recesses
> - Sealing between metal fascia and cladding not provided
> - No base flashing is provided to cladding
> - The cladding does not appear to be an approved system
>
> Due to the above points council does not believe that the cladding system used complies with E2 of the Building Code…
>
> This does not and should not be taken as an inference that a code compliance certificate will be issued on completion of the listed works.

2.12 The owner applied for this Determination on 21 February 2004.

3 THE SUBMISSIONS

3.1 The territorial authority forwarded a submission accompanied by referenced photographs. The submission said that a number of non-compliance items had been noted during a final inspection undertaken on 21 October 2003. Furthermore, after the re-check inspection, the territorial authority inspectors "discussed the poor workmanship and un-tradesman like manner in which the cladding system and plaster had been applied". Another inspection led a territorial authority official to decide, "that the building was not finished to a standard that a code compliance certificate could be issued…". The letter listed non-compliance issues with references to attached photographs. The issues were:

- Non-sealed penetrations of plaster;
- Ground clearance to cladding insufficient;
- High risk widow recesses (these are not as approved plan attached);
- Moisture appears to be exiting from behind cladding below window;
- Sealing between metal fascia and cladding;
- Exposed polystyrene at bottom of cladding;
- Exposed polystyrene eaves; and
- Examples of poor workmanship

The letter concluded:

> It is council's opinion that the present cladding would be very difficult to repair to a standard that would meet the building code and should be replaced by an approved installer and an amended plan should be submitted to council clearly showing how watertightness is to be achieved on the replaced windows.

3.2 The owner made a submission in which it was stated that there had been no indication at the territorial authority's site visit of 22 December 2003 that poor workmanship was an issue. The exterior wall system had been applied in accordance with the manufacturer's instructions, apart from the exceptions set

out in the "Cladding Producer Statement". Nor did the owner accept that the cladding would be difficult to repair. The house was completed in 2000 to 2001 when a cavity was not required by the relevant Approved Document. The owner made specific references to the construction issues raised by the territorial authority and that these had now been rectified, as follows:

- The spouting fixing screws had been refixed;
- The drainage metal built up to the cladding had been removed;
- All windows had been installed by the builder in accordance with the plans and manufacturer's instructions and had been passed by the territorial authority in the course of its inspections as verified by the inspection sheets. There were no leaks apparent with regard to the windows;
- The moisture exiting behind the cladding was due to a leaking toilet system and this had been rectified;
- The joint between the metal fascia and the cladding has now been sealed;
- The bottom of the cladding sheets above garden areas were capped and at the remaining areas the base has now been re-plastered and painted;
- The exposed polystyrene at the eaves has now been plastered and painted; and
- The small areas showing examples of poor workmanship have been tidied up.

3.3 The owner also provided copies of:

- The building plans;
- The building consent and the territorial authority's inspection records;
- The interim code compliance certificate;
- The notice from the territorial authority that a firm of consultants would be carrying out the building inspection services;
- Letters and photographs from a registered valuer;
- The owner's letter to the territorial authority of 8 March 2004;
- The territorial authority's letters to the owner of 4 February 2004 and 27 February 2004, together with accompanying photographs;
- The "Cladding Producer Statement" from the Plasterer;
- The 5-year warranty issued by the aluminium joinery manufacturer;
- A producer statement relating to structural design;
- The cladding manufacturer' technical data sheet;
- Invoices from a building materials supplier; and
- A set of photographs showing aspects of the building.

3.4 The copies of the submissions and other evidence were provided to each of the parties. While the territorial authority did not respond to the owner's submissions, the owner did write on 20 March 2004 in response to the territorial authority's submission. In this letter, the owner commented on the issues raised by the territorial authority, noting that the

majority of these had been rectified. The owner also pointed out that the house had not leaked externally and that in the main the cladding was installed in accordance with the manufacturer's instructions.

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. The Authority is therefore of the opinion that the cladding system as installed can be considered to be an alternative solution.

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

- Some acceptable solutions cover the worst case, so that in less extreme cases they may be modified and the resulting alternative solution will still comply with the building code.

- Usually, however, when there is non-compliance with one provision of an acceptable solution, it will be necessary to add some other provision to compensate for that in order to comply with the building code.

5 THE EXPERT'S REPORT

5.1 The Authority commissioned an independent expert ("the expert") to inspect and report on the cladding. The expert inspected the building and furnished a report, which described the plaster coating as appearing to be consistent and applied evenly. The plaster coating and painting is of a good standard and the exterior finish is generally of good quality with certain exceptions. The expert found the following specific faults during the inspection:

- The bottom edge of cladding on right hand side of garage is not finished and fibreglass mesh can be seen;
- The ground heights at the garage are too high, and it is also noted that the hard landscaping and paving has not yet been completed;
- There is minor damage to base of cladding beside the lounge door;
- The cladding is buried in paving to the landing at the laundry, the patio area outside study and at the front entry;
- There are the following defects at the wall cladding above the roof of the dining room:
    a) Insufficient cladding clearance,
    b) The bottom edge of the polystyrene is unfinished,
    c) A fascia and spouting are buried in the cladding,
    d) The apron flashing is poorly formed, and
    e) A TV cable is screwed to wall cladding;
- Mesh is exposed over head of garage door opening, which will allow moisture to wick up into the plaster;
- While the bottom edge of the cladding has been plastered and painted following the territorial authority's identification of issues, a second coat of paint is required to ensure the area is fully sealed and protected from moisture;
- There are holes and cracks at the joint between the column and joinery units at the dining area;
- The angular shaped windows at 5 locations are considered to be high risk due to the nature of the construction. In particular, the 40 mm wide flashings do not extend out past the line of the cladding;
- The grate installed between the cladding and the patio and which is hard up against the cladding, has not been installed correctly;
- There are no conduits or ducts installed in several areas where the electrical cables penetrate the cladding; and
- Flashings or scribers are required to the meter box.

5.2 The expert also used an-invasive type moisture meter applied through the exterior cladding to detect areas of moisture ingress. The moisture readings ranged from 15% to 16.9% at a total of 9 locations, and 30% at a location where a leak had occurred in a water pipe. This

leak has since been rectified and the framing timber in the vicinity is drying out. 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. While there was no response from the territorial authority, the owner forwarded a detailed submission. In general, the owner was prepared to rectify most of the items referred to by the expert. However, the owner disputed whether it was necessary to carry out the following requirements:

- Fitting scribers around the meter box and between the exterior joinery/column junctions;
- The uplifting of paving to ensure ground clearance;
- Fitting an apron flashing to the Dining Room area spouting;
- Work to the angular windows.

The owner also referred to the fact that the expert had stated that the "exterior finish is generally of good quality and plaster coating and painting is of a good standard".

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 a fundamental 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 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 600 mm 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;
- Taller buildings result in an effective increase in the catchment area of the wall. Available data suggests a clear correlation between higher number of storeys and an increased incidence of leaking;

- Complex roofs and overall envelope shapes where the roofs frequently intersect with the walls on upper floors create opportunities for leaks to directly penetrate into the wall; and
- Recent data also shows that decks and balconies that are exposed in plan and/or cantilevered from the external walls are the most frequent location for water leaks.

6.6 Any likely penetration of moisture through the cladding can then be countered by a combination of effective drainage, ventilation of the drainage cavity and moisture tolerance in the external wall framing timber. In particular:

- The structure should allow water that has penetrated the cladding to drain out as quickly as possible. The Authority believes that generally a drainage cavity should be provided behind the outer cladding barrier in monolithic construction;
- The design of the outer walls should allow walls to dry to the outside once moisture penetrates the cladding and the moisture barrier. If walls do not dry, decay fungi can become established in as little as 3 months. Until scientific data on the optimum depth and configuration of the ventilation mechanism in New Zealand conditions is available, the Authority believes that the drainage cavity should be not less than 20 mm deep; and
- The external walls should have some degree of decay resistance or moisture tolerance to allow for situations when moisture circumvents the cladding and moisture barriers and moisture levels in the timber rise to more than 18%.

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

- Has, with one minor exception, 600 mm wide eaves that effectively protect the cladding;
- Is in a very high/Specific wind zone;
- Is single storey;
- Has only one area with wall/roof intersections;
- Has an overall envelope, which with the exception of the dining room annexe, is relatively simple on plan;
- Has a no decks or balconies;
- Has no drainage cavity where the cladding is face fixed; and
- Has external walls claimed to be constructed from HI Plus treated timber, which would be reasonably effective in delaying the onset of decay.

Weathertightness performance

6.8 Generally, the cladding appears to have been installed according to good trade practice and to manufacturer's instructions. It can, therefore, be considered to be reasonably effective in preventing the penetration of water. There are, however, defects, which are set out in paragraph 5.1, that are likely with time to allow the ingress of moisture behind the cladding.

6.9 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. These are:

- Apart from the faults identified by the expert, the cladding generally appears to have been installed according to good trade practice and to manufacturer's specifications;

- The building does not display to any significant extent any of the weathertightness risk factors; and
- Apart from the area in the vicinity of the previously leaking water pipe, the moisture level readings do not indicate any undue moisture ingress behind the cladding at this time.

6.10 The Authority considers that the design of this house presents a low risk of weathertightness failure. The simple building envelope and roof design, the presence of eaves and the absence of decks or balconies are such that face fixed cladding can meet the requirements of clauses B2 and E2 without requiring a cavity.

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. 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 While the building does not show any signs of water ingress at the present time, this building will also have to comply with the durability requirements of clause B2. 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 in this building are likely to allow the ingress of moisture in the future, the building does not achieve the durability requirements of clause B2.

7.3 The Authority also finds that when the cladding faults have been satisfactorily rectified this house should be able to remain weathertight and will thus comply with clause B2. It is essential that all the required items of rectification which are detailed specifically paragraph 5.1, be competently carried out to ensure such compliance.

7.4 Clause B2.3.1 of the building code requires 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 such inspections and activities such as regular cleaning, re-painting, replacing sealants, and so on.

7.5 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.

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

8 WHAT IS TO BE DONE?

8.1 It is not for the Authority to decide directly how the defects listed in paragraph 5.1 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.

9 THE AUTHORITY'S DECISION

9.1 In accordance with section 20 of the Building Act, the Authority determines 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, 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.

9.2 The Authority finds that because of the compensating factors in this case, the lack of a drained cavity behind the cladding is not, on its own, sufficient grounds to withhold a code compliance certificate.

9.3 The Authority, therefore, finds that once the items of non-compliance that are listed in paragraph 5.1 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.

9.4 The Authority considers that the cladding will require on-going maintenance to ensure its continuing code compliance, and that this maintenance programme should be undertaken after consultation with the territorial authority.

Signed for and on behalf of the B**uilding Industry Authority** on 2 July 2004

John Ryan
Chief Executive