Determination 2004/64

Refusal of a code compliance certificate for a building with a "monolithic" cladding system: House 49

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 owners of the property (referred to throughout this Determination as "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 seven-year old house unless changes are made to its monolithic cladding.

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"), which is applied to the walls, entrance column and chimney of this house, complies with the building code (see sections 18 and 20 of the Act). By "external wall cladding as installed" we mean the components of the system (such as the backing sheets, the flashings, the joints and the plaster and/or the coatings) as well as the way the components have been installed and work together.

1.3 In making its decision, the Authority has not considered any other aspects of the Act or the building code.

1.4 The house itself is described in paragraphs 2.1 to 2.2, and paragraph 8 sets out the Authority's final decision.

2 PROCEDURE

The building

2.1 The building is a two-storey detached house situated on a level site in a medium wind zone in terms of NZS 3604: 1999 "Timber framed buildings". The house is of conventional light timber frame construction, built on concrete foundations and floor slab. Windows are aluminium and external walls are sheathed entirely with a monolithic cladding. The house has a relatively complex shape, with the roof comprising a complex configuration of ridges, hips, parapets, flat roofs and intersections. The sloping roof area is at 60^{o} pitch and is clad with fibreglass shingle tiles, while flat roof areas are clad with butyl-rubber membrane. The living room in the second storey has an adjoining cantilevered deck overhanging the main entry and garage doors below, with the deck floor clad in tiles laid over a butyl-rubber membrane. The deck has solid balustrades, clad on both sides and top with monolithic cladding. There is a monolithic clad chimney inset into the second storey roof. There are parapets to the flat roofed areas, and no eaves projections to sloping roofs.

2.2 The framing in the external walls is kiln dried boric treated timber. The owner provided copies of test results based on two samples of framing timber, which indicated that leaching of boron from the samples had occurred, due possibly to moisture ingress, since the examples were apparently taken at leaking locations. The Authority notes these samples indicate that only a low level of treatment remains in the timber (around 50% of the level of boric acid equivalent that would be expected in timber treated to a H1.2 level).

2.3 The cladding is a monolithic cladding system described as a 20 mm thick proprietary plaster applied over a solid backing. As indicated in the detail sheets of March 1995 produced by the supplier of the plaster coating system ("the manufacturer's instructions"), the cladding consists of fibre cement sheets fixed through the building wrap directly to the framing timbers, and covered with a solid screed, which is adhered to the backing sheets without the use of a slip plane, and that is finished with a thin coat of fibreglass mesh reinforced plaster coating. The manufacturer's instructions comprise technical data sheets with specifications and typical installation details. The construction details include drawings of typical flashing details for various junctions, but do not cover all of the junctions actually present in the house. For the purposes of this determination, the manufacturer of the plaster and coating system is regarded as the manufacturer of the cladding system, despite the fact that the fibre cement backing sheets are proprietary to another manufacturer. All plaster products and the associated components are supplied by the manufacturer. There is no reference made to requirements for the final paint coating system. An independent organisation carried out an appraisal of the cladding system in 1995 (although the appraisal certificate was voluntarily withdrawn in July 2004).

2.4 There is no evidence of warranties or "Producer Statements" for the cladding system, nor information as to which sealing, plaster or painting systems were actually applied.

Sequence of events

2.5 The territorial authority issued a building consent on 24 January 1997. None of the "Consent Requirements" attached to the consent referred to the cladding.

2.6 The territorial authority made various inspections during the course of construction, and the owner moved into the house on completion in June 1997. On 4 July 1997 a final inspection was carried out which identified that seven specific matters required attention, as confirmed by a copy of the "Code Compliance Certificate Memorandum". Only one of these items related to the cladding, and this noted that "ground levels to be completed and rechecked". There is some debate as to whether these items were completed and checked in 1997. The builder went into liquidation shortly after completion of this house and, possibly due to this, formal matters may have been left uncompleted, as the territorial authority issued no Code Compliance Certificate. It appears that the owners were unaware of this matter until early in 2004, when they arranged a new inspection.

2.7 On 27 January 2004 the territorial authority completed a new final inspection, issuing a handwritten "Recheck" note. The note quoted a new consent number and stated:

> All items rechecked in order. These items were checked in 1997.

2.8 On 4 May 2004, the territorial authority carried out a further site inspection of the building, and subsequently issued a Notice to Rectify under section 43(6) of the Act, dated 13 May 2004, and using the new building consent number in addition to the former number. The notice made no reference to the earlier inspection of 27 January 2004, and stated that the owner was:

notified to rectify building work on the project described above that was not done in accordance with the Building Act 1991 or the Building Code, as detailed on Page 2 attached headed 'Particulars of Contravention'.

notified that building work, except for work necessary to properly secure and protect the building and to keep it in a safe condition, is to cease forthwith, and is not to be resumed without the written approval of Council.

2.9 The 'Particulars of Contravention' attached to the Notice to Rectify noted that in regard to the cladding:

1. The following have not been installed per the manufactures (*sic*) 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 junction between the bottom edge of the window joinery and the wall cladding are to have a sill flashing installed. This junction is fully sealed with no visible sign of a sill flashing having been installed.

   - Control joints at a maximum of 4.0 centres vertically from internal and external corners and horizontally at floor joist level are required. Control joints have not been installed vertically, and confirmation is required that horizontal control joints have been installed.

   - Horizontal surfaces are to be formed with sufficient fall (1 in 10) to prevent water from ponding on them. The deck barriers and parapets have flat horizontal surfaces.

2. The following items have not been installed per the acceptable solutions of the building code, (no alternative solutions have been applied for)

   - Two outlets are required to internal gutters/decks. The cross-sectional area of the outlet shall be no less than the down pipes servicing the gutter/deck. The minimum internal diameter permitted is 63mm. The overflow outlet for the deck of the Lounge is less than permitted and is located above the floor level of the floor.

   - 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 on the western elevation and northeast elevation front/garage entry.

3. The following items have not been installed per accepted trade practice

   - Handrails and the like shall be fixed to a vertical face where ever possible to minimise possible water ingress through the fixings.

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 territorial authority also noted:

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…

The notice also required the owner to:

1 Provide adequate ventilation to the monolithic cladding and into the wall frame space by means of either a ventilated cavity or alternate approved system, and ensuring all issues relating to the above and 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 the consent application to be processed, alternative

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.

2.10 The owner applied for this determination on 14 June 2004.

3 THE SUBMISSIONS

3.1 In a covering letter submitted with the application for a determination, dated 14 June 2004, the owner outlined the background leading up to this determination and included the following points for consideration by the Authority:

> All interim building inspections [during construction in 1997] were undertaken by [the territorial authority] and the works were passed by its inspectors. The final 'code compliance' inspection failed a 4 July 1997 due to seven specific items. While the items were all addressed in 1997, we discovered in January of this year that the builder, who went into liquidation immediately following completion of our house, may have failed to arrange a follow up inspection (although we recall one being undertaken, we can find no record of it).
>
> In 2003, having become aware of the issues relating to monolithic cladding, we arranged an inspection of the house by the Weathertightness Homes Resolution Service… The report, issued in February 2004, identified four areas with high moisture content… These four specific areas are in two locations (ie there are two 'couples' of problem areas). Both of these 'couples' are immediately below transitions from a flat roof to a 'sloping' roof.
>
> We have arranged a registered architect to redesign the roof so that the two small areas of flat roofs are removed and replaced with a sloping roof that will extend beyond the cladding…. This work, which is in excess of that recommended by the Weathertightness Homes Resolution Service is expected to be undertaken by the end of July 2004.
>
> …when the work on the roof is undertaken, we will have the builder remove parts of the lining to enable the framing to be inspected to ensure that no deterioration has occurred. The [WHRS] inspector was not able to identify any signs that, after 7 years, either the cladding or windows were 'leaking'.
>
> Having discovered that a code compliance certificate had not been issued by Council, we immediately arranged another inspection. This was undertaken on 27 January 2004 – and the outstanding items 'passed'.
>
> We have challenged the Council's ability to issue the Notice to Rectify (as the works have been completed in accordance with the Building Consent and, with the exception of the ground to floor clearance of the western elevation, Council had not at any of its previous inspections identified the items it now requires rectified).
>
> After 7 years, there is no evidence of the windows leaking – with small plastic flashings installed as per the cladding manufacturers specifications.

> The handrail is to be removed from the deck barrier and a cap installed with the required fall. The parapets are to be removed as part of the roofing alterations.
>
> A new outlet is to be installed.
>
> The ground level clearance is to be increased on the western side…. [Regarding the front door/garage area] the area is contiguous with the garage entry – and greater clearance would make the garage inaccessible, the area is under a 1.7 metre overhang.
>
> There is no evidence that the cladding system 'leaks' (inspections have suggested that the system is well installed).

3.2 The owner also provided copies of:

- The drawings and the carpentry section of the specification;
- The building consent documentation;
- Correspondence with the territorial authority;
- The Weathertightness Homes Resolution Service (WHRS) assessor's report; and
- An architect's drawings of proposed alterations based on recommendations contained in the WHRS assessor's report.

3.3 Included in the owner's submission is a copy of the report prepared by the WHRS assessor ('the assessor"). The report noted that minor leakage had occurred in several areas, and these had been temporarily repaired. Indicative moisture readings using a non-invasive meter were taken on 20 October 2003 in walls below two windows and below the flat/sloping roof junction. These indicated moisture contents ranging from 23% to over 40%. As well as identifying in some detail the likely causes of the leaks as being the flat membrane roofing with associated parapets and roof junctions, the report noted a number of other faults in the house, including the following:

> The cladding finishes on the paved area to the western elevation. This may be causing moisture to enter the structural timber by capillary rise.
>
> In my opinion there is insufficient free board to the exterior deck in relation to the internal floor level. This may allow moisture to enter the building by capillary action.
>
> There may be an absence of effective means to waterproof the top of the barrier wall.
>
> The screw fixings for the metal handrail penetrate the top of the barrier wall. This is likely to be allowing moisture to enter the barrier wall via gravity.
>
> The overflow relief outlet is too small and is located too high on the barrier wall to be effective in the event of the deck flooding.
>
> …there were no visible signs of damage to the exterior cladding at the time of inspection, although in my opinion moisture may have penetrated behind the cladding. If further investigations are not carried out, damage may occur to the building.

3.4 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 are the primary failure in the stucco wall system comprising stucco, backing boards building paper, timber frame, fibreglass insulation (batts) and plasterboard in that it is defectively designed as in Auckland conditions it results in a RH (relative humidity) in the timber wall cavity sufficiently high for mould and rot to grow. Current construction methods do not provide for ventilation and a drainage plane.

- The secondary failure is that work in excess of normal maintenance is required to keep the stucco and wall elements of sufficiently low moisture content to prevent the effects of the primary failure from reoccurring even if all the water entry points were eliminated.

- The third failure of the stucco system is that it is an inflexible cladding and does not allow for the expected movement associated with timber frame construction, and thereby cracks form and sealants tear letting water in.

- Fourthly the building materials in the wall assembly are inadequate and there is no allowance for the consequence of failure of the system components or the system as a whole. Especially the timber frame the end result means the timber will degrade and be incapable of lasting 50 years as required by the Building Regulations.

- The [territorial authority] points out that there are already numerous defects in the cladding envelop and even if all these were repaired this will not alter the four principle failures identified above and the building will remain in contravention of the Building Act.

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

3.6 The territorial authority in a letter to the Authority, dated 26 July 2004, 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), as well as general comments on monolithic claddings, design risk factors and ventilated cavity construction. The territorial authority also calculated the weathertightness risk to be high, using the risk matrix contained in the external moisture Acceptable Solution E2/AS1. With reference to matters raised in the owner's submission (as outlined in paragraph 3.1), the territorial authority included the following comments:

> The Building Consent was approved and the inspections carried out in good faith based on the information that the Council had available at the time. Council is empowered to enforce the provisions of the Act, (Section 26) states "The Council has a duty to gather information and monitor"… … We believe that this building was not code compliant in July 1997 nor is it now based on the current information that we have available.
>
> [According to the manufacturer's information of June 1996] a sill flashing is to be installed at the base of all joinery units. The detail referenced clearly defines a substantial proprietary sill flashing.
>
> At time of construction a slope to all horizontal surfaces was regarded as good trade practice.
>
> Council acknowledges that this [floor clearances] requirement of the code is very difficult to achieve where the driveway meets the garage entry. We also acknowledge that there may be grounds for a waiver or the acceptance of an alternative solution in some instances. Council requests that the BIA make appropriate comment on this situation in the determination.

[With respect to the owners' comment that the cladding does not leak] by the owners own admission and the previous report… …moisture readings were recorded over 40%. ...the non-issue of Code Compliance Certificate at this time was justified on the basis that this building is not weathertight and does not comply with NZ Building Code E2/AS1.

4 THE RELEVANT PROVISIONS OF THE BUILDING CODE

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

Clause B2 DURABILITY

B2.3.1

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

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

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

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

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

(b) 15 years if:

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

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

Clause E2—EXTERNAL MOISTURE

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

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

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

4.2 There are no Acceptable Solutions that have been approved under section 49 of the Act that cover this cladding. The 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 noted that the quality of finish to the cladding appeared to be high, and generally reflected good trade practice. The finish to the cladding appeared to generally be of a good standard with no visible cracking, except for a minor crack to the soffit edge of the overhang above the garage door and another below a window. No control joints in the cladding were evident, but the expert noted that wall dimensions are within the limits recommended by the manufacturer as requiring such joints. The sealing of services and plumbing penetrations generally appeared weathertight, and the cladding was observed to form a continuous weathertight surface behind all obstructions. Inspection of the bottom of the cladding revealed that the detail used appeared to be in accordance with the manufacturer's technical recommendation. The expert's report made the following specific comments on the cladding:

- The ground clearances to the finished floor level are inadequate on two sides of the house. While a clearance of 150 mm is required between a finished floor slab and paving, the west elevation has only 52 mm, and the south elevation has 100 mm. Clearance is also low at the entry area. However, this area is sheltered by a 2 metre overhang;

- Clearances from ground level to the bottom of the cladding are also inadequate for most areas of the house;

- The overlaps of the cladding over the foundation slab vary between 35 mm and 50 mm.

- Removal of two small sections of plaster at the jamb/sill and jamb/head junctions of one window confirmed that jamb flashings appear to be installed according to the manufacturer's recommendations. However, while the sill flashing generally appears to accord with the manufacturer's recommendations, a specified 6 mm gap between the window flange and the sill flashing has not been provided and the junction has been sealed which will prevent moisture escaping to the outside;

- The window head flashing has not been installed according to the manufacturer's recommendations that the head flashing is to be fitted with the cladding backing sheets overlapping the flashing upstand. Instead, the head flashing upstand is fitted over the backing sheets, a specified finishing angle is missing, and the required gap between the bottom of the cladding and the slope of the head flashing has been sealed;

- A wire penetrating the cladding behind the gas water heater has not been sealed;

- The outer vertical face of the metal parapet capping has no formed drip edge and is flush with the wall cladding;

- The second storey deck has;

    - Balustrade to wall junctions that have no membrane or metal saddle flashing under the cladding,

    - A balustrade top that is flat and lacking a separate superimposed capping,

    - Handrail supports fixed through the top of the enclosed balustrade, providing potential for moisture entry,

    - The enclosed deck is at the same level as that of the internal adjoining floor, and;

    - A 25 mm diameter pipe overflow to the enclosed deck is undersized, is located above the adjacent internal floor level, and is thus ineffective.

5.2 The expert took interior non-invasive moisture content readings around all openings and the bottom of exterior walls. No raised moisture levels were recorded from these readings.

5.3 Invasive moisture readings were taken through holes drilled through the exterior cladding. Readings were taken at 10 different locations and included zones considered to be potentially vulnerable, such as parapets, top and bottom of enclosed balustrades, and around windows. Of the 10 invasive readings taken, two window areas recorded readings above 25%. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure.

5.4 There was evidence of moisture ingress at two of the window sill/jamb areas, as indicated by readings of:

- 25.6% at the jamb to sill junction of the full height window to the family room on the west elevation ground floor. This location is adjacent to where the cladding has insufficient clearance above the paving.

- 36.8% at the jamb to sill junction of the window to the master bedroom on the west elevation second storey. The Authority notes that this location is below the flat roof that the WHRS assessor found to be defective and a major cause of water entering the cladding. The assessor recorded a reading of 40% plus at this point.

5.5 Readings at all other locations recorded low levels of moisture, and the expert also commented:

- Although the handrail supports are fixed through the flat top of the balustrade and there appears to be no waterproofing membrane or other flashings under the cladding at the balustrade to wall junction, there was currently no evidence of the presence of moisture in walls associated with these areas.

- Although the enclosed deck is the same level as the adjoining internal floor, there was currently no evidence of the presence of moisture in associated walls.

- Although the parapet capping is flush with the surface of the exterior cladding, there was currently no evidence of moisture in associated walls.

- Indicative readings taken throughout the interior of the building showed no evidence of elevated moisture level in the wall cavities.

5.6 Copies of the expert's report were provided to each of the parties. The territorial authority did not respond, but the owner commented in a letter to the Authority, dated 14 October 2004. In this correspondence, the owner referred to the issues raised by the territorial authority and to which the expert referred. The owner in general terms:

- Commented on the clearance to the base of the cladding;
- Will be installing the window flashings;
- Noted that control joints are not required;
- Will be relocating the balcony overflow outlet;
- Will remedy the western elevation ground clearance and will seek dispensation in respect of the north-eastern front/garage entry;
- Was prepared to remedy the top slope to the balcony handrails; and
- Commented on the territorial authority's requirement to create a cavity, requesting the Authority to determine the issue.

5.7 The Authority has assessed the compliance of this house on the basis of the expert's report. It makes no comment on any subsequent remediation, nor on the owner's proposals for remediation.

6 THE AUTHORITY'S VIEW

General

6.1 The Authority has considered the submission of the owner, including the WHRS assessor's report, the expert's report and the other evidence in this matter. The Authority's approach in determining whether building work complies with clause 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 Research data and experience, both international and local, indicates that the impact of weathertightness problems in monolithic clad houses can be minimised if good and effective design and construction practices are followed.

6.3 The installation of exterior cladding to manufacturer's specifications and to accepted good trade practice is an important but not the only requirement to ensure good weathertightness performance.

6.4 The next priority is to reduce the ability of moisture to get through the cladding by using design measures that minimise the effects of the rain impacting on the walls.

6.5 Important matters for consideration are:

- Data shows a strong relationship between the width of the eaves and the incidence of wall leaks. An effective deflection mechanism, such as eaves greater than 600 mm wide, has been shown by Canadian data to manage more than 90% of rain incidence;

- While most reported leaks are substantially caused by defects in the cladding that require little or no wind pressure differential, the Authority believes that buildings in high and very high wind zones (as defined by NZS 3604) are likely to experience wind pressure differentials and thus a higher risk of water ingress;

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

- Complex roofs and overall envelope shapes where the roofs frequently intersect with the walls on upper floors create opportunities for leaks to directly penetrate into the wall; and

- Recent data also shows that decks and balconies that are exposed in plan and/or cantilevered from the external walls are the most frequent location for water leaks.

6.6 Any likely penetration of moisture through the cladding can then be countered by a combination of effective drainage, ventilation of the drainage cavity and moisture tolerance in the external wall framing timber. 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 no eaves protecting the top of the cladding;

- Is in a medium wind zone;

- Has two storeys;

- Has an overall envelope that may be described as relatively complex, with a complex roof configuration including flat to sloping intersections, internal gutters and parapets;

- Has an enclosed deck at the upper level, which is exposed in plan and cantilevered from external walls;

- Has no drainage cavity as the backing sheets of the cladding are fixed directly to the framing; and;

- Has external walls constructed with boron treated timber which would be effective in preventing the onset of decay. However, the Authority notes that the test samples show that the treatment may have been seriously compromised in at least 2 locations.

Weathertightness performance

6.8 The Authority has carefully considered the principal points in the territorial authority's main submission (and outlined in paragraph 3.4).

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 has 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. Accordingly, this is the approach the Authority has followed in this determination.

6.10 The Authority finds that while in most respects the cladding appears to have been installed according to good trade practice and to the manufacturer's instructions, this does not apply to the flashing of window penetrations, the enclosed deck and balustrades, and the provision of adequate clearances above paved or unpaved areas.

6.11 The areas of past moisture penetration outlined in paragraph 3.3 appear to have been temporarily remedied and show no evidence of current moisture penetration. However, if the defects associated with the flat roof and parapet areas that have lead to this past moisture penetration are not remedied, further moisture penetration is likely in the future.

6.12 The Authority notes the owner's intentions and plans for long term remedial measures (based on the assessor's recommendations) described in paragraph 3.1 and 5.6. The Authority suggests that this work be carried out after consultation with the territorial authority.

6.13 As the flashings to the exterior joinery unit are installed in this particular proprietary plaster system, the Authority accepts that they will be effective in preventing moisture entering the cladding. However, the Authority requires a gap to be formed between the sill flashings of the units and the adjacent plaster.

6.14 There are also other defects associated with the bottom of the cladding as described in paragraph 5.1. In the case of the garage and entry wall, the Authority considers that the driveway drainage channel and large overhang above should provide sufficient protection against moisture penetration. However, for all other walls the lack of adequate separation of the cladding from paved or unpaved surfaces is likely, if not remedied, to eventually

allow moisture to be absorbed by the cladding and to penetrate into the bottom of framing timbers.

6.15 Other defects are associated with the enclosed deck as described in paragraph 5.1 and these may, if not remedied, allow moisture penetration into the cladding. These defects are inadequate overflow provision, the lack of slope to the top of the enclosed balustrades, the fixing of handrail supports into the top of the balustrades, the lack of a separate capping and the apparent lack of underlying saddle flashings beneath the cladding at the balustrade to wall junction.

6.16 The Authority considers that, if the faults causing, or likely to cause, moisture penetration through the cladding are remedied satisfactorily, the cladding will comply with the relevant requirements of the building code. These faults are associated with:

- The inadequate installation and inappropriate sealing of window flashings;
- The lack of adequate clearances from the finished floor level and the bottom of the cladding to paved and unpaved surfaces on walls (other than the sheltered garage/entry wall);
- The inadequate size and position of the overflow outlet to the enclosed deck;
- The possible lack of underlying effective membrane protection beneath the cladding to the top of the solid balustrade;
- The possible lack of underlying saddle flashings at the solid balustrade to wall junctions;
- The flat uncapped top to the solid balustrade with the fixing handrail supports penetrating the top; and
- The lack of sealing of the penetration of an electrical cable from the water heater.

6.17 The Authority acknowledges the territorial authority's concern in regard to the lack of control joints in the cladding. However, in line with the expert's report, the Authority is of the opinion that joints installed at 20 metres horizontally and two storeys vertically in this proprietary specific cladding system will meet the requirements of good trade practice. Experience with this product, reflected in the results of its appraisal by an independent organisation, indicates that the reinforced outer plaster layer is sufficiently strong and flexible to prevent cracking over large panel sizes. Accordingly, as the wall dimensions in this house fall short of the described limitations, the Authority finds that control joints need not be installed for the areas of wall cladding used for the house.

6.18 The Authority also notes the expert's concern that the deck is at the same level as the adjoining interior floor. The detail increases the risk of water ingress around the door threshold, but the Authority considers that a properly designed solution should be developed to ensure continuing weathertightness integrity for this junction. This should include investigation if the waterproof deck membrane is turned up under the threshold. If this and the other defects associated with the enclosed deck are remedied, the deck structure should remain weathertight.

6.19 The Authority is of the opinion that, as the cladding appears to have been largely installed according to good trade practice, the discrete faults that have been clearly identified are

capable of being rectified. In addition, although moisture is evident in the external walls, it is in two defined areas. One of these is below the flat roof that has recently been rectified and the moisture here may well be residual from the initial leakage. Accordingly, the Authority considers that these provisions adequately compensate for the lack of a drained cavity and compensating design features, and with the exception of the items outlined in 6.16, can allow the house to comply with the weathertightness and durability provisions of the building code.

6.20 The Authority recommends that the interior linings be removed at the location below the flat roof to verify if the remedial work has been effective and to allow any wet timber to dry out.

6.21 The Authority notes that when assessed against the risk matrix incorporated in the Acceptable Solution E2/AS1, two elevations of this building demonstrate a high risk rating, one elevation a medium risk rating and one elevation a low risk rating. The matrix is an assessment tool intended to be used at the time of application for consent, but must be supplemented at the time of issuing a code compliance certificate by careful inspection of the building as actually built.

7 CONCLUSION

7.1 The Authority is satisfied that the performance of the cladding has been reduced because it has not been installed according to good trade practice. In particular, it demonstrates key defects listed in paragraph 6.16, which are currently allowing water penetration into the wall framing at a number of locations. Consequently, the Authority is not satisfied that the cladding system as installed complies with clause E2.3.2 of the building code.

7.2 The Authority also finds that because the faults in this cladding occur in discrete areas, it is able to conclude that rectification of the identified faults is likely to bring the cladding into compliance with the code. Once the cladding faults, listed in paragraph 6.16, have been satisfactorily rectified this house should be able to remain weathertight and thus comply with both clause E2 and B2.

7.3 The Authority notes the importance of the owners' responsibility for ongoing maintenance to the cladding, in particular with reference to the item outlined in paragraph 6.18. The code assumes that normal maintenance necessary to ensure the durability of the cladding, is carried out and thus clause B2.3.1 of the building code requires that the cladding be subject to "normal maintenance". That term is not defined, so that the Authority takes the view that it must be given its ordinary and natural meaning in context. In other words, normal maintenance of the cladding means inspections and activities such as regular cleaning, re-painting, replacing sealants, and so on. The Authority recognises that a territorial authority does not have any statutory responsibility for the ongoing maintenance of a building. However, the maintenance programme adopted by the owner could be undertaken after consultation with the territorial authority, bearing in mind that any comments or advice provided by the territorial authority to the owner are likely to be accompanied by appropriate disclaimers.

7.4 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.

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

8 THE AUTHORITY'S DECISION

8.1 In accordance with section 20 of the Building Act 1991 the Authority hereby determines that the cladding system as installed does not comply with clause E2.3.1 of the building code and there are also a number of items to be remedied to ensure that the building remains weathertight and thus meet the durability requirement of the code. Consequently the Authority finds that the house does not comply with clause B2. Accordingly, it confirms the territorial authority's decision to refuse to issue a code compliance certificate.

8.2 The Authority finds that because the faults that have been identified with this cladding occur in discrete areas, it is able to conclude that rectification of the items outlined in paragraph 6.16 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 building being weathertight and in compliance with clauses B2 and E2, notwithstanding the lack of a ventilated cavity.

8.3 The Authority notes that the territorial authority has issued a Notice to Rectify requiring a number of items to be rectified and the installation of a ventilated cavity or alternate approved system. 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 the Authority to dictate how the defects listed in paragraph 6.16 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 Authority for another determination.

8.4 The Authority considers that the cladding on this building will require on-going maintenance to ensure its continuing code compliance.

Signed for and on behalf of the **Building Industry Authority** on 4 November 2004.

John Ryan
Chief Executive