

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

1 THE DISPUTE TO BE DETERMINED

1.1 This is a determination of a dispute referred to the Chief Executive of the Department of Building and Housing (“the Chief Executive”) under section 17 of the Building Act 1991 as amended by section 424 of the Building Act 2004 (“the Act”). The applicant is the 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 building work to an existing house that closes in an existing deck area, provides a new deck and alters adjoining building work (“the extension”).

1.2 The question to be determined is whether on reasonable grounds the monolithic cladding (“the cladding”) as installed on the extension complies with the building code (see sections 18 and 20 of the Act). By “monolithic cladding as installed” I mean the components of the system (such as the backing sheets, the flashings, the joints and the plaster and/or the coatings) as well as the way the components have been installed and work together.

1.3 This determination is made under the Building Act 1991 subject to section 424 of the Building Act 2004. That section came into force (“commenced”) on 30 November 2004, and its relevant provisions are:

“ . . . on and after the commencement of this section,—

“(a) a reference to the Authority in the Building Act 1991 must be read as a reference to the chief executive; and

“(b) the Building Act 1991 must be read with all necessary modifications to enable the chief executive to perform the functions and duties, and exercise the powers, of the Authority . . . ”

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

1.4 This determination refers to the former Authority:

(a) When quoting from documents received in the course of the determination, and

(b) When referring to determinations made by the Authority before section 424 came into force.

- 1.5 In making my decision, I have not considered any other aspects of the Building Act or the building code.
- 1.6 The extension itself is described in paragraphs 2.1 to 2.4, and paragraph 9 sets out my final decision.

2 PROCEDURE

The building

- 2.1 The extension is to an existing two-storey house, which is on a level site that is in a high wind zone in terms of NZS 3604: 1999 “Timber framed buildings”. The existing deck area of the house has been closed in at both levels and has a new roof constructed over it, and the existing carport has been enclosed to form a new garage. The new roof is constructed with a plywood base that has a metal roof covering. There are small perimeter parapet walls but no eaves projections to the roof and it is drained through an internal gutter lined with membrane. There are also other altered areas within the main building adjoining the extension. The new work is of conventional light timber frame construction and has a relatively simple shape. A new deck runs the full length of the existing deck, extends a further 3.5 metres past it and returns into a recess adjoining an existing curved glazed frame. The deck has support columns to one side at the lower level and is fixed directly to the existing structure at the other side. The upper area also has isolated columns and these are in-filled with framed and clad balustrade walls, some of which have open panels. The floor of the new deck is plywood lined and covered with membrane roofing that is formed into a purpose formed dished channel between the columns. Elsewhere, the roofing is turned up under the new or existing cladding. Terracotta tiles then overlay the roofing membrane. There are wall/roof intersections where the base of the existing cladding adjoins the new roof or deck membranes beneath it. The extension has no projecting eaves.
- 2.2 The framing in external walls is untreated kiln dried timber.
- 2.3 The new walls, columns and balustrade wall of the extension are clad with what is described as monolithic cladding. As detailed in the manufacturer’s technical data sheet, it incorporates 40 mm thick expanded polystyrene (EPS) backing sheets fixed through the building wrap face-fixed directly to the framing timbers. The backing sheets are finished with a 100% acrylic sealer coat overlain with one of three plaster options, each reinforced with fibreglass mesh. The plaster has an external 100% acrylic paint system applied to it. The manufacturer’s instructions detail the sheet joints, sheet terminations and flashings at various junctions. The jointing and finishing systems are described in detail. Both the jointing and the two-coat acrylic roughcast finished plaster systems applied to this building are one of those described in the manufacturer’s instructions. A contractor licensed by the manufacturer has applied the plaster.
- 2.4 I note that, as described by the expert appointed by the Authority, there have been the following departures from the approved drawings:
- A pergola over part of the upper deck has been deleted;
 - The roof cladding has been changed from a membrane cladding to metal roofing;
 - A door has been added to the basement level;

- Part of the deck balustrade has had openings added; and
- There are changes made to the floor plan layout.

2.5 The owner supplied copies of the manufacturer’s “Materials Components Guarantee” and a “Workmanship Guarantee” issued by the plasterer.

Sequence of events

2.6 The territorial authority issued a building consent on 29 October 2001.

2.7 The territorial authority made various inspections in the course of construction, a final inspection was carried out on 15 December 2003 and on a “Final Check List”, dated 19 December 2003, the territorial authority noted “[Named product] not on cavity system. Recommend contact [the territorial authority]”.

2.8 The territorial authority issued a Notice to Rectify dated 18 February 2004. Its accompanying “Particulars of Contravention” notice stated:

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, and ensuring all issues relating to the above are resolved.
- Lodge with Council an application for an amended building consent and provide all necessary information that may be requested to allow this consent application to proceed.

The territorial authority also detailed items that it considered not to have been installed in accordance with the building code acceptable solutions and accepted trade practices. These are set out in a subsequent analysis that is detailed in paragraph 2.9 below.

2.9 Following a request from the owners, the cladding manufacturer in a letter to the owner dated 26 February 2004, responded to the specific items raised by the territorial authority in its “Particulars of Contravention”. The owners summarised these comments and added their own responses in a document headed “Detailed analysis of Notice to Rectify”, which addressed each of the issues raised by the territorial authority in the “Particulars of Contravention” This is set out in an abridged form below:

Notice to Rectify Declarations	[Manufacturer’s] Response	Owner’s Response
<i>Items not installed per manufacturers specification</i>		
The exterior cladding system is to finish 100mm above paved surfaces or 175mm above unprotected ground. These clearances have not been achieved.	So long as [Named product] carried 50mm over bottom plate and ground level maintained then it is to manufacturers specification...	175mm above unprotected ground - will make good if required. 100mm above protected ground - the protected ground in question has a 1 m sloped fall to the pool area. The interior space (the garage) is not lined. The [Named product] is taken 100mm over bottom plate. The entire area is protected by a 2m overhang and 300mm drip edge. There is absolutely no possibility of water ingress or seepage.
A 6mm gap (horizontally) is	See [Named product]	[The territorial authority] have agreed

required between the back of the cladding and the foundation wall. This has not been achieved.	data sheet page... A 6mm gap is not required and has been applied without incident since 1984.	subsequent to Notice to Rectify being issued that this is not a manufacturer's specification.
Horizontal surfaces are to be formed with sufficient fall to prevent water from ponding. The deck barriers and parapets have flat horizontal surfaces.	A minimum 15deg slope required	The parapets were constructed with waterproof butynol lining to prevent seepage. The construction has been exposed for 2 years already. No pondage or seepage occurs. The building consent approved by [the territorial authority] clearly showed no slope...
Vertical edges are to have a drip edge formed within the cladding system. Drip edges have not been formed.	Manufacturer is not sure what issue is regarding.	There are 100mm drip edges on all vertical edges. [The territorial authority] have agreed subsequent to Notice to Rectify being issued that this is not an issue.
The cladding system is to be taken behind window timber sills.	The cladding has been installed according to specification. See [Named product] data ...	The window joinery has been installed with a drip tray. This is an added protection over and above than that shown [Named product] data sheet... The cladding is taken to the level of bottom of the drip tray and sealed...
The exterior cladding system is to be capped and finished a minimum of 40mm above the finished deck level. This clearance has not been achieved.	The purpose of the requirement is to allow the owner to clean the area effectively. A clearance of least 20mm has been achieved.	The butynol layer from the deck has been taken 150mm up the vertical surface. The [Named product] has been capped. There is an effective clearance throughout. There is a min. 40mm clearance between the waterproof layer (the butynol) and the [Named product], however the porous tile layer means that in some areas the 40mm clearance is not achieved. The deck is sloped to allow proper drainage to prevent ponding. The floor below the clearances in question (the garage) is not lined. This allows ventilation and inspection. This has lasted 2 years already without any sign of seepage. Additionally, this area is the old open deck, which all timbers have been H4 treated...
<i>Item not installed per acceptable solutions of the building code (no alternative solution applied for, other than for the cladding system approved).</i>		
The distance between the finished floor level and unprotected ground of 225mm has not been achieved.	[Named product] is an Alternative Solution and was permitted by [The territorial authority] at the time consent was issued.	We don't understand what the issue is here, and presume our comments for 1A above apply.
There appears to be some cracking around the living room window. There is some exposed polystyrene opposite the lower garage door.		There is absolutely NO CRACKING around the window in question. [The territorial authority] have accepted there is no cracking. There is a gap between the window sill and drip tray to allow any condensation from the window joinery to fall to the outside... We agree the strip of exposed polystyrene should be properly flashed.
<i>Items not installed per accepted trade practice.</i>		
The junction between	At the time the [Named	The junctions have been installed for 2

<p>the horizontal surfaces and vertical surfaces requires flashing. There are 2 junctions that have no flashing.</p>	<p>product] was installed there was no trade practice to install flashings. Manufacturer] believe[s] the junctions as installed are acceptable.</p>	<p>years and have not shown to have required flashing. Close up Photographs Band C of both junctions provided. We believe that to install flashings at this point would increase the risk of failure rather than decrease it.</p>
<p>Penetrations through the cladding system shall be as waterproof as the cladding itself. There are a number of penetrations through the cladding that should be protected with rubber flanges and silicon.</p>	<p>Silicone sealant is an acceptable solution for the penetrations a: described.</p>	<p>There are 3 penetrations for patio lights. The electrician who installed the lights protected the area with silicon. We agree the penetrations should be sealed and will ensure these are protected to everyone's satisfaction.</p>
<p>Buildings shall have claddings that are waterproof, the junction between the roof parapet over the living area and the original deck has not been flashed satisfactory to prevent water ingress.</p>	<p>This junction should have been flashed.</p>	<p>We agree this junction should be flashed.</p>
<p>Ventilated cavity system</p>		
<p>The Council has recently received information which shows that monolithic cladding systems without a 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.</p>	<p>[Named product] is an Alternative Solution that was accepted by Auckland City at the time cons was issued. [Named product] is [Named organization] appraised.</p>	<p>The renovation in question represents only approx 5% of the total surface area of the original construction. The original construction (1950) is brick and tile (approx 70% surface area) with a later renovation (1987) in [Named product] (25%)...</p> <p>The renovation is basically the closing in of an existing deck. The foundation timber of the old deck has been retained and is H4 treated timber. Treated timber has been used to complete the construction. The construction was completed during a completely dry period (we can provide confirmation from the builder and plasterer to attest to this). The new garage area created under the new living area created is unlined to allow ventilation and inspection. The structure was fully tested (over a number of weeks) after the [Named product] was installed to check water tightness before the new living area was lined. The structure has withstood 2 years of [Area] weather (including the latest wind storms in February 2004) without showing any evidence of water ingress or seepage. The structure was given building consent by [the territorial authority], and passed 3 inspections after cladding applied, before any mention of the issue of cavity was raised.</p>
<p>Variations to the building consent</p>		
<p>There have been variations to the consent plans (deck balustrade,</p>		<p>We have lodged amendments to the building consent as required. [The territorial authority] have agreed this is no</p>

lower floor joinery location, deck pergola not installed and change to profile of roof above new living area).		long an issue.
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2.10.1 The owner applied for this determination on 5 March 2004.

3 THE SUBMISSIONS

3.1 The owners made a submission in a letter dated 26 March 2004, which set out the process that they had adopted during the building process and was critical of the events that have transpired with regard to weathertightness issues. The owner went on to summarise their position as being:

[The extension] is weathertight as it stands, the renovation is only a minor proportion of the entire construction and the renovation enclosed in an existing exposed deck, which was completed with H4 treated timber. Also the cavity was not required at the time of our construction.

The owner also provided copies of:

- The plans;
- The consent documentation, and the territorial authority's checking lists;
- The Notice to Rectify;
- The manufacturer's letter of 26 February 2004;
- The "Detailed analysis" set out in paragraph 2.9;
- The cladding manufacturer's data sheets;
- The "Materials Components Guarantee" and Workmanship Guarantee" described in paragraph 2.5;
- Photographs and diagrams supporting the "Detailed Analysis"; and
- A letter from the builder, which confirmed:
 - 1) Proper materials from [the manufacturer] were used in accordance to the building code.
 - 2) An inspection was carried out prior to plastering commenced, to ensure all surfaces were dry and correct flashings to corners, windows etc were used.
 - 3) The weather conditions were dry during the whole installation of plaster surfaces.
 - 4) [Membrane] wraps were used on all exposed surfaces to prevent seepage.
 - 5) Extensive tests were carried out during and after plastering to confirm weather protection.
 - 6) As the builder on site I can confirm the standard of workmanship was of high quality.

- 3.2 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.
- 3.3 The specific comment on this house related to the risk factors perceived by the territorial authority, and inadequacies in the window and roofing membrane flashings and in the sealants to window jambs. In addition, there was a lack of a mid-floor control joint, some ground clearances were inadequate, and the textured plaster was not continuous behind the fascia boards. The specific comments reiterated some of the comments made by the territorial authority in the Notice to Rectify but were not nearly as extensive. The territorial authority also raised questions as to the registration, attendance on site and work record of the plasterer and to warranties, guarantees and maintenance relating to the cladding. The territorial authority also noted that the “paint system will shed water and be reasonably resistant to dust pick up”.
- 3.4 The general comment in the submission was, in substance, a treatise on wall moisture management. The submission was substantial but the main points may be summarised as follows:
- Face-fixed monolithic cladding has no ability to dry out in the absence of a cavity and therefore decay can occur in conditions of sustained high humidity even when there is no moisture ingress from outside;
 - Adding moisture to timber may have a negative effect on timber strength and durability and nails will have less gripping power. The territorial authority concluded that the timber used in this house was therefore unsuitable;
 - Fibre cement sheets and timber bottom plates can reach high moisture levels in the absence of any external leaks, and thus have a reduced effectiveness as bracing elements when the design calls for that function;
 - Paint systems over stucco plaster are inadequate because of the plaster’s higher alkalinity while it is drying and the consequent effect on the integrity of the finished coat; and
 - Building papers differ in the way that they allow moisture to pass through them, and that differing performance may affect the ability of monolithic walls to dry out.
- 3.5 The submission also included a set of photographs showing the areas of concern outlined in the Notice to Rectify.
- 3.6 The territorial authority felt that it must refuse to issue a code compliance certificate on the grounds that there was insufficient scientific evidence on the performance of these building elements.
- 3.7 The territorial authority in a letter to the Authority dated 11 June 2004, elaborated on its original submission, which was not fully specific as to this particular house. In this letter the territorial authority stated that their areas of concern were those itemised in the Notice to Rectify and then listed them in detail.

- 3.8 The copies of the submissions and other evidence were provided to each of the parties. The applicant forwarded a detailed response, which in the main raised issues and queries relating to the process and background of the territorial authority's consent and inspection processes. While I note the concerns raised by the owner, they are in the main not issues that can be determined by me. The owner did make a specific comment in relation to the territorial authority's supporting evidence, which was considered to contain various opinions and suppositions [on] various subjects:

To include a photo of a failed section of [Named product] from an unknown location and background is at best reckless. If [the owner] found a photo of a weather board house with rot and mould, then does this prove weather board is not suitable for house construction also?

The owner made further comments on the territorial authority's submission that can be summarised as:

- The questions raised as to the membrane, timber treatment and flashings were not mentioned in the Notice to Rectify;
- The registration of the plasterer and the warranties and guarantees were shown in documentation that had been forwarded to the territorial authority;
- The renovation did not contain any two-storey cladding;
- The ground clearance and sealing issues had been dealt with in the owner's initial submission; and
- It was the opinion of the owner that they had "a very good paint job".

The owner also noted that:

In the original approved consent there was not one specific issue raised relating to cladding: The retrospective nature of the Council's subsequent analysis is somewhat overwhelming...

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 clause E2.3.2 of the building code (First Schedule, Building Regulations 1992) is correct. Those provisions of the building code provide:

Clause E2—EXTERNAL MOISTURE

- 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 approved under section 49 of the Act that cover this cladding. The cladding is not accredited under section 59 of the Act. I am 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, which in my view remain valid in this case:

- 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 stated that the plaster coating appeared to be consistent and well applied. The exterior finish is generally of good quality and the plaster coating and painting is of a good standard. The expert also noted the following faults during the inspection:

- There is no capping over parapets or the balustrades and their horizontal surfaces do not have the required slopes;
- There is no flashing where the cladding of the parapet and the main building meet or to the internal corner of the roofing, both of which are at present only silicone sealed;
- The membrane on top of the gutter and up under the cladding is lifting and exposing the bare timber;
- No overflow is fitted to the gutter;
- There is a hole in the parapet cladding on the north-eastern corner of building;
- The sill to the timber window on the western side of building does not extend beyond the cladding and is allowing moisture to get into the building;
- The sill to the timber door on western end of the northern side of building is not properly installed and allowing moisture to get into the building;
- Two columns at either end of deck are not properly flashed where they join the deck;
- The base of the cladding of one column on north-eastern end of building is buried in the ground;
- The ground levels on the eastern side of building are too high;
- The support for the glazed section of the barrier penetrates the cladding;
- There is an unpainted head flashing over the door to the northeastern corner of the building;

- The sealant around the light fittings is not suitable; and
- Indications are that the framing timber used was treated to H1+.

5.2 The expert also used a non-invasive type moisture meter applied to the internal face of external walls to detect areas of moisture ingress. The moisture readings varied between 7.2% and 30%. Following these tests the expert removed the internal linings inside both the Lounge and Rumpus Room and observed that the framing timbers were wet and that moisture and mould were present on the surfaces of the wall lining. The screw fixings had developed rust and some mould growth was evident on the timber. The expert took a further 4 readings using an invasive moisture meter with 32 mm probes. The readings were 15.7%, 37.7%, 45 % and 61% respectively. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. While a moisture reading of less than 18% does not of itself indicate that the cladding is code compliant, it is indicative of the efficiency of the cladding in preventing moisture ingress to date.

5.3 Copies of the expert's report were provided to each of the parties. The territorial authority responded expressing general agreement with the expert's report. It also made several comments that reflected some of the issues raised in their initial submission to which we have made prior reference. The owner did not comment on the expert's report.

6 THE HEARING

6.1 The territorial authority requested a hearing, which was held before a tribunal consisting of the Determination Manager and two Referees acting for and on behalf of the Chief Executive by delegated authority under section 187(2) of the Building Act 2004. At the hearing, the owner attended, together with the cladding manufacturer, and the territorial authority was represented by two of its officers. Three staff members of the department were also in attendance. The territorial authority and the owner spoke and called evidence at the hearing, and evidence from those present enabled me to amplify or correct various matters of fact that were not adequately identified in the draft.

6.2 Both the territorial authority and the owner produced written submissions for the hearing, and elaborated on the issues raised in the written submissions by means of a "Powerpoint" presentation. I identify the territorial authority's key concerns as follows:

General observations

- While the building code itself had not changed, the knowledge available to the territorial authority and its understanding of weathertightness has.
- The extension must be sound and durable; and
- The territorial authority outlined its belief that all cladding should be constructed with a cavity, but when questioned by the tribunal, accepted that face fixed claddings will perform adequately in some low risk circumstances.

The extension in question

- The territorial authority now requires a standard of construction that is higher than that which existed when the extension received its consent. The draft determination accepts that the extension is not compliant in terms of B2 and E2;
- As the extension is in a high wind zone, is exposed to salt-laden air, lacks eaves projections, has face-fixed cladding, and has external wall framing with a low level of treatment, it is a high risk building;
- The territorial authority considered that rectification work should include establishing adequate ground clearance, amending the level parapet tops, providing adequate window sill projections, provision of junction flashings, the securing of the membrane, and provision of junction flashings. I note that notwithstanding these observations, the territorial authority still requires the removal of the existing cladding and the installation of a cavity under new cladding;
- The territorial authority is concerned about continuing performance, and if water gets through the cladding it must be able to escape before it causes structural damage;
- The building is leaking and the owner was not aware of this until the expert uncovered the leaks. Accordingly, the territorial authority recommends a cavity and the introduction of a normal maintenance programme;
- There was no reference to the outstanding items of the Notice to Rectify in the draft determination; and
- The territorial authority outlined a proposal for an “early warning” system that involves the installation of insitu moisture probes to detect moisture. However, the territorial authority did not indicate how it would use such a system if it was installed in this extension nor whether it would influence its views on whether the extension was code compliant.

6.3 The main comments made by the owner were:

- The owner accepts that the extension is in a high wind zone, but notes that the site is protected by trees apart from the north east direction;
- The expert had stated that the building work was of a high quality;
- As the support columns to the deck were formed from steel “girders” with H4 treated casing timbers, the owner considered that they were appropriately durable;
- Where the cladding was close to the paving under the deck it was well protected, there was an adequate fall away from the cladding, and as there was no lining on the inner face of the garage wall, it was fully ventilated by the space behind it. The lack of an internal lining allowed a clear indication that there was no moisture in the framing at this location;
- The owner would improve the ground clearance to other affected external areas;

- The butyl rubber membrane to the deck had a 150mm high upstand under the cladding and the manufacturer was prepared to accept the reduced clearance between the cladding and the tiles for this reason;
- The inadequate window sill projections and the door jambs and sill would be remedied;
- A metal capping and saddle flashings would be installed to the tops of the parapets;
- The staining identified by the expert at the top of a column was in fact staining off kwila deck boarding; and
- The existing flashings would not accommodate a cavity and the whole of the cladding would have to be demolished to provide a cavity.

6.4 In answer to questions put by the tribunal, the owner:

- Was willing to produce a detailed proposal on a remediation program that would address the faults outlined in this determination, and to discuss these with the territorial authority;
- Stated that approximately 20% of the clad walls were unlined on the inside; and
- Was prepared to look into the question of an “early warning” system.

6.5 In answer to questions put by the tribunal, the territorial authority:

- Was prepared to receive a detailed proposal on a remediation program that would address the faults outlined in this determination and to enter into meaningful discussions with the owner; and
- Would accept a determination that states that a cavity is not required.

6.6 In a closing submission, the territorial authority stated that it had issued the Notice to Rectify in good faith, but had heard nothing at the hearing to change its view. The territorial authority required advice, guidance and direction from the Department how to resolve the weathertightness problems existing in the extension.

6.7 In closing, the owner said that drawings would be provided for the items that are to be rectified, and that proper producer statements would be provided by the plasterer and the manufacturer. The owner proposed that all clearances between the cladding and the ground or the tiling should remain as they were.

6.8 The tribunal in its concluding remarks, and in answer to concerns raised by both the territorial authority and the owner, stated that once a determination was issued the Department could have no further input. Accordingly, it was over to the owner to propose what remedial work was to be undertaken and for the territorial authority to accept or reject it. If there was acceptance the owner should proceed with the remediation subject to the requirements of the territorial authority. However, if the territorial authority rejected the proposals, then there was an option for owner to apply for a new determination.

7 DISCUSSION

General

7.1 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 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

7.2 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.

7.3 The installation of exterior cladding to manufacturer's specifications and to accepted good trade practice is a fundamental requirement to ensure good weathertightness performance.

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

7.5 I consider that the 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 incidents;
- While most reported leaks are substantially caused by defects in the cladding that allow leaking even with little or no wind pressure differential, it is believed that houses 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 tend to 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.

7.6 Any likely penetration of moisture through the cladding can 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 consider that the drainage cavity should be not less than 20 mm deep; and
- The external wall frames 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%.

7.7 In relation to these characteristics, I find that the extension:

- Has no eaves projections and, therefore, no effective shielding of the cladding in this respect. However, the deck overhang protects the lower level cladding under it;
- Is in a high wind zone;
- Is constructed to two levels.
- Has wall/roof or deck intersections;
- Has an overall envelope that is relatively simple on plan;
- Has a deck at first floor level which finishes directly against the cladding;
- Has internal-membrane lined gutters to both the roof and deck and there is no overflow fitted to the roof gutter;
- Has no drainage cavity where the cladding is face fixed; and
- Has external walls constructed from H1+ treated timber, which provides some initial resistance to decay.

Weather-tightness performance

7.8 I find that the cladding in general appears to have been installed according to good trade practice and to the manufacturer's instructions. I agree that the list of faults listed in the Notice to Rectify and the expert's report are an accurate assessment of the condition of the cladding. As a result, there are numerous defects as set out in the expert's report and summarised in paragraph 5.1 and in the territorial authority's Notice to Rectify, which if not remedied will eventually allow the ingress of moisture behind the cladding. These are set out below:

- The lack of a capping and associated saddle flashings to the tops of the parapets or the balustrades;
- The lack of a flashing where the cladding of the parapet and the main building meet or to the internal corner of the roofing;
- The lifting membrane on top of the gutter and up under the cladding;
- The hole in the parapet cladding on the north-eastern corner of building;

- The sill to the timber window on the western side of building not extending beyond the cladding;
- The improperly installed sill to the timber door on western end of the northern side of building;
- The lack of flashings to the tops of the two columns at either end of deck where they join the deck;
- The ground levels on the eastern side of building being too high, with the exception of the area protected by the deck;
- The penetration of the cladding by the supports for the glazed section of the barrier;
- The unpainted head flashing over the door to the north-eastern corner of the building; and
- The unsuitable sealant around the light fittings.

- 7.9 I accept that the ground clearance to the cladding under the deck on the eastern side of the extension is acceptable because of the protection afforded by the deck over the cladding, the ground falls away from the cladding, and the ventilation afforded by the space behind the wall in question.
- 7.10 I have noted that the base of the cladding of one column on northeastern end of building is buried in the ground. However, taking into consideration that the column itself is a steel H member and that the cladding support timber is H4 treated, I consider that no remediation is required at this time because the column is likely to remain durable despite any ingress of water.
- 7.11 I consider that the clearance of the cladding above the deck tiling is acceptable, as the butyl rubber flashing is carried up under the cladding at this junction, and the junction is weathertight.
- 7.12 The territorial authority has raised additional concerns in its Notice to Rectify that are not listed in the cladding faults set out in this determination. I agree with the expert that these items do not warrant remediation.
- 7.13 I note that the internal gutters to the roof and deck are high-risk details. The cross sectional area of the gutter should meet requirements set out in E2/AS1, and there should be provision for overflow if a downpipe or rainwater head becomes blocked.
- 7.14 Referring to the principal points of the territorial authority's main submission (refer section 3.3 previous), I:
- (i) accept that the performance of many of the materials questioned in the territorial authority's submission has been established through successful use in practise; but
 - (ii) acknowledge that the building science surrounding such successful use is not so well known, or established; and
 - (iii) consider that, in the absence of peer reviewed scientific research evidence to the contrary, the approved use of these materials should be based on their established

performance in building work to-date in New Zealand, plus additional margins of safety to reflect known uncertainties.

Consequently, the new Acceptable Solution on timber treatment (B2/AS1) and the new Acceptable Solution on external moisture (E2/AS1), which covers weathertightness detailing, both rely on established building science as well as observed field performance of the building systems concerned and building elements within these systems, in order to establish code compliant details for local use. Both these documents have been reviewed by appropriately qualified parties with experience across the building industry, and have been subject to the public consultation process as required by Section 49 of the Act.

The territorial authority's submission effectively questions the technical basis of a number of the benchmarks for assessing likely code compliant performance of timber-framed construction in New Zealand as contained within these documents and proposes that an alternative (and more conservative) benchmark be used to assess likely Building Code compliance for monolithically-clad buildings within its jurisdiction.

- 7.15 I have carefully reviewed the general aspects of the territorial authority's submission, alongside the benchmark provision it has already established to evaluate the anticipated overall performance of monolithically clad buildings in New Zealand. I determine that the performance of building elements as now installed in this house should be based on the abovementioned code compliance benchmarks together with observations of the current state of the building, and not on the higher (albeit more conservative) performance levels suggested in the territorial authority's submission.
- 7.16 The distinction does need to be made between the reliance on comparison with benchmarks when assessing a consent application for as yet unbuilt work and the assessment of a completed work for code compliance purposes when the actual performance of the building can be established. Use of the risk matrix in this situation will also be of lesser significance.
- 7.17 In other words, I believe, based on the evidence currently available to it, that if the territorial authority's submission on the likely performance of fibre cement-based systems constructed without a cavity was soundly based, it would expect to see a far greater prevalence of failure in external walls of buildings with face-fixed monolithic claddings that were not subject to external moisture ingress than in fact has been the case. Having said that, I have noted the territorial authority's concerns and will ensure that theoretical investigations of the type referred to in the territorial authority's submission are incorporated into any future development of the Department's wide work on durability and weather-tightness.
- 7.18 I note the emphasis that the territorial authority places on the manufacturer's recommendations as a means of establishing code compliance, especially in regard to of ground clearances. However, I am of the opinion that it is the performance of the cladding elements that has to be considered, and while manufacturer's instructions are a useful guide in this respect, they are not the only measure of performance. Accordingly, I have assessed the compliance of the cladding in the overall context of performance rather than just on meeting the manufacturer's recommendations.
- 7.19 The Authority has previously issued a public warning about the dangers presented by balconies that had been affected by timber decay. The deck balustrade in this house could become unsafe and I therefore strongly recommend that the territorial authority

use the powers available to it under section 65 of the act to address any safety hazard that might be presented by the balustrade.

- 7.20 Finally, I acknowledge the concern of the owner that the territorial authority's submission is based on material supplied for the purposes of this determination by the supplier of a competing cladding system, and as such, could be seen as being compromised

8 CONCLUSION

- 8.1 I consider that the expert's report establishes that the cladding complies in most respects with the manufacturer's instructions. However, as there is evidence of external moisture entering the building, I find that the cladding on this particular building does not comply with clause E2.
- 8.2 I also find that when the cladding faults have been satisfactorily rectified this house should be able to remain weathertight and will thus comply with clause E2. It is essential that all the required items of rectification, which are detailed specifically in paragraphs 7.8 and 7.13, be competently carried out to ensure such compliance.
- 8.3 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.
- 8.4 I emphasise 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.
- 8.5 I decline to incorporate any waiver or modification of the building code in its determination.

9 THE DECISION

- 9.1 In accordance with section 20 of the Act, I determine that the house does not comply with clause E2. Accordingly, I confirm the territorial authority's decision to refuse to issue the code compliance certificate.
- 9.2 I find 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 I therefore find that once the items of non-compliance that are listed in paragraphs 7.8 and 7.13 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 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 paragraphs 7.8 and 7.13 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.
- 9.5 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 21 January 2005.

John Gardiner
Determinations Manager