Determination 2005/46

Refusal of code compliance certificates for 25 house units clustered into 6 separate buildings with "monolithic" cladding systems

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 a Body Corporate comprising the owners of 25 house units, and is referred to as "the owner". The other party is the territorial authority ("the TA"). The application arises from the refusal of the TA to issue a code compliance certificate because there is doubt whether the monolithic cladding system used to construct the units complies with the building code.

1.2 My task in this determination is to consider whether I am satisfied on reasonable grounds that the external wall cladding system as installed ("the cladding") on these units complies with the building code (see sections 18 and 20 of the Act). By "external wall cladding as installed" I mean the components of the system (such as the backing sheets, the flashings, the joints and the plaster and/or the coatings) as well as the way the components have been installed and work together.

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

> ". . .on and after the commencement of this section,—
>
> "(a) a reference to the Authority in the Building Act 1991 must be read as a reference to the chief executive; and
>
> "(b) the Building Act 1991 must be read with all necessary modifications to enable the chief executive to perform the functions and duties, and exercise the powers, of the Authority . . . "

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

1.4 This determination refers to the former Authority:

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

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

1.5 In making my decision, I have not considered any other aspects of the Act or the building code.

1.6 The house itself is described in paragraphs 2.1 to 2.7, and paragraph 8 sets out my decision.

2 PROCEDURE

The buildings

2.1 The complex is comprised of six separate buildings providing a total of 25 house units. There are six blocks of units. One is a three-storey building containing 6 units, while the other blocks are all two storeys and contain 7, 4, 4, 2, and 2 units respectively. They are located on a moderately sloping site, but the site has been reshaped by earthworks and the use of some retaining walls to provide for near level building platforms and more gentle slopes between the buildings and for driveways. The site is in a medium wind zone in terms of NZS 3604: 1999 "Timber framed buildings."

2.2 All six buildings are similarly constructed in that they each have a concrete slab ground floor and concrete masonry block for inter-tenancy walls between house units. Other walls, floors, and roofs are timber framed. Parts of the exterior end walls adjacent to two house units are made of concrete masonry block with monolithic cladding fixed over timber strapping fastened to the masonry blocks. The sections of concrete masonry block walls that extend beyond the exterior walls, and the end wall of one house unit are similarly constructed. The roofs are mostly pitched, but many have flat sections at their centres. There are also flat roofs over some balconies and canopies. All external walls continue up past the roof-line to form parapets behind which there are internal gutters. The roof cladding on the pitched roofs, including the flashings and parapet cappings, is a proprietary metal tray-section system. Claddings to the flat roofs and to the internal gutters are two different proprietary mineral fibre sheet membrane systems. There are no eaves, but some shelter is provided to entry doors by porches, and to some garage doors by cantilevered decks above.

2.3 There are cantilevered decks, but no decks constructed over habitable rooms.

2.4 The wall cladding is what is described as monolithic cladding. As specified in its technical information (the manufacturer's instructions), it incorporates proprietary 4.5 mm thick fibre-cement rigid sheets fixed through the building wrap directly to the framing timbers and finished with a three coat proprietary plaster system. The system consists of a 10 mm thick base coat of low density cement-based insulating plaster, overlaid with a 1.5 mm thick fibreglass mesh reinforced plaster, with a further 1.5 mm thick layer of finishing plaster. An acrylic paint system is then applied. The manufacturer's instructions include details for flashings at various junctions, for movement joints, and require flashings at the heads, jambs, and sills of exterior joinery units such as windows. The instructions also require all the plaster products, reinforcing mesh, and PVC flashing components to be supplied directly to the plastering contractor by the manufacturer of the system. It is not disputed that those instructions were followed.

2.5 The exterior joinery is a mix of aluminium and timber.

2.6 The specification for the house units requires the structural timber (which would include framing in the external walls) to be kiln-dried H3 treated timber. A letter from the supplier of the pre-nailed wall frames confirms LOSP H3 treated timber was used.

2.7 The specification requires the plaster contractor to provide a guarantee to make good defects in the plaster system workmanship and materials for a period of five years but a copy of such a guarantee has not been submitted to me.

Sequence of events

2.8 On the basis of a certificate from a building certifier the TA issued a building consent early in 2001.

2.9 Initial inspections were made by the certifier who passed the building work at each stage.

2.10 The TA undertook the remaining inspections from the time the certifier advised the TA that under section 57(3)(b)(i) of the Act the certifier was no longer able to continue to inspect all or any of the work.

2.11 According to a consultant engaged by the owner, the TA carried out a final inspection on 14 March 2003. At that time the TA completed its inspection checklist, on which an item "Cladding painted", was noted as a (F)ail, it was the only cladding-related matter identified.

2.12 On the 27 February 2004 the TA issued a Notice to Rectify, attached to which was a document headed "Particulars of Contravention". (see Appendix A).

2.13 The owner applied to the Authority for a determination on all 25 units on 9 April 2004.

3 THE SUBMISSIONS

3.1 The developers, who initially applied for this determination on 20 December 2003, supplied copies of:

- The plans for the building work;
- The specifications for the work;
- A bound collection of detail drawings;
- An appraisal document concerning the plaster system; and
- Detail sheets published by the plaster systems manufacture.

3.2 As the developer was not a party to the determination under the Act, the owner remade the application on 9 April 2004. That application referred to the documents already submitted by developer, but added:

- A copy of the Notice to Rectify;
- A statement pointing out that the cladding system had been approved at the time the consent was issued, and favourably appraised by an independent testing organisation in 1998; and
- Advice that a report on the cladding system and the Notice to Rectify had been commissioned by the owner. A copy of the report, dated 10 June 2004, was received by the Authority on 1 July 2004.

3.3 The TA submitted a letter, dated 15 August 2004, which affirmed its areas of concern were as stated in the Notice to Rectify issued on 8 April 2004. I believe the TA has mistaken the date on which it issued the Notice to Rectify, because it is clear from the applicant's submission that the Notice was issued on 27 February 2004. The letter reiterated the lists of items in the Particulars of Contravention issued with the Notice to Rectify on that date, and also stated:

> Recent New Zealand data and experience indicates that the impact to weathertightness problems in monolithic clad buildings can be minimised if good effective design and construction practices are followed. The installation of exterior cladding to manufacturer's specifications and to good trade practice is a fundamental requirement to ensure good weathertightness performance. However it is further excepted that deflection, drainage, drying and decay resistance are of greater importance.
> Intersecting roofs with walls have a bearing on moisture leakage as do building heights, eave widths, decks with living spaces below, low roof pitches and parapets.
>
> The council wishes to confirm that these buildings are two and three storeys in height. They have no eaves but have parapets, and attached decks (with out rooms under).
>
> Effective drainage and ventilation can address any penetration of moisture through the cladding. The cavity will allow moisture to drain out quickly and provide ventilation for drying out the framing. As walls that are not dry can allow fungi to be come established with in as little as three months.

Recent publications from both the BIA and BRANZ both support the concept from Canada that there are four basic components of an effective cladding system known as "the four D's". These in order of importance are "deflection", "drainage", "drying" and "decay resistance". In this dwelling we have limited deflection, no drainage, no drying and Council would suggest limited decay resistance.

[The TA] made submissions to the E2 working committee where Council agreed that building should be assessed on a "low Risk" "high risk" basis. Since that time some 18 months ago Council have become aware of a far greater range of issues, and would today disagree with the low risk high risk basis and would support a no or very low risk policy. In supporting this Council believe that the average homeowner does not accept and risk of living in a leaky home. Based on what we know today the only way of achieving a no or very low risk type policy, at minimal cost is by way of a cavity.

Even though not necessarily agreeing with the low-risk high-risk classification, Council have for the Authority's information used the draft Acceptable Solution E2 Weathertightness risk factors classification. (Here the submission referred to a table which showed how the TA used the draft E2/AS1 table). In using this matrix it clearly shows this dwelling would be deemed "high risk" and would require a cavity.

Council have also for the Authority's information used the recently released Acceptable Solution E2 risk severity matrix. (Here the submission referred to a completed matrix). In using this matrix it clearly shows these dwelling units, using this cladding would be to require a cavity.

3.4 The TA also commented on the report prepared by the owner's consultant, and noted:

With reference to the owner's submission, being (named consultants) report job number (given) dated 10 June 04, Council would like to make comment, and correct inaccuracies using the same numbering system as the (named consultant) report.

Clause 8(a) Data from Canada shows that eaves greater than 600mm wide manage more than 90% of rain incidents, these buildings have no deflection.

Clause 8(c) Not all the units are two storeys, of the 25 units on site 19 are two storey and the remaining six three storey. The maximum height of the three storey buildings is more like 9 metres.

Clause 8(e) Approximately 50% of all claims through the weathertight homes resolution service have decks, and attribute leaks to this area. Decks are high risk.

Clause 8(f) The system, including (proprietary backing sheet), has not been installed per the manufacturers specifications. For example within the (propretary plaster product) manual is the follow. "…The New Zealand building code sets clearances at an absolute minimum of 150mm when ground has been paved, 255mm when the ground is unpaved. Failure to maintain these minimum clearances will result in rotten timber floors and framing with consequential damage to finishings and furnishings"(failure to comply with (proprietary backing sheet) specification is covered below)

Clause 9(a) The requirement for a 6mm gap is from (proprietary backing sheet manufacturer) Manual page 13 fig 16.

Clause 9(b) unclear what the applicant is referring to.

Clause 9(c) The detail referred to does not appear in the documentation supplied with this application, so therefore I am unclear what it exactly looks like. The clearance between the bottom of the sheets and ground is there for among the other things maintenance reasons, in that this edge needs to be repainted at regular intervals to prevent wicking. Furthermore the comment that the certifier (named organisation) would have approved

this alternative is of concern to council. (Named organisation) at the time were not able to approve alternative solutions to E2/AS1. It therefore is Councils responsibility to approve or decline an application for use of an alternative to E2/AS1. In this case no application was received for an alternative and none granted.

Clause 9(d) The requirement is for a gap. Anything else is an alternative solution, which is covered in 9(c) above.

Clause 9(e) For moisture to only be likely to drip out is not sufficient. Cracks will allow moisture in and with out a ventilated cavity, will create problems.

Clause 9(f) The requirement for two outlets comes from the current E2/AS1 page 44 clause 5.5.1 internal gutters.

The items above and the sciences attached of Councils submission provide doubts that compliance with the Building Code can be achieved. Council therefore asks, in accordance with Section 43 of the Building Act how can it be satisfied on reasonable grounds of compliance, with the weight of evidence saying otherwise.

The TA included in its submission completed risk assessment matrices (as described in the new E2/AS1 document) for the 2 and 3 storey buildings in the complex. That assessment indicated a high risk for all faces of the buildings.

3.5 Copies of the submissions and other evidence were provided to each of the parties. Neither party made any further submissions in response to the submission of the other.

4 THE RELEVANT PROVISIONS OF THE BUILDING CODE

4.1 The dispute for determination is whether the TA's decision to refuse to issue a code compliance certificate because it was not satisfied that the cladding complied with clauses B 2.3.1 and E2.3.2 of the building code (First Schedule, Building Regulations 1992) is correct. Those provisions of the building code provide:

Clause B2—DURABILITY

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

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

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

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

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

(b) 15 years if:

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

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

Clause E2—EXTERNAL MOISTURE

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

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

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

4.2 There are no Acceptable Solutions that have been approved under section 49 of the Act that cover this cladding. The cladding is not accredited under section 59 of the Act. I am therefore of the opinion that the cladding system as installed can be considered to be an alternative solution.

4.3 In several previous determinations, the Authority made the following general observations, which in my view remains valid in this case, about acceptable solutions and alternative solutions.

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

- Usually, 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

General

5.1 The Authority commissioned an independent expert ("the expert") to inspect and report on the cladding on the 25 units. In his report the expert used the numbering system handwritten on the plans attached to his report. The expert numbered each house unit individually and assigned a number from 1 to 6 to each of the blocks of units. Thereafter his report referred to a particular unit or block of units by those assigned numbers.

5.2 The expert conducted a visual interior inspection of most (21) of the units as well as the external walls and selected parts of the roofs of all but one of the blocks of units, which was three stories high and not safely accessible by ladder.

5.3 The expert reported that there were no visual signs of rainwater leaks in any of the units inspected. Those owners/tenants who happened to be home when the expert called confirmed, when asked, that they were unaware of any leaks inside their houses, apart from one instance where wind-blown rain entered under a front door in adverse weather. In three units the expert noticed serious plumbing leaks in the ground floors and informed the occupants. The expert commented that the plumbing leaks had probably caused extensive wetting and damage to internal walls.

5.4 The expert commented that the drawings and wall thicknesses actually observed on site were somewhat confusing. For example, he noted that a number of sectional drawings specified *"(Proprietary) cladding system on 4.5mm (Proprietary backing sheet) over building paper over ex 25 x 45 mm timber strapping*" on a number of both timber-framed and concrete masonry walls (which would suggest a cavity system). On other similar walls there is no such reference to the timber strapping. On the detailed drawings of these walls (e.g. DD-D03) no strapping is drawn. The framing on the plans is detailed as being "*100 x 50 mm*" whereas some walls are thicker than this. However, at the lower edges of the wall cladding there were no signs of strapping being used, even on the concrete masonry walls, unless the concrete masonry walls were set back from the face of the foundation walls/edge of floor slab by the thickness of the strapping. The expert surmised that the timber-framed walls had not been strapped and had either 150 x 50 mm framing or 100 x 50 mm framing. The concrete masonry walls had probably been strapped but are set-back at their bottom edge.

5.5 The expert noted that the manufacturer's recommendation for movement control joints, in the horizontal plane, was for such joints to be installed at maximum spacings of 20 metres. In these buildings the maximum unbroken horizontal length of wall is about 18 metres. The manufacturer's recommendations for control joints in the vertical plane were that they be installed at a maximum vertical spacing of two storeys. Only one building, three storeys in height, requires a horizontal control joint. The drawings and specifications clearly indicate that such joints should be installed to the manufacturers recommendation. I note that neither the expert nor the TA suggests that the joints were not installed. An appraisal of the cladding by an independent organisation, which included observations of its performance in use, indicated that the reinforced outer plaster layer is sufficiently strong and flexible to prevent cracking over large panel sizes. Accordingly, as the wall length dimensions in these buildings fall short of the prescribed limitations, and appropriate control joints have been installed in the only building to exceed two storeys in height, I am satisfied that adequate control joints have been installed in these buildings.

5.6 The expert found that the external walls and roof claddings had in some respects been installed to the design details and the manufacturer's instructions. However, he reported a number of significant variations from the design details and manufacturer's instructions, which affected the weathertightness of the house units. Those variations are paraphrased as follows:

- The fixing of the joints in the parapet cappings are not as designed and do not appear to allow for thermal expansion and contraction. One set of rivets in such a joint (roof of Unit 9) was seen to have sheared, which the expert considered might have been the result of thermal expansion. The expert could not see if the specified pairs of sealant beads had been applied at those joints.

    - A combination of no provision for thermal movement and missing sealant beads would put those joints at risk of leaking; and

- The inter-tenancy wing walls separating the partially enclosed balconies between Units 1 to 6 and 24 and 25 have the cladding taken down to the level of the tiled surface of the balcony decks.

- The expert considered that this detail presents a risk of water entry; and

- The canopy roofs on one side of Block 1 have been built differently to the designer's details. The fascia detail is different, there is a drainage channel formed in the roof and the wall cladding comes down closer to the roofing surface.

  - The expert sees the points of risk with these changes as being the junctions between the ends of the fascia cappings and the walls, and the relatively small clearance at the underside of the wall cladding;

- Contrary to the design, no drip edges have been formed at the outer edges where the wall cladding returns under door heads, balconies, and porches. Also, where the cladding is so returned, the junction of the cladding with the soffit of door heads has not been constructed and sealed as detailed by the designer.

  - The expert noted that the risk that water will track back to unprotected joints at the edge of the cladding; and

- The wall cladding of the entrance porches to the front doors has been taken down below the level of the tiled paving. The expert said the cladding appeared to have been installed first and then the tiles laid on a levelling screed against the cladding, without a waterproofing membrane to the slab rebate and behind the cladding as intended by the designer.

  - The expert saw the risk as being that the porches could get wet in driving rain and water will track up behind the bottom edges of the cladding through capillary action; and

- The sills of the bi-folding doors at the ground floors of the units were not constructed according to the design detail. The intended metal sill flashing and packer have been replaced with a plastered fillet.

  - The expert considered there was a risk that water can get behind and under the plaster and could reach exposed wall and packing timbers; and

- The bottom edge of the wall cladding on all the buildings has generally been stopped 50 mm below the level of the ground floor with the plaster stopping at the outer edge of the uPVC bead, and backing sheets hard against the edge of the floor in most instances. The expert observed that the construction was in accord with one of the plaster system manufacturer's details but not with what the designer had detailed. I disagree with the expert on this point because the designer's detail drawing DD-D03 appears to replicate the manufacturer's detail.

  - The expert said there was a risk that water will track up behind the bottom edges of the cladding through capillary action; and

- The finished surfaces around the perimeters of the buildings are a mix of grass, bare earth, gardens, stones and paving slabs. In a number of places these surfaces are above the bottom edge of the wall claddings, and thus within 50 mm of the floor level. In other locations the surfaces are 25 to 100 mm below the bottom edge of the cladding (and thus 75 to 150 mm below the floor level) and in the remaining places they are more than 100 mm below. The designer specified a minimum of 225 mm on all drawings and sections, except for paths to entranceways.

    - The expert said there was a risk of water tracking up behind the bottom edges of the cladding through capillary action when the clearance between the finished ground surface and the bottom edge of the wall cladding was too small; and

- Where the concrete masonry garden and retaining walls abut the buildings' walls, the plaster is continuous in places and not built as shown in the designer's detail. In some cases the masonry walls have moved and broken the plaster of the claddings of the houses with resulting visible cracks.

    - The expert said there was a risk that water could enter the cracks and make its way behind the wall claddings of the buildings.

5.7 The expert then commented on each block of house units.

5.8 On Block 1 the expert observed cracks in the plaster at one corner at the top of the ground storey, at the bottom of a column to the first floor balcony, at the junction with the garden wall at one corner, and at one corner of the first floor balcony to Unit 6. The expert noticed "whitish and brownish stains" on the fascias of the partially enclosed balconies on one side of the building. The whitish stains came from around the junction between the aluminium bottom rail of the balustrade glazing where it sits on top of the metal sill flashing. The brownish stains started at the lower edge of the sill flashing. The expert could find no sign of the staining on the cladding behind the flashings. After discussion with the owners, the expert concluded that the staining was historical and occurred for the first time after remedial work was done to the balconies after a fire in Unit 25. In the expert's opinion the brown staining did not appear to be a result of water leaks draining out from behind the flashings.

5.9 On Block 2 the expert observed the plaster was cracked at the upper storey junction between Units 11 and 12. There was an unpainted repair to the plaster on one corner of Unit 8, just below the parapet.

5.10 On Block 3 there is a section of wall cladding on one side of the garage door to Unit 15 that does not extend much below the bottom plate, but the expert observed there is adequate ground clearance.

5.11 On Block 4 there were unpainted repairs to the plaster at the jambs of two windows.

5.12 On Block 6 there were unpainted repairs to the plaster at the sill of the bi-folding doors on one side of Unit 25 (the unit that had been rebuilt after a fire). On this Block the new cappings to the parapets had been fitted over the top of some of the original

cappings. At a corner to the garage to Unit 25 the wall cladding was incomplete behind the end of the concrete driveway kerb. The kerb had been cast up against the cladding of the original house (and out of line with the design) and that when the house was rebuilt the kerb has not been cut back to allow the cladding to be completed. That left the styrene screeds and backing sheet exposed.

5.13 The expert acknowledged that he has not inspected all the walls for cracking.

5.14 The expert observed that the ends of a number of sill flashings had had a white sealant bead applied since the buildings were painted.

5.15 Although the expert did not check the sealing of the penetrations for wiring and fixings by removing fittings such as bulkhead lights and security alarms, some loose fitting and poorly sealed tap fittings, as well as unsealed holes for an earth wire and a gas pipe in Block 6 were observed.

5.16 At one corner of Block 6 there was also a wet stain spreading from the bottom edge of the wall-floor junction and draining to a hole in the paving. The expert did not conduct invasive testing at this location because of the presence of wiring and piping that might be damaged by such testing. It is therefore not clear whether the moisture is related to water entry through the cladding or a plumbing fault. I note that Units 13, 17, and 25 were found by the expert to have had serious plumbing leaks. Further investigation is obviously needed to establish the source of the observed moisture.

Moisture investigation

5.17 The expert carried out a systematic search for possible moisture entry points, by using a non-invasive moisture meter to detect areas that should be further investigated using an invasive moisture meter with probes. The expert commented that because of rain before and during much of the period of the investigation there was only a limited time when the walls were dry to check for moisture using the non-invasive moisture meter.

5.18 The selected locations for the initial non-invasive investigation included:

- Beneath joints in parapet cappings. No excess moisture was detected.
- Beneath the ends of parapet cappings where they abut walls. Excess moisture was detected at some locations and invasive moisture measurements taken at one location.
- Beneath fixings through the walls. An increase in moisture was detected at some of the bolt fixings of the balustrades to the 'Juliet' balconies.
- At cracks in the plaster. Excess moisture was detected at some locations and invasive moisture measurements taken at one location.
- Beneath the jamb of the lounge window in the 1st floor of Unit 3. No excess moisture was detected.

- At the jamb/sill junctions of windows. An increase in moisture was detected at some locations and invasive moisture measurements taken at one location.
- Beneath joints in flashings. Excess moisture was detected at some locations and invasive moisture measurements taken at one location.
- Beneath the ends of flashings. Excess moisture was detected at a few locations and invasive moisture measurements taken at two locations.
- Beneath penetrations through the walls. An increase in moisture was detected at a few locations.
- At the soffits of the partially enclosed balconies. Excess moisture was detected at a few locations and invasive moisture measurements taken at one location. Drilling of the soffits failed to locate framing timbers as detailed on the plans, but the moisture meter suggested moisture in the fibre cement and plasterboard soffit linings.
- The lower edges of walls where they meet paving in the balconies and porches. Excess moisture was detected at most locations, particularly towards the outer edges of the balconies and porches, and invasive moisture measurements taken at one location.
- At the lower edges of walls at the edges of ground floor slabs. Excess moisture was detected at many locations and invasive moisture measurements taken at nine locations.

Not all of these locations were checked on every building, nor were all such locations on each building checked.

5.19 Where the non-invasive measurements indicated high levels of moisture in or behind the claddings the expert drilled holes through to the timber framing and measured the moisture contents. The following are the locations and moisture meter readings. *

Block 1:

Bottom plate, 1st floor lounge window, Unit 1	13%
Bottom of column, 1st floor balcony, Unit 1	28%
North end of flashing, 1st floor balcony, Unit 1	28%
South end of flashing, 1st floor balcony, Unit 6	34%
Joint in flashing, beneath 1st floor doorsill, Unit 6	34%
Bottom plate, wing wall between balconies, Units 5 & 6	22%

The expert observed a crack at bottom of the column, 1st floor balcony, Unit 1. The expert surmised it could have been a result of the timber column swelling when it became wet. The detail beneath the cladding to the column was unusual and not a continuation of proprietary brand plaster. It appeared to be coated timber.

[*] * The expert stated that the meter readings had not been corrected for timber temperature, species or treatment. If the framing timbers were LOSP treated Radiata pine sapwood at 15 QC, as appears possible, then according to BRANZ Bulletin No. 424 (which is based on information from the Forest Research Institute), the actual moisture contents could be 4 to 5 % higher than these readings.

When the flashing joint beneath 1st floor doorsill, Unit 6 was prised open to check for sealing and amount of overlap, water flowed out.

Block 2:

Bottom plate, SE wall Unit 7, East corner	24.5%
Bottom plate, SE wall Unit 7, West corner	17%
Bottom plates, N side of bi-folding doors, NE side, ground floor, Unit 7	28%
Bottom plates, N side of bi-folding doors, NE side, ground floor, Unit 10	28%

The expert reported that the three measurements taken in Unit 7 were through holes previously drilled for similar invasive testing by an unknown person.

There were holes at the ends of the sills of all such doors on this and other blocks with similar doors and into which rainwater could go and apparently lie beneath the ends of the bottom plates.

***Block 3*:**

Bottom plate, S side of garage door, SW side, Unit 17	23%
Bottom plate, S side of garage door, SW side, Unit 14	35%
Wall stud 350 mm below end of capping to entrance canopy, Unit 17	22.5%
Bottom end of trimming stud, southern side of garage door, Unit 16	17%
Jamb/sill junction window, end of sill trimmer, NW wall, Unit 14	14%
Jamb/sill junction window, trimming stud, NW wall, Unit 14	14%

At the bottom end of the trimming stud, on the Southern side of the garage door, Unit 16, the bottom plate could not be accessed for drilling from the outside. The expert suggested it could be wetter than the stud based on the non-invasive reading.

Block 4:

Bottom plate, southern side of garage door, SW side, Unit 21	21%
Bottom end of trimming stud, southern side of garage door, Unit 18	26%

At the last location the bottom plate could not be accessed for drilling from the outside. The expert considered it could be wetter than the stud, based on the non-invasive reading.

***Block 5*:**

Beneath end of flashing beneath Juliet balcony, SW side, Unit 23	13%

***Block 6*:**

Bottom plate, SW corner of SE wall, ground floor, Unit 24	27%
Bottom plate, S side of bi-folding doors, SW side, ground floor, Unit 25	21%

The expert failed to locate timber at South East face of balcony, Unit 24 where the non-invasive meter indicated moisture in or behind the cladding.

5.20 The expert commented that these readings, even without the possible upwards adjustment to allow for timber temperature, species and treatment, when taken in conjunction with non-invasive readings, indicated that moisture had penetrated to the timbers of all buildings in a number of places. A possible exception is Block 5 where the bottom plate was not invasively tested). A much more extensive programme of

testing and destructive investigations will be needed to determine all of the locations of moisture entry and their causes and to identify an appropriate remediation strategy. The holes drilled through the claddings were sealed with a sealant and will require a permanent repair.

Flashings

5.21 The expert observed that there are metal flashings fitted:

- At the sills of upper storey doors
- Behind the bolted steel frames supporting balconies and cantilevered canopies,
- At the outer edges of the partially enclosed balconies beneath the glazed balustrades.

The expert stated there are defects in some of these flashings. The first is that at their ends they did not all have up-stands to prevent water runoff behind the wall cladding, relying instead on poorly applied beads of sealant. The second defect is that a number are joined and the joints have minimum overlap (25 mm measured in two cases) and are not sealed. As the invasive moisture testing showed in three locations, water is getting into and behind the claddings at such details. A third defect is that the wall cladding system has been taken hard down to the surface of a number of flashings.

Parapets and roofs

5.22 The expert's inspection of the roofs indicated there was little untoward. Most roofs had at least two scupper outlets to rain heads servicing each internal gutter, the exception being the roofs to the two units in Block 6 where each internal gutter had one scupper and a 50 mm diameter PVC overflow pipe had been fitted through the parapet.

5.23 The expert noted that the flat canopy roofs on the South-West side of Block 1, and the flat roofs over the entrance porches to Units 14 and 17 in Block 3, each had only one rain water outlet, without provision for an overflow. The flat roof to the balconies on Block 6 had two rainwater outlets. The expert did not observe the number of rainwater outlets to the flat roofs of the balconies to Block 1, or the number of outlets to the portions of flat roofs at the top of each pitched roof.

5.24 The expert reported that the metal cappings to the parapets appeared to have all been fitted after the wall claddings had been plastered. They have all been fitted without any saddle flashings where they abut walls. In some instances there is a sealant bead between the end of the capping and the wall cladding, and in other cases there is a gap. In all instances observed the membrane lining to the internal gutter behind the parapet did go up behind the wall cladding and also onto the top of the parapet. However, the detail often left a gap behind the top edge of the wall cladding at the end of the capping where water can freely enter and this was confirmed on Unit 17.

5.25 The expert noted that where parapet cappings met the roof claddings there were some places where the flashing from under the roofing lapped under the capping and had a

thin sealant bead at the joint, rather than the flashing lapping on top of the capping. This is a weathertightness weakness.

Windows and doors

5.26 All windows and doors were fitted with head flashings, and the lower ends of uPVC jamb flashings were visible at many doors. The head flashing to the French Doors to the upper storey balcony on the SE side of Unit 7 was seen to be loose and had dropped away from the cladding (photo 23). This head detail was seen to be different from that detailed by the designer (refer to DD-F01), but there were no indications of water entry around the head flashing.

5.27 On Block 1 some of the walls are thicker (with 150 x 50 mm framing the expert suggested) with windows that are recessed 95 mm back from the face of the wall cladding. At the jamb/sill junction of the first floor lounge to Unit 3 the plaster was removed to check for the presence of the specified uPVC flashings (refer to the (proprietary plaster product) Detail Sheet Page 3 and the designer's detail sheet DD-F06). Jamb and sill flashings were in place but they only extended out 55 mm from the face of the window frame rather than extending out to the face of the cladding, and at the sill down the face a distance. Beyond the edges of the flashings there was only polystyrene beneath the reinforced plaster. There were no indications that this detail was allowing water to enter. The expert did not check the similar details at other walls where 100 x 50 mm framing had been used. The area of removed plaster was temporarily sealed with sealant and will need a more permanent repair.

5.28 As identified in paragraph 5.5 (bullet point 6) above, the sill detail of the bi-folding doors is different from the design and appears to allow water to an area immediately under the bottom plates of the adjacent timber framed walls. The expert also could not confirm whether these doors have been fixed to the "H3 timber packer" shown in DD-F19. If this packer is in place then the expert thought it too is probably able to get wet.

Juliet Balconies

5.29 The connection of the cantilevered steel-framed balconies appears to have been done similar to the design. While an upturn was confirmed at the embedded end of the flashing under and behind the junction of the balcony to the house, the cladding has also been taken hard down to the flashings.

5.30 The metal balustrades to these balconies have been bolted to the walls through metal tubes (refer detail DD-MOl). In addition metal washers have been fitted over the tubes and sealed to the cladding, presumably in an attempt to improve the sealing and protection of the tube-to-cladding seal. In a number of instances the washers were loose and the sealing of the tube to the cladding appeared to be incomplete. In one case the fixing/tube was seen to be sloping downwards creating an additional risk of leaking. The non-invasive moisture meter indicated that there was probably some moisture in or behind the cladding at some of these fixings.

Partially enclosed balconies (Blocks 1 & 6)

5.31 Apart from the previously mentioned issues with the claddings meeting the tiled surfaces and with the flashings, these balconies have not been fitted with any overflows. The design of the fixing of the glazed balustrades (refer to DD-MO5) shows fixings going down through the waterproofing membrane, and shows a path whereby water can drain from the outer edge of the waterproofing membrane and down behind the wall cladding of the fascia to the balconies.

Continuity of cladding system

5.32 The wall cladding system was continuous behind down pipes and plumbing and the like.

Drainage, ground/surface clearances and cladding overlap details

5.33 The expert's general observation was that the paving of the driveways has in many instances been placed at levels that are too high relative to the ground floors. Also, a number of storm water drains have been placed too high. Another complication is the design of the paved and stoned approaches to the porches (DD-AI7) and which have been laid approximately as designed, but seemingly without weed mats and free-draining stones. The net effect of all these details is that there are wet surfaces close to the bottom edges of the wall claddings and not far below floor levels.

5.34 Because of the rain during the investigations, the expert was also able observe the flow and ponding of surface water. Even though there was little wind with the rain, the surfaces of the tiled floors to the front entrances and to the partially enclosed decks were wet half way back to the doors and the expert said it is reasonably clear that the entire surfaces back to at least the door thresholds would be wet in driving rain.

5.35 At some garages the drives sloped towards the doors and where there were no cut-off drains the water was ponding against the small (20 mm high) rebates in the edge of the concrete floors. This brought the water level to less than 20 mm below the underside of the bottom plates at the sides of the doors.

5.36 On the SE side of Unit 24 water had ponded against the garden and was close to the bottom edge of the wall cladding.

5.37 On the SE side of Unit 25 the concrete slopes down to the edge of the floor slab with a storm water drain 150 mm out from the edge of the slab. The top surface of the water was less than 20 mm below the bottom edge of the cladding.

5.38 The high levels of ground/paved/tiled surfaces relative to the bottom edges of the wall claddings, and the lack of an effective anti-capillary gap and seal behind the lower edges of the wall cladding and the edges of the floor slab, were, in the opinion of the expert, most probably the reasons for the excess moisture measured in the bottom plates.

Manufacturer's instructions

5.39 The only item the expert commented on with respect to manufacturer's instructions was the question of an anti-capillary gap behind the lower edge of the wall cladding. The relevant detail on page 5 of (proprietary product) Detail Sheets does not show a gap. The designer's detail (DD-D03) also does not show a gap, instead it shows the cladding being continuous with a form of anti-capillary detail with a uPVC moulding and styrene former 50 mm below the floor slab. In the expert's view this detail may not prevent moisture diffusing through the concrete/masonry edge of the floor to the back face of the (proprietary rigid backing product).

5.40 The (proprietary plaster product) Technical Data Sheet under the section headed "Fixing the Fibre-Cement Sheets" says the sheets should be fixed in accordance with "the specification for the chosen fibre cement substrate".

5.41 The Technical Information for the rigid backing sheet states that it is intended for use behind "Solid Plaster Exterior Cladding" and that "An approved plastering system is to be applied which is either proprietary or in accordance with NZS 4251". That information also implies in the section headed "Framing" that the timber framing must be built in accordance with NZS 3604:1990 (the version in effect when the information was published). NZS 3604: 1990 in Figure 4.17 states with regard to the fixing of bottom plates, "On an external wall project plate over edge of wall by 6 mm min. to prevent water being drawn up behind cladding by capillary action".

The Expert's Comments on the Notice to Rectify

5.42 The expert commented on the Notice to Rectify issued by the TA, in the light of his findings after examining the building. The Notice to Rectify contained a number of issues 'dot-pointed' under five headings. The headings numbered 1 to 5 and their related 'dot points' are repeated in italics below followed by the expert's comment on each.

1. The following items have not been installed per the manufactures (sic) specifications:

The junction between the bottom edge of the joinery and the cladding system should be left open (6mm). There are places were this gap has been sealed.

Comment: The (proprietary plaster product) Detail Sheet Page 3 (refer to Appendix 4) does not specify a clearance for recessed joinery but it does show one and specifies a 6 mm gap for face-fixed joinery (Page 2). It is possible that this dimension was inadvertently omitted from Page 3. Most of the gaps at the buildings are less than 6 mm, and a few are sealed. In my experience the presence of this gap is only critical if there are air seals fitted between the joinery and the timber framing. If there are no air seals then these gaps can sometimes leak in very strong winds with rain. While air seals are shown on the designer's detail at a window head they are not shown in the details for jambs and sills. I did not check that they had been fitted. There were no indications that the lack of 6 mm gaps was resulting in any water entry.

Clearance is required between the claddings and flashings. There is no clearance between the wall claddings and horizontal flashings.

Comment: Agreed. This comment mainly relates to the flashings at the sills of upper storey doors opening out onto the open 'Juliet' balconies. The (proprietary product)

Detail Sheets do not cover this point so it is left to 'good practice' that would achieve weathertightness. It is usual to provide a clearance at the bottom edge of claddings (typically at least 30 mm, but it does vary between proprietors) with an anti-capillary gap behind (and sometimes a seal as well).

The bottom edge of the (proprietary rigid backing sheet) is to overlap the bottom plate by a minimum 50mm and finish a minimum 100mm above paving or 175mm above unprotected ground The claddings continue below ground level.

Comment: Generally agree. While there are places where the clearances have been achieved (e.g. the NW ends of all blocks), there are many places where they haven't, and a number of places where the finished surfaces are above the bottom edge of the cladding. I believe that the high ground/paving levels relative to floor levels, coupled with the lack of an effective seal and anti-capillary gap behind the bottom edge of the (proprietary rigid backing sheet), are the most likely reasons for the excess moisture found in the bottom plates.

Plaster to be capped (finished) a minimum 40mm above terraces. These clearances have not been met.

Comment: Agreed. This comment relates to the tiled ground floor entrance porches to the front doors of all Units, and to the tiled partially enclosed balconies to Blocks 1 and 6. This detail is similar to that regarding horizontal flashings above.

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

Comment: This appears not to be true in part in that the (proprietary plaster system) on (proprietary rigid backing sheet) wall cladding system was detailed in the application for the Building Consent (in effect as an 'Alternative Solution'), and the front porch tiling and adjacent paved/stoned pathway details showing the high finished levels were in the drawings (I am assuming that the designer's details DD-AI7, DD-CO2 & DD-DO3 were included in the application for the Building Consent).

The minimum distance from finished floor level to ground levels for solid plaster claddings are: 150mm paved areas and 225mm to unpaved areas. These clearances have not been achieved

Comment: Refer to previous related comments.

Buildings shall have claddings that are weatherproof. There are some small cracks and penetrations that have not been sealed There is a bad crack in the exterior cladding at first floor level above the front door to unit one, and the wrought iron barrier/wall junction is not likely to prevent water egress. Furthermore, beneath the small timber decks, some wall cladding material has been left unfinished.

Comment: Generally agreed. The reasons for the cracks will need investigating as they may have been caused by moisture ingress (e.g. Unit 1 wall and column) or settlement (e.g. abutting garden walls). The 'wrought iron barrier/wall' fixings do need to be effectively sealed. It appeared to me that there had been recent repairs with sealant, plaster and paint to some cracks and to the areas under the timber decks ('Juliet' balconies).

Two outlets are required to gutters and decks. There are sealed decks and roofs with only one outlet.

Comment: Agreed. This comment most probably only relates to the flat roofs of the canopies on the SW side of Block 1, to the flat roofs over the entrance porches of Units 14 & 17, and to the partially enclosed balconies of Blocks 1 & 6.

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

At the junction between horizontal surfaces (i.e. foundation walls and parapets) and a vertical surface (i.e. wall claddings) flashing are required Flashings have not been installed at these junctions

Comment: Agreed. I do not understand the reference to "foundation walls", but the reference to parapets meeting a wall surface is correct. This relates to the metal parapet cappings, which abut walls without saddle flashings or other effective means of sealing the junctions.

A minimum clearance of 50mm is required between the cladding and adjacent surfaces. There is no clearance between the wall claddings and horizontal flashings.

Comment: Covered previously

Penetrations through the cladding system shall be as waterproof as the cladding itself. There are a number of penetrations through the cladding (ie light fittings) that should be protected with rubber flanges and silicon (sic), and flashings are required around openings. (i.e. extractor fan outlets and meter boxes).

Comment: While the comment is correct in principle, I only observed a few unsealed penetrations as previously noted. I did not remove any other fittings to check for effective sealing.

A 6mm gap (horizontally) is required between the foundation wall and cladding. This has not been achieved.

Comment: Agreed. The (proprietary rigid backing sheet) being in contact with the face of the concrete masonry foundation wall forming the edge of the floor slab, apart from not providing an anti-capillary gap, could be absorbing moisture from the masonry and transferring it to the bottom plates.

Drip edges or weathergroove are required to be formed at the junction of soffits and wall claddings. These have not been formed.

Comment: Drip edges are detailed on the drawings but have not been formed. While the lack of drip edges is not good practice, I could not find any signs that this was resulting in any water entry at this time.

4. Ventilated cavity system

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.

The Council cannot be satisfied that the cladding system as installed on the above building meets the Functional Requirement of Clause E2 External Moisture of the Building Code, which states:

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

Accordingly the above works do not comply with the requirements of Clause E2.3.5 and £2.3.6 *of the New Zealand Building Code* 1992 *(the "Code*").

Comment: I found no evidence that the cladding system of plaster over (proprietary

rigid backing sheet) was allowing moisture to penetrate. All areas of walls away from the edges of the cladding or penetrations were indicated as being dry using a non-invasive moisture meter. I believe that all of the moisture detected behind the cladding system was as a result of poor construction at such edges/penetrations.

5. Unit Six

The above unit has not been built in accordance with the building consent, in that the ground floor layout is not per a current building consent, and furthermore, this area is being used as a shop, for the sale of furniture. This is an alteration to an existing building, under section 38 *of the Building Act, and furthermore is a change of use under section* 46 *of the Building Act.*

Comment: This item is outside my brief for this report. I did note though that the floor layout with the section of inter-tenancy wall removed is shown on the floor plans and the area is labelled as 'showroom' on sheet WD-51.

Summary

5.43 The expert made the following statement in summarising the investigations:

My investigations have revealed that water has penetrated behind the claddings of at least five, and possible all six, buildings in this complex, to varying extents. A much more extensive investigation will be needed to identify all the places that water has leaked into all of these buildings, the reasons for those leaks and the appropriate remedial work needed.

There are many details on these buildings that have been built differently to the design details. Some of the variations appear to be weathertight while others have failed or are at risk of failing.

While there are a number of individual faulty items of varying importance identified in this report, the more significant defects are:

- The ground and paving levels around many parts of the perimeters of these buildings are too high relative to floor/wall cladding levels and as a result excess moisture has reached the bottom plates in Blocks 2, 3 4 & 6, and most probably also Blocks 1 and 5.
- The wall cladding in the entrance porches and to the wing walls between balconies is too low relative to the tiled floor surfaces. As a result excess moisture has reached the bottom plate at the first floor level in Block 1, Unit 6 and most probably has also reached the bottom plates in the upper floors of some other Units in Blocks 1 and 6.
- The detail at the sills of the bi-folding doors appears to be allowing water to accumulate and be absorbed into the bottom plates either side of the openings. If timber packers exist beneath these doors as detailed, then these too will be at risk.
- Some of the fixings of the metal balustrades of the Juliet balconies to the walls are improperly installed/sealed.
- The cappings to parapets and fascias do not have saddle flashings where they abut walls.
- All of the partially enclosed balconies and a few of the flat roofs do not have over flows.

5.44 Copies of the expert's report were provided to each of the parties. The TA made no comment but the owner did make comments and included with its response was a separate response from the owner's consultant. In general terms the owner:

- Emphasised its willingness to direct the completion of all remedial work that I might determine were necessary and explained that it had held back from such work until "the major issue in relation to the ventilated cavity is resolved."
- Included views supplied by the architects of the buildings, relating in particular to the use of a detail recommended by the plaster system manufacturer and approved by an independent appraisal organisation. The owner and its architect expressed the view that the expert's concerns about the finishing of the plaster system close to or below the finished ground surface should be allayed by the fact that the particular detail had been used.
- Generally agreed to remedy those matters where weathertightness had been compromised because what had been designed had not been built.
- Noted that neither the expert nor the TA had found evidence that the cladding system itself had allowed moisture to penetrate the building. Rather the owner stated that design and construction failings are to blame.

5.45 The owner's architect also explained how the problem of setdown and weather protection at thresholds had been resolved by sloping the threshold.

5.46 The owner's consultants (as distinct from the owner's architect) commented that they concurred with the expert's report and went on to describe the actions that could be taken to remedy the faults in the buildings.

6 DISCUSSION

6.1 I have considered the submissions of the parties, and the expert's report. The approach to determining whether building work complies with clauses B2 and E2 is to examine the design of the building, the surrounding environment, the design features that are intended to prevent the penetration of water, the cladding system, its installation, and the moisture tolerance of the external framing.

Weathertightness risk

6.2 Recent research and experience, both 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 Experience suggests it is important to note that:

- 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, I believe 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 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 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. Desirable characteristics of the wall system are that:

- The structure should allow water that has penetrated the cladding to drain out as quickly as possible. I believe that generally a drainage cavity should be provided behind the outer cladding barrier in monolithic construction;

- The design of the outer walls should allow walls to dry to the outside once moisture penetrates the cladding and the moisture barrier. If walls do not dry, decay fungi can become established in as little as 3 months. Until scientific data on the optimum depth and configuration of the ventilation mechanism in New Zealand conditions is available, I believe that the drainage cavity should be not less than 20 mm deep; and

- The external walls should have some degree of decay resistance or moisture tolerance to allow for situations when moisture circumvents the cladding and moisture barriers and moisture levels in the timber rise to more than 18%.

6.7 In relation to these characteristics, I find that each of these blocks of houses:

- Has no eaves that might shield the cladding over the greater part of the six buildings, but there is some limited protection of some entry porches by canopy roofs over them;

- Is in a medium wind zone;
- Is constructed to three levels in the case of one building and to two levels for the other five;
- Has several wall/roof intersections and an overall envelope that is relatively simple in shape but made complex by the presence of parapets at the edge of the roofs;
- Has both open and closed cantilevered balconies, none of which are built over a habitable space;
- Has face-fixed cladding with no drainage cavity, and
- Has external walls that are constructed from timber, which has received treatment to an H3 LOSP level that is very effective in delaying the onset of decay.

Weathertightness performance

6.8 I find that the cladding junctions, edges, intersections, and penetrations are generally not well constructed. There is evidence that moisture is entering at least five and possibly all six of the buildings on the site. The expert has identified general and individual defects or causes of risk in the course of the detailed report, and has recommended further investigations be carried out to confirm his conclusion or to complete aspects of investigation the expert was unable to complete. The defects that I have identified so far and which I believes should be rectified are:

- The ground and paving levels around many parts of the perimeter of the buildings which are too high relative to floor wall cladding levels with the consequence that excess moisture has reached the bottom plates in Blocks 2, 3, 4, and 6 and most probably also Blocks 1 and 5;
- The wall cladding in the entrance porches and to the wing walls between balconies is too low relative to the tiled floor surfaces. As a result excess moisture has reached the bottom plate at the first floor level in Block 1,Unit 6 and most probably has also reached the bottom plates in the upper floor of some other Units in Blocks 1 and 6;
- The detail at the sills of the bifolding doors appears to be allowing water to accumulate and be absorbed into the bottom plates either side of the openings. If timber packers exist under these doors as detailed, then these too will be at risk;
- The sill and jamb flashings to the windows require a thorough investigation since the expert's findings that in at least one case the sill and jamb flashings do not extend to the face of the building, contrary to the cladding manufacturer's details and to the designer's specification;
- Some of the fixings of the metal balustrades of the Juliet balconies to the walls are improperly installed/sealed;

- The cappings to parapets and fascias do not have saddle flashings where they abut walls; and

- All of the partially enclosed balconies and a few of the flat roofs do not have overflows.

6.9 I find that the design of this building shows only one of those compensating factors that can mitigate the effect of moisture entering the building. That is that:

- The external timber frames (with the possible exception of Unit 25) are constructed of timber treated to H3 LOSP that will provide very effective resistance to the onset of decay. I emphasises the value of suitably treated timber framing as a reliable 'backstop' in the event of the building leaking at any time during its life.

6.10 I have previously issued a public warning about the dangers presented by balconies that had been affected by timber decay. The concerns identified by the expert concerning the fixings of the metal balustrades, the cladding junctions with the tiled floors of balconies, and the fixings of the glazed balustrades that penetrate the waterproofing membrane, are all matters that might affect the performance of timber used in the balcony structures. I therefore strongly recommend that the TA uses the powers available to it under section 65 of the Act to ensure no safety hazard is presented by the balustrades on this building.

6.11 I note that when assessed for risk using the risk matrix contained in the E2/AS1 document, these buildings are shown to be high risk at all elevations. The matrix is an assessment tool that is intended to be used at the time of application for consent, but must be supplemented at the time of issuing a code compliance certificate by careful inspection of the buildings as actually built.

7 CONCLUSION

7.1 I accept that the expert's report establishes that the majority of the cladding surface area has generally been installed according to good trade practice and the manufacturer's instructions, but at the crucial junctions, edges, intersections, and penetrations there are a number of deviations from the details provided by the designer and/or the manufacturer that have led to the ingress of moisture. Consequently the buildings do not comply with clause E2.3.2 of the building code. Accordingly, I confirm the TA's decision to refuse to issue the code compliance certificate. In making this determination I have completed the task described in paragraph 1.2.

7.2 I observe that the consent drawings and specifications for these buildings are comprehensive and well detailed. I also observe that in many instances details critical to ongoing weathertightness were not constructed according to the consented details. Taking those two observations together, I am concerned that:

- The critical building work deviated so clearly from the approved, well-documented, construction details; and

- The inspections of the cladding by the TA did not uncover the obvious differences between the consented and the as-built details.

7.3 The evidence available to me, including the extensive sampling investigation carried out by the expert, is sufficient to enable my conclusion that the building envelope of the units is leaking at the present time.

7.4 If I were confident that the expert's list of cladding faults was complete, I would have been able to form a view that, if all the identified faults were rectified, the buildings would be brought into compliance with the code, notwithstanding the lack of a drained ventilated cavity. I would have been able to reach this conclusion because the identified moisture ingress can be traced to discrete and rectifiable faults in the weathertightness details, and the timber framing has been treated to an H3 level that will provide effective decay resistance.

7.5 Those faults appear to be common to several locations on the six buildings, but such is the size nature, and complexity of this cluster of buildings, I cannot be certain its expert has, in the time available, identified all the locations of moisture ingress and all the faults in the cladding. Indeed the expert acknowledges that he has not inspected all parts of the building and recommends further investigation. I agree that this is necessary to ensure that all faults are located.

7.6 The buildings will also have to comply with clause B2 of the building code. B2 requires that a building continue to satisfy all the objectives of the code throughout its life and that includes the requirement for the building to remain weathertight for its prescribed life. Because the cladding faults in this building are likely to allow the ingress of moisture in the future, I find that the units will also not achieve the durability requirements of B2.3.1 until the faults are rectified.

7.7 It is emphasised that each determination is conducted on a case-by-case basis. Accordingly, the fact that a particular cladding system has been established as being code compliant in relation to a particular building does not necessarily mean that the same cladding system will be code compliant in another situation.

7.8 I decline to incorporate any waiver or modification of the building code in this determination.

7.9 It cannot prescribe how the building work on the 25 units is to be brought to compliance with the building code. That is a matter for the owners to propose and for the TA to accept or reject, with either of the parties entitled to submit doubts or disputes to I for another determination. I recommend that the proposal for rectification should be consistent with the findings of this determination. In other words the proposal should encompass not only the faults identified so far, and noted in this determination, but should also include any other faults revealed by the completion of the further investigative work recommended in paragraph 7.5 (above). That further work might complement the limited investigation the expert was able to carry out. I also note that the three-storey building in the complex may warrant

special scrutiny because of its greater height and consequent greater weather exposure.

7.10 I consider that, following rectification, the cladding on the buildings will require on-going maintenance to ensure its continuing code compliance. That maintenance is the responsibility of the 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 THE DECISION

8.1 In accordance with section 20 of the Building Act, I determine that the cladding as installed does not comply with either clause E2 or B2 of the building code. Accordingly, it confirms the TA's decision to refuse to issue the code compliance certificates.

8.2 The TA has issued a Notice to Rectify, dated 27 February 2004. Under the Act, a Notice to Rectify can require that the owner bring the cladding into compliance with the code, but I have already stated in a previous determination (2000/1) that the Notice to Rectify cannot specify how that compliance is to be achieved. I consider that this Notice to Rectify should therefore be put aside. A new Notice should be issued that requires the Owner to bring the building into compliance with the code without specifying the features that are required to be incorporated.

8.3 I believe that the cladding system on the six buildings will require ongoing maintenance to ensure its continuing compliance with the building code.

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

John Gardiner
Determinations Manager