Determination 2005/38

Refusal of a code compliance certificate for a building with a monolithic cladding system: House 32

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 territorial authority and the other party is one of the joint owners of the property (referred to throughout this determination as "the owner"). The application arises from the refusal by the territorial authority to issue a code compliance certificate for a 7-year old house unless changes are made to its monolithic cladding system.

1.2 The question to be determined is whether I am satisfied on reasonable grounds that the external wall cladding ("the cladding"), which is applied to the walls of this house, 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 to the Chief Executive.

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.

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

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

2 PROCEDURE

The building

2.1 The building is a detached house situated on a steeply sloping site in a high wind zone in terms of NZS 3604. The house is on three levels, with basement garage and laundry, ground floor living and bedroom areas and upper floor master bedroom and ensuite bathroom. Construction is conventional light timber frame, with a concrete slab and concrete block walls and foundations to the part basement floor. The remainder of the ground floor is supported on concrete block foundation walls and treated timber piles. All windows are aluminium, and external walls are sheathed with monolithic cladding. There is a spaced timber deck at basement level, a large enclosed deck from the ground floor living areas and a smaller enclosed deck from the upper floor master bedroom.

The house shape is moderately complex in plan, with the 20^{o} pitched roof clad in asphaltic shingles laid over plywood. The roof is made up of a series of hips, valleys and gables set at two levels, with a number of wall to roof intersections. The eaves and verges have 255 mm wide projections, including gutters and fascias.

2.2 The specification does not call for timber wall framing to be H1 treated, and I have not received any evidence, by means of invoices or other documentation, as to the treatment, if any, of the framing timber purchased for the house construction.

2.3 The cladding to the walls of the ground and upper floors is a proprietary monolithic cladding system described as EIFS (exterior insulating and finishing system). As specified in the manufacturer's data sheets ("the manufacturer's instructions"), the cladding incorporates 40 mm thick expanded polystyrene backing sheets fixed through the building wrap directly to the wall framing and finished with a multi-coat plastic mesh reinforced, modified cement coating. The system has been subject to an independent appraisal ("the appraisal"). The manufacturer's instructions include details for flashings at various junctions and require uPVC flashings to the heads,

jambs and sills of exterior joinery units. The jointing, sealing, sponge finished coating and painting system used in this instance is one of those systems referred to in the appraisal. The manufacturer administers a system of licensed contractors for installing the cladding system, one of whom is the installer of the cladding to this house.

The cladding to the timber-framed walls of the basement floor is another type of monolithic cladding described in this determination as flush-finished fibre cement. As specified in the manufacturer's data sheets, it incorporates fibre cement sheets fixed through the building wrap directly to the framing timbers and finished with a jointing, textured coating and painting system. The manufacturer's instructions include details for flashings at various junctions, and refer to (but do not specify) the sealants, jointing systems and coatings, and state that they all have to be provided by a single supplier. For the purposes of this determination, the manufacturer of the jointing and coating system is regarded as the manufacturer of this cladding system; despite the fact that the fibre cement backing sheets are proprietary to another manufacturer. All coating products and the associated components are supplied by the manufacturer. There is no reference made to requirements for the final paint coating system. An independent organisation carried out an appraisal of the cladding system in 1995 (although the certificate was withdrawn in July 2004). For this house, the installer of the EIFS cladding was also the supplier and applicator of the coating and painting system for the flush-finished fibre cement cladding.

2.4 The cladding installer issued a "Materials Components Guarantee" for the EIFS cladding, dated 11 March 2004 and noting that the material components will meet the relevant requirements of the building code. It contained the qualification that the licensed contractor will not accept responsibility for damage resulting from the use of untreated timber, and notes the date of completion as April 1998.

Sequence of events

2.5 The territorial authority issued the building consent number B11745, on 23 September 1997. None of the "Building Consent Conditions" attached to the consent referred to the cladding.

2.6 The territorial authority made various inspections during the course of construction including following lining and cladding installation ("Post Line / Bracing") on 21 April 1998, and the owner occupied the house during 1998 without a final inspection having taken place.

2.7 I have received no evidence that the territorial authority carried out any further inspections until December 2003, when the owner requested a Code Compliance Certificate.

2.8 The territorial authority carried out a final building inspection on 10 December 2003 and noted that several items required attention, The only item in regard to the cladding was the requirement to provide a detail of the fixing and sealing of the metal balustrade to the upstand of the upper level deck. This detail was subsequently provided on 9 March 2004 and all outstanding items were noted as satisfactory on 9

March 2004, as confirmed by a copy of the "Development Building Officers Field Memorandum 47976".

The final building inspection also noted the need for a final plumbing and drainage inspection. This was carried out on 8 January 2004 and noted that various pipe penetrations and fixings needed to be sealed to the cladding. This work was rechecked and noted as satisfactory, as confirmed by a copy of the "Development Building Officers Field Memorandum 46406". (Although the recheck is dated 10 March 2003, I believe that date must have been 10 March 2004).

2.9 The territorial authority wrote to the owner on 12 March 2004, stating:

> We have received your request for a code compliance certificate (CCC) for a dwelling at the above address.
>
> Before the council can issue a code compliance certificate, we must ensure that all building work meets the NZ Building Code requirements. In particular, the building code specifies that building work must remain durable for specific periods of time after the code compliance certificate is issued.
>
> You will be aware of the current weathertightness issues often reported in the media. These issues have highlighted the care that must be taken to establish that all building elements, but particularly cladding, is durable before any CCC can be issued.
>
> As your building is face fixed (monolithic) construction with no cavities we are unable to verify that it fully complies with the Building Code requirements, manufacturer's details application (*sic*) at the time and that it will remain durable for the required period.
>
> There has been recent information and knowledge that face sealed cladding systems without an adequate drainage and ventilation cavity will cause irrevocable damage to structural elements in the event of leakage and/or the effect of residual moisture. Visual inspection has highlighted there are cracks and discolouration visible, and columns are in contact with the entry landing. Council also made no inspections of external sheathings.
>
> Council cannot be satisfied that the cladding system as installed on the above building will meet the functional requirements of Clause E2 External Moisture of the New Zealand Building Code and is therefore unable to issue a code compliance certificate.
>
> If you still wish to seek a code compliance certificate, you may request a determination from the Building Industry Authority as per section 17 of the Building Act 1991.

2.10 The territorial authority did not issue a Notice to Rectify as required under section 43(6) of the Act.

2.11 The territorial authority applied for this determination on 12 August 2004.

3 THE SUBMISSIONS

3.1 In a covering letter to its application for a determination dated 12 August 2004, the territorial authority set out a brief summary of its involvement with the construction of the house, and noted that:

- As per the council requirement at the time, the owners were informed in writing on 10 and 12 March 2004, that due to the age of construction and type of monolithic cladding installed, council was unable to be satisfied on reasonable grounds that the dwelling complies with clauses E2 and B2 of the building code.
- There were no specific cladding inspections undertaken during the period from January to April 1998, for building wrap, flashings, board fixings etc.
- A weathertightness inspection undertaken at the final recheck identified the following risk factors and defects.
    1. External timber frame – timber treatment unknown
    2. Direct fixed monolithic cladding system – [flush-finished fibre cement] and EIFS (40 mm ….
    3. Three storey construction on a high wind zone location
    4. High risk design – decks at three levels, gable ends, complex roof/wall junctions and different cladding junctions.
    5. Deck barrier – handrail top fixed and H1 framing
    6. Some cracks on [flush-finished fibre cement] cladding
    7. Entry column cladding in contact with ground

It is noted that monolithic cladding systems are being continuously tested, improved and detailing revised. New knowledge indicates that monolithic systems should have a drainage cavity to improve its function meeting durability requirements of the Building Code. The issues such as high risk design, application by licensed applicators, quality control systems of suppliers, installers and applicators, specific independent inspections during installation have further complicated compliance verification process.

The territorial authority went on to say:

In regards to this application for a determination, specifically in this case the matters of doubt are

- Whether the installed cladding systems comply with clauses B2.3.1 and E2.3.2 of the Building Code
- Whether building elements, which have 5 and 15 year durability requirements comply with clause B2 of the Building Code, considering the age of construction.

The territorial authority also supplied copies of:

- Relevant correspondence with the owner; and
- The consent documentation,
- The territorial authority's inspection documentation.

3.2 In a covering letter dated 6 September 2004, the owner set out a short summary of events, and stated that:

> The building had been completed in early 1998 and occupied by [the owner] since its construction. During this six year occupation [the owners] have experienced no water penetration problems. The delay in obtaining a Code of Compliance was due to the finishing of detail inside the building and financial restraints in order to complete the detail due to the increase in family size.

The owner went on to respond to the points raised by the territorial authority in regard to risk factors and defects in the house construction, stating that:

1. External timber frame – timber treatment unknown.
   The council during its inspections of the house in early 1998, should have undertaken an inspection of the timber framing to ensure compliance.
2. Direct fixed monolithic cladding system.
   On provision of the design plans to [the territorial authority] in 1997, the application of monolithic cladding systems on the design of the house should have been denied by the Council.
3. Three storey construction on a high wind zone location.
   As above, the design plans to [the territorial authority] should have identified the risk of a three storey construction in a high wind zone, and therefore Resource Consent to build declined. However [the owners] dispute that the house is in a high wind zone – the house has had buildings on either side of it since its construction and the street is well established. If this area was a high risk zone, it is the expectation of the owners that no residence would be established in the street, let alone numerous three storey constructions which currently reside in the street.
4. High risk design
   As above, the design plans to [the territorial authority] should have identified the high risk design and therefore Resource Consent to build declined. However [the owners] dispute that the house is of high risk design – the building design is of straight lines, the roof is pitched, the windows have flashings, and there are eaves on all levels.
5. Deck barrier – handrail top fixed and H1 framing.
   Again, this was provided on the plans, which received Resource Consent to build. At the time of inspection in December 2003 this was not identified. However, [the owners] are rectifying the issue identified by the re-inspection in order to ensure safety is maintained with advice of experts.
6. Some cracks on [flush-finished fibre cement] cladding
   These areas have been rectified with advice from experts.
7. Entry column cladding in contact with ground
   The entry columns at the front of the house are purely aesthetic and provide no structural enhancement to the building.

The owner also supplied copies of:

- The consent documentation;
- The plans and specifications;
- Various notes from the territorial authority's inspection documentation; and
- Various guarantees, producer statements and other statements.

3.3 The copies of the submissions and other evidence were provided to each of the parties. Neither the owner nor the territorial authority made any further submissions in response to the submissions of the other party.

4 THE RELEVANT PROVISIONS OF THE BUILDING CODE

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

Clause B2 DURABILITY

B2.3.1

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

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

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

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

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

(b) 15 years if:

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

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

Clause E2—EXTERNAL MOISTURE

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

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

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

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

Act. 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 has made the following general observations, which in my view remain valid, about acceptable solutions and alternative solutions.

- Some acceptable solutions cover the worst case, so that in less extreme cases they may be modified and the resulting alternative solution will still comply with the building code; and
- Usually, 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, noting that the cladding appeared to have been installed generally in accordance with the manufacturer's instructions at the time of construction, and that the quality of the exterior cladding was generally good, with the exception of some minor defects. The expert removed the plaster coating at the jamb to sill junction of one representative window in the EIFS cladding and observed that window and door flashings generally complied with the manufacturer's details at the time of installation and appeared to have performed adequately. The sealing of services and plumbing penetrations generally appeared weathertight, and the cladding was observed to form a continuous weathertight surface behind all obstructions.

5.2 The expert took non-invasive moisture readings through interior linings of external walls throughout the house. These readings did not show raised moisture levels. 13 further readings were taken through holes drilled through the exterior cladding at locations considered to be vulnerable to moisture penetration, such as bottom plates, the bottom of wall studs, deck plywood and framing adjacent to deck balustrades. Moisture levels above 18% recorded after cladding is in place generally indicate that external moisture is entering the structure. There was evidence of moisture penetration at four locations, with moisture readings of:

- 19.6% in the plywood adjacent to the downpipe penetration through the ground floor deck outside the dining room;
- 21.5% in the boundary joist of the ground floor bathroom;
- 22.5% in the bottom plate of the sub floor wall on the south-east corner; and
- 52% in the enclosed balustrade framing at the corner of the first floor deck, where the balustrade intersects with the adjoining roof.

The expert's report made the following specific comments on the cladding:

- All windows and doors have metal head flashings installed in accordance with the manufacturer's instructions. Removal of a small sections of plaster at the jamb/sill of one window in the EIFS cladding confirmed that flashings appear to be installed according to the manufacturer's instructions except that, while the sill flashing generally appears to accord with the manufacturer's instructions, the jamb to sill flashing junction was sealed with plaster and not with sealant. However, there are no cracks and no sign of moisture penetration.

- Roof to wall intersections are protected with apron flashings that appear adequate, although where aprons terminate against walls, reliance is placed on sealant to weatherproof the junctions. The sealant appears to be preventing water penetration.

- No control joints in the cladding are evident, but wall dimensions of the EIFS cladding are within the limits set by the manufacturer as requiring such joints and there is no evidence of stress in the main expanses of the cladding.

- The ground clearances to the finished floor level are generally adequate except for the sides of the garage door and the right hand side of the entrance door. However, there is no indication of moisture entry in these areas.

- The detail at the bottom edge of the EIFS cladding conforms to the manufacturers' instructions.

- The cladding is continuous behind downpipes, and pipe penetrations are sealed to the cladding and appear to be performing adequately, with the sealant still pliable.

- Minor cracks are evident at some joints of the flush-finished fibre cement cladding to the basement garage wall, and these have been repaired with sealant. It is not possible to detect the reason for the cracking as, on scraping the sealant away over one repair, the crack behind was too small to see. Moisture content in the garage wall is normal and the hairline cracks may be considered a maintenance item.

- There are also cracks in a narrow band of EIFS cladding over the boundary joist to the ground floor deck above the basement garage. Moisture readings in the joist are normal at 15.7% and 15.8%, indicating no current water penetration. The cracking may have been due to past high thermal movement of the adjacent deck, which was originally finished with black membrane, although it is now paved.

- The ground floor enclosed deck has a downpipe penetrating through the tiles and underlying membrane, and water has penetrated into the plywood substrate, leaving water stains and a moisture content of 19.6%. However, the pipe appears to have been recently sealed, and the moisture level in the plywood may indicate residual water.

- The metal balustrade to the ground floor deck is fixed through a membrane-covered perimeter upstand and is sealed to the membrane with sealant. There was no sign of moisture penetration into the underlying timber and plywood, with moisture levels recorded as 15.7% and 15.8%.

- The outer face of the ground floor deck upstand has EIFS cladding extending up to cover the turn-down of the membrane, and sealed to the membrane with sealant. While there is no evidence of moisture penetration at present, the detail does not accord with the manufacturer's instructions and is entirely dependent on sealant for maintaining weathertightness.

- The ground floor deck upstand abuts the main wall at the ends of the deck, with no clearance between the membrane and the wall cladding. However, there is no significant moisture penetration into the underlying plywood, although the recorded moisture level at 17.6% is close to the upper limit of 18%.

- The ground floor enclosed deck is supported in one area with a laminated beam, the end of which is exposed to rain and is showing signs of dampness on the bottom. There is no evidence of the level of timber treatment to the laminated beam.

- The first floor deck has a part-height enclosed balustrade upstand with a metal balustrade above. The enclosed balustrade is clad on both sides and the top with the EIFS cladding. The top of the balustrade is flat, which does not accord with the manufacturer's instructions and the appraisal, both of which indicate a fall of 15 degrees. The metal balustrade supports are fixed through the top of the enclosed balustrade, and are sealed to the EIFS with sealant. However, there is no sign of current moisture penetration into the balustrade framing beneath the fixings, with the moisture level recorded at 9.7%.

- The first floor enclosed deck is partially set back within the line of the upper roof, with complex deck to roof intersections. The roof level is above the enclosed balustrade on the bedroom wall side and below the roof level at the outer edge of the deck, leading to several complex junctions. The roof, balustrade and wall framing below the bedroom wall junction was inspected and no signs of water penetration were seen. However, at the outer edge of the deck, the moisture level of the enclosed balustrade framing below the junction was measured at 52%, a clear indication that water is leaking into the framing.

- The horizontal junction between the EIFS cladding of the ground and first floor levels and the flush-finished fibre cement cladding of the basement level does not incorporate a drip edge where the upper cladding overhangs the lower, but there is no evidence of water entry and no signs of cracking.

- Part of the basement floor level is undeveloped sub-floor space enclosed with stepped concrete block walls and timber framing clad with flush-finished fibre cement up to ground floor level. The vertical junctions between the two materials are not sealed and moisture contents of the bottom plate in two locations were recorded as 21.5% and 22.5%, indicating some water penetration into the unlined sub floor framing. The sub floor space has no

ventilation along the east wall and only one on the north wall, giving inadequate cross ventilation and causing elevated moisture levels.

- The ground floor entrance canopy is clad in membrane over plywood, with the EIFS fascia cladding extending up to cover the turn-down of the membrane, and sealed to the membrane with sealant. While there is no evidence of moisture penetration at present, the detail does not accord with the manufacturer's instructions and is entirely dependent on sealant for maintaining weathertightness.

- The membrane roof to the entrance canopy shows raised fixings, indicating that fixings have not been countersunk and are likely to damage the membrane over time. The canopy upstand stops short of the corner, leaving a patch of unprotected polystyrene vulnerable to moisture penetration. However, no elevated moisture levels were recorded in the adjacent wall.

- The original EIFS cladding to the entrance columns had been replaced with timber cladding prior to the inspection. The new timber cladding now finishes about 30 mm above paving level.

5.3 The expert concluded that there is evidence of moisture ingress related to:

- The first floor deck at the enclosed balustrade to roof junctions;

- The ground floor deck at the downpipe penetration; and

- The sub floor vertical junctions between the flush-finished fibre cement and the concrete block walls.

5.4 The expert also noted a number of areas which seemed to have been performing adequately to date, but which did not demonstrate good trade practice and were of concern in the longer term. These were:

- The untreated plywood used in the ground and first floor decks;

- The cladding and flashing below the overflow outlet from the first floor deck;

- The exposed polystyrene to the EIFS cladding at the corner of the entrance canopy;

- The cracking to the flush-finished fibre cement cladding to the garage area;

- The cracking to the EIFS cladding on the ground floor deck perimeter band;

- The fixings of the metal balustrades into the membrane covered upstand to the ground floor deck and to the top of the EIFS-clad balustrade on the first floor deck;

- The lack of slope to the top of the EIFS-clad balustrade on the first floor deck;

- The junction between the EIFS and membrane on the entrance canopy roof and the ground floor deck upstand;
- The raised fixings below the membrane to the canopy roof;
- The inadequate ventilation to the sub-floor space; and
- The lack of weather protection to the end of the laminated deck support beam.

5.5 The expert noted that joists under the ground floor deck and the sub-floor framing timbers were marked as H1 treated. However no treatment was specified for other wall and floor framing and there is no evidence of treatment. The plywood substrate to the enclosed decks was specified as H3, but has no markings or evidence to confirm this.

5.6 The expert also noted that a sub-floor joist had been completely cut through to accommodate bathroom waste pipes, with no added support to the joist.

5.7 Copies of the expert's report were provided to each of the parties.

6 DISCUSSION

General

6.1 I have considered the submissions of the parties, the expert's report and the other evidence in this matter. The approach in determining whether building work complies with clauses B2.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 Research data and experience, both internationally and locally, indicates that the impact of weathertightness problems in monolithic clad houses can be minimised if good and effective design and construction practices are followed.

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

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

6.5 Important matters for consideration are:

- Data show a strong relationship between the width of the eaves and the incidence of wall leaks. An effective deflection mechanism, such as eaves

greater than 600 mm wide, has been shown by Canadian data to manage more than 90% of rain incidence;

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

- 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 into the wall; and

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

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

- The structure should allow water that has penetrated the cladding to drain out as quickly as possible. It is believed 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 this house:

- Has 250 mm wide verge projections and 355 mm eave projections, including gutters and fascias, that provide some protection to the cladding under them;

- Is in a high wind zone;

- Is a maximum of three storeys high;

- Has exterior windows and doors that are fully flashed;

- Has an overall envelope that is moderately complex, with a roof system having a number of complex valley, wall to roof junctions and roof to deck junctions;
- Has an enclosed deck on the ground floor that is exposed in plan, and is partly constructed over the basement garage area. This deck has a framed and clad upstand, into which metal balustrades have been fixed;
- Has an enclosed deck on the first floor that is exposed in plan, constructed over a living area, and set back into the adjoining roof area. This deck has framed and clad balustrades, with the plaster coating on both sides and over the flat top, into which metal balustrades have been fixed;
- Has plywood beneath the membrane of both decks, which is specified as treated to H3, but has no evidence of any timber treatment;
- Has cladding fixed directly to the framing with no drainage cavity; and
- Has external walls constructed with untreated timber, which provides no resistance to decay if it gets wet and cannot dry out.

Weathertightness performance

6.8 I consider that the window investigated by the expert's removal of plaster is representative of the remaining windows in the house, and that these have been installed according to the manufacturer's instructions and have been effective to date in preventing the penetration of water. However I also consider that, while in most respects the cladding appears to have been installed according to good trade practice and to the manufacturer's instructions, this does not apply to a number of areas.

6.9 There are three areas, as set out in paragraph 5.3, that are experiencing current moisture penetration. These are set out below:

- The first floor deck at the enclosed balustrade to roof junctions;
- The ground floor deck at the downpipe penetration; and
- The sub floor flush-finished fibre cement to concrete block vertical junctions.

6.10 There are some additional defective areas, as set out in paragraph 5.1, which if not remedied, will eventually allow the ingress of moisture behind the cladding. These are set out below:

- The cladding and flashing below the overflow outlet from the first floor deck;
- The exposed polystyrene to the EIFS cladding at the corner of the entrance canopy;
- The sealant junction between the EIFS cladding and the membrane on the outer edge of the entrance canopy;

- The cracking to the EIFS cladding on the ground floor deck perimeter band;
- The sealant junction between the EIFS cladding and the deck membrane on the ground floor deck perimeter band;
- The lack of clearance between the EIFS wall cladding and the deck membrane at the ends of the ground floor deck upstand;
- The fixings of the metal balustrades into the membrane covered upstand to the ground floor deck and to the top of the EIFS-clad balustrade on the first floor deck;
- The lack of slope to the top of the EIFS-clad balustrade on the first floor deck; and
- The junction between the EIFS and membrane on the entrance canopy roof and the ground floor deck upstand.

6.11 There are further defects that may affect the durability of some elements within the house. These are set out below:

- The untreated plywood used in the ground and first floor decks;
- The raised fixings below the membrane to the canopy roof;
- The inadequate ventilation to the sub-floor space; and
- The lack of weather protection to the end of the laminated deck support beam.

6.12 I note the expert's comments regarding the hair line cracking, subsequent satisfactory repairs and lack of moisture penetration to the flush-finished fibre cement cladding of the garage area, and I consider that this is unlikely to allow moisture penetration providing the walls in question are adequately maintained.

6.13 Notwithstanding the fact that the cladding is fixed directly to the timber framing, thus inhibiting drainage and ventilation behind the cladding sheets, I find that there are compensating factors that assist the performance of the cladding in this particular case. These are:

- Generally, and notwithstanding the deficiencies that have been identified, the cladding appears to have been installed according to good trade practice and to manufacturer's specifications;
- The house has fully flashed exterior windows and doors;
- Apart from a localised area outlined in paragraph 6.10, the coating and finish to the EIFS cladding appears to be in good condition, with no current evidence of cracking;

- The house has 250 mm wide verge and 350 mm wide overall eaves projections that will give some protection to the top of the wall framing; and

- Apart from the areas outlined in paragraph 6.9, there is no current evidence of moisture penetration into or accumulation within the external wall cavities.

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

6.15 I accept that control joints in the cladding are not required to any of the walls of the house.

6.16 I acknowledge the territorial authority's concern regarding the entry column cladding clearance, but accept that this has now been remedied by the recladding of the columns.

6.17 The territorial authority has claimed that no cladding inspections were carried out during construction of the house. However, I note that, as set out in paragraph 2.6, the territorial authority noted the satisfactory completion of the "Post Line / Bracing" inspection.

6.18 I also note the expert's comment that a sub-floor joist has been cut through to accommodate plumbing pipes. While this is not a weathertightness issue and is not part of this determination, I draw it to the attention of the territorial authority. In addition, there is no evidence that the floor framing or the plywood substrate to the enclosed decks has been treated

6.19 I note that all elevations of the house demonstrate a medium to high weathertightness risk rating, as calculated using the E2/AS1 risk matrix. The matrix is an assessment tool that is intended to be used at the time of application for consent, but must be supplemented at the time of issuing a code compliance certificate by careful inspection of the building as actually built.

7 CONCLUSION

7.1 I find the expert's report establishes that there is evidence of external moisture entering the building in three locations as listed in paragraph 6.9. Accordingly, I find that the cladding on this building at this time does not comply with clause E2.

7.2 The building is also required to comply with the durability requirements of clause B2. Clause B2 requires that a building continues to satisfy all the objectives of the building code throughout its effective life, and that includes the requirement for the house to remain weathertight. Because the additional cladding faults listed in paragraph 6.10 in this building are likely to allow the ingress of moisture in the future, the house does not comply with the durability requirements of clause B2.

7.3 I also find that because the faults in this cladding occur in discrete areas, I am able to conclude that rectification of the identified faults is likely to bring the cladding into

compliance with the code. Once the cladding faults listed in paragraphs 6.9 and 6.10 have been satisfactorily rectified, this house should be able to remain weathertight and thus comply with both clauses E2 and B2.

7.4 I note the additional defects listed in paragraph 6.11 that may affect the durability of some elements in other areas of this house, and conclude that rectification of these should ensure durability of these elements to comply with clause B2.

7.5 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. I recognise that a territorial authority does not have any statutory responsibility for the ongoing maintenance of a building. However, the maintenance programme adopted by the owner could be undertaken after consultation with the territorial authority, bearing in mind that the nature of the advice, and the basis on which it is provided to the owner, are for the territorial authority to decide.

7.6 I decline to incorporate any waiver or modification of the building code in my determination.

8 THE DECISION

8.1 In accordance with section 20 of the Act, I determine that the house is not weathertight and, therefore, the cladding does not comply with clause E2. There are also a number of items to be remedied to ensure it remains weathertight and thus meet the durability requirements of the code, I find that the house does not comply with clause B2. Accordingly, I confirm the territorial authority's decision to refuse to issue the code compliance certificate.

8.2 I also find that once the items of non-compliance that are listed in paragraphs 6.9 to 6.11 are rectified to the approval of the territorial authority, together with any other instances of non-compliance that become apparent in the course of rectification, the cladding as installed on the house will comply with the building code, notwithstanding the lack of a drainage cavity.

8.3 I note that the territorial authority has not issued a Notice to Rectify. The territorial authority should do so and the owner is then obliged to bring the house up to compliance with the building code. It is not for me to decide directly how the defects are to be remedied and the cladding brought to compliance with the building code. That is a matter for the owner to propose and for the territorial authority to accept or reject, with either of the parties entitled to submit doubts or disputes to the Chief Executive for another determination.

8.4 Finally, I consider that the cladding on the building will require on-going maintenance to ensure its continuing building code compliance.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 21 March 2005.

John Gardiner

Determinations Manager