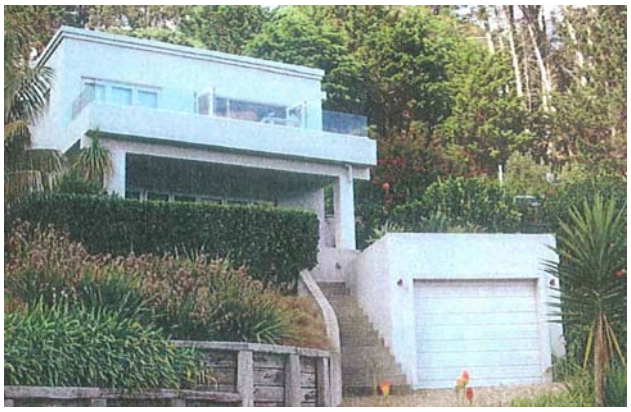
Department of Building and Housing
Te Tari Kaupapa Whare

Determination 2009/86

Determination regarding the refusal to issue a code compliance certificate for house alterations and a new garage at 3 Le Roy Road, Waiheke Island



1. The matter to be determined

1.1 This is a determination under Part 3 Subpart 1 of the Building Act 2004[1] ("the Act") made under due authorisation by me, John Gardiner, Manager Determinations, Department of Building and Housing ("the Department"), for and on behalf of the Chief Executive of that Department. The applicant is the owner, M Castles ("the applicant") acting through an architect, and the other party is the Auckland City Council ("the authority"), carrying out its duties as a territorial authority or building consent authority.

1.2 This determination arises from the decision of the authority to refuse to issue a code compliance certificate, and to issue a notice to fix for 7-year-old alterations and additions to a house because it is not satisfied that the building work complies with the requirements of certain clauses of the Building Code (First Schedule, Building Regulations 1992).

[1] The Building Act, Building Code, Compliance documents, past determinations and guidance documents issued by the Department are all available at www.dbh.govt.nz or by contacting the Department on 0800 242 243

1.3 I consider that the matters for determination[2] are:

Matter 1: The external envelope

Whether the external envelope of the house complies with Clause B2 Durability and Clause E2 External Moisture of the Building Code. The "external envelope" includes the monolithic cladding, the windows, the deck and the roof cladding, their configuration, components and junctions with other building elements. By "the monolithic cladding" I mean the components of the system (such as the backing materials, the plaster, the flashings and the coatings), as well as the way the components have been installed and work together. (I consider this matter in paragraph 8.)

Matter 2: Other Building Code clauses

Whether certain building elements comply with Building Code Clauses B1 Structure, E1 Surface Water and F4 Safety from falling. (I consider this matter in paragraph 9.)

1.4 Matters outside this determination

1.4.1 The notice to fix cites contraventions of Clauses B1, B2, D1, D2, E1, E2, E3, F4, F7, G4, G12, G13 and H1 of the Building Code. I note that there are no specific items within the notice that relate directly to Clauses D1, D2, E3, F7, G4, G12, G13 and H1, and I have received no evidence relating to a dispute about them. I have therefore not considered these clauses further within this determination.

1.4.2 The notice to fix also raised the matter of whether the building elements in the house comply with Clause B2 Durability of the Building Code, taking into account the age of the building work. However, I note that the applicant has applied to the authority for a modification in respect of the durability provisions (refer paragraph 3.7), and I therefore leave this matter to the parties to resolve.

1.4.3 I note that subsequent correspondence between the authority and the architect, as outlined in paragraphs 3.7 to 3.10 indicates that the parties are in the process of resolving some items referred to in the notice to fix, and I leave these matters to the parties to resolve.

1.5 In making my decision, I have considered the submissions of the parties, the report of the independent expert commissioned by the Department to advise on this dispute ("the expert"), the report of the independent roof cladding specialist ("the roofing consultant") and the other evidence in this matter. I have evaluated this information using a framework that I describe more fully in paragraph 7.

2. The building work

2.1 The building work consists of alterations to a house, and the construction of a detached garage with associated siteworks on a steeply sloping coastal site. This

[2] Under section 177(a) of the Act. In this determination, unless otherwise stated, references to sections are to sections of the Act and references to clauses are to clauses of the Building Code

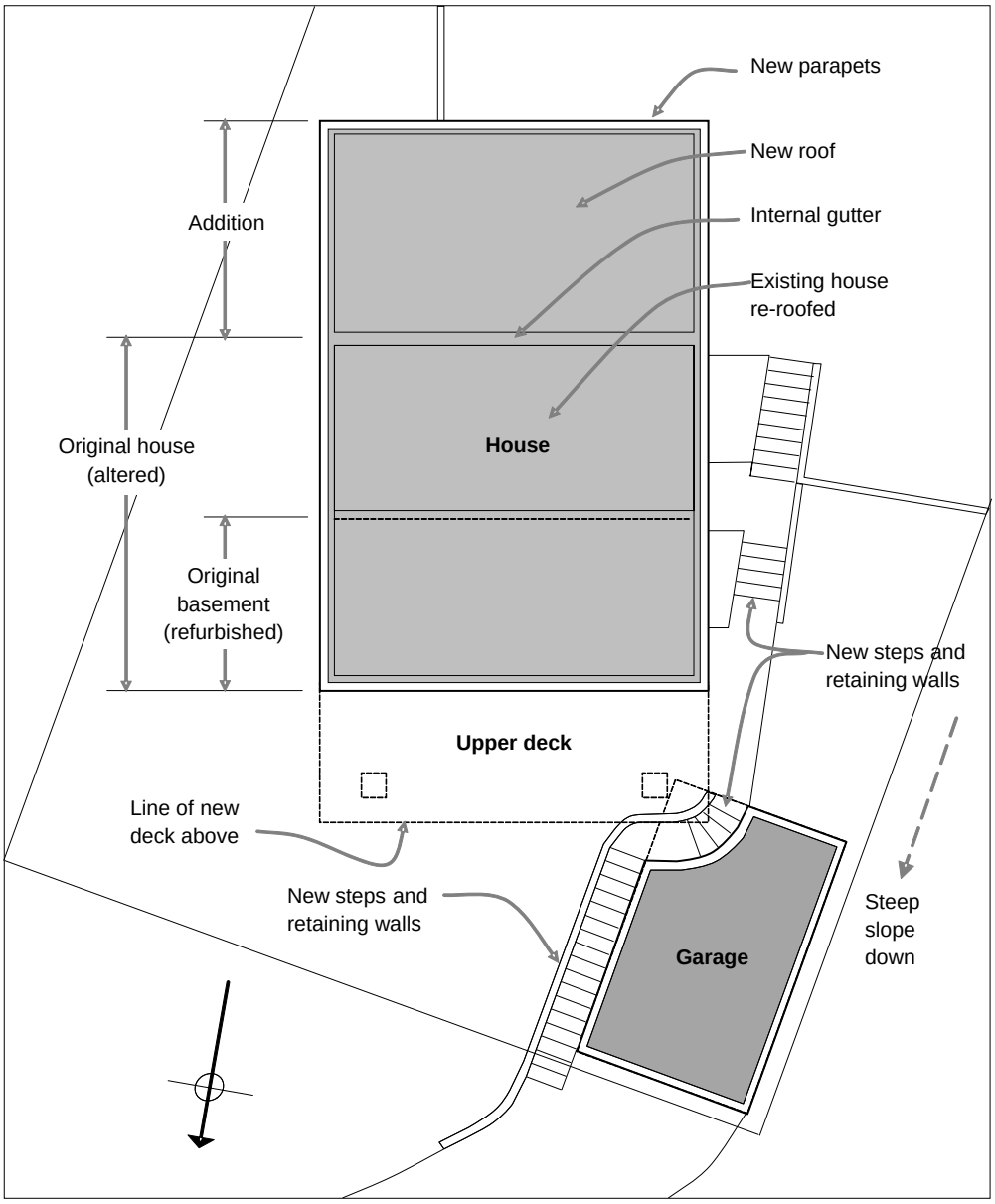
north facing site is long and narrow and is in a high wind zone for the purposes of NZS 3604[3].

2.2 The original house

2.2.1 The house was originally a small timber-framed house ("the original house") with a gabled corrugated metal roof, timber weatherboard wall cladding and timber windows. The house had a concrete block part basement to the north (downhill side), with separate external access, and a timber-framed subfloor area to the south. A timber-framed deck was added along the north elevation in 1994.

2.3 The alterations and additions

2.3.1 The building work considered in this determination is shown in the following sketch:



[3] New Zealand Standard NZS 3604:1999 Timber Framed Buildings

2.4 The new garage

2.4.1 A new detached garage is located to the northwest of the house. The garage is a specifically engineered structure set into the steep slope with a concrete slab and foundations, reinforced concrete block retaining walls and a proprietary reinforced concrete roof.

2.4.2 The front and side garage walls extend above the concrete roof by 600mm, with this upstand cutting across the south east corner of the roof. The rear wall of the garage rises beyond the upstand to retain ground at the house basement level. The area within the roof upstands forms a garden, with membrane applied over the concrete and a layer of stippled plaster matting under the soil.

2.5 The new siteworks

2.5.1 Extensive siteworks were undertaken between the new garage and the rear of the house. Specifically engineered concrete masonry retaining walls and concrete steps accommodate the steep slope from the garage to the basement level, to the subfloor level, and to the main entry and courtyard at the southwest corner.

2.5.2 Concrete steps and a curved concrete retaining wall lead up the east wall of the garage, across the garage roof and up to the basement level of the house. The steps continue up the west side of the house, with a landing at the subfloor level, to finish at the rear of the original house. The steps are bordered by stepped concrete planters set against the house and by concrete retaining walls to the west.

2.5.3 Further retaining walls form a courtyard and planters to the rear of the house. Concrete steps follow a curved retaining wall across the southwest corner of the courtyard, to provide access to the remaining site.

2.6 The altered house

2.6.1 Alterations and additions to the original house included:

- an addition to the rear south wall
- a new deck to the front north wall
- new roof and wall claddings, including parapets to all walls
- new aluminium windows and doors
- interior alterations and refurbishment.

2.6.2 The altered house has the appearance of a new building, with a simple rectangular form that is two storeys to the north and single-storey to the south. Construction is generally conventional timber framing with some specifically engineered steel beams, concrete slab and foundations to the north and south (with a timber framed subfloor area between), and concrete block retaining walls to the southeast corner.

2.6.3 The eaves and verges of the original house have been removed, with the walls extended to form parapets around the new roof. The house now has monolithic cladding to all external walls, including over the existing weatherboards of the

original house. The new liquid-applied membrane roof retains the original low pitch, with the added south roof sloping to an internal gutter at the junction.

2.6.4 The new deck has a liquid-applied membrane floor over a plywood substrate. Spaced timber decking is installed above the membrane, to provide level access from the interior. The monolithic-clad outer face of the deck extends above the deck floor to form 400mm high upstands, with glass balustrades fixed to the tops.

2.6.5 The monolithic cladding is a system described as solid plaster ("stucco") over a solid backing of H3 treated plywood sheets, which are covered by a slip layer of building wrap, and metal-reinforced plaster. The stucco is applied in two coats to a thickness varying from 22mm to 26mm and is finished with a flexible paint coating (refer to paragraph 5.6). On the new exterior walls, the plywood backing sheets are fixed through the building wrap directly to the framing timbers. On the remaining external walls, the original weatherboards were retained, timber packing was added to line up the walls, and the building wrap and plywood backing sheets were installed over the packing.

2.6.6 The expert noted that the wall framing he was able to observe appeared to be untreated, which was confirmed by the results of testing a sample sent to a biodeterioration laboratory. Given the date of construction in 2001 and the other evidence, I consider that the wall framing in the alterations and additions is untreated.

3. Background

3.1 The authority issued a building consent (No. BLD 41000564201) on 1 November 2000 under the Building Act 1991.

3.2 The authority carried out various inspections of the construction, including a pre-line building inspection on 6 April 2001. The last inspection recorded was the garage floor slab inspection on 23 April 2001.

3.3 The architect and the engineer also undertook various inspections during construction. I note that the engineer provided calculations and a "Producer Statement – Design" dated 14 April 2001 to support the addition of a garden to the garage roof.

3.4 After a period of almost 5 years, a standard "Pre-final check list", date-stamped 2 February 2006, was issued to the owner listing documentation that was required. That noted that the plumbing, drainage, insulation and stucco inspections had not been carried out. (I assume that the check list was completed by the authority).

3.5 The authority carried out a final inspection on 31 August 2007 and wrote to the applicant on 5 October 2007, stating that it was not satisfied that the building work complied with the Building code in a number of respects. The authority recommended that:

> ...you engage the services of a suitably qualified person to review the attached NTF and to develop a proposed scope of work, which in their view would address all the areas of contravention. Council will then review this proposal and if it

agrees with it, will then advise you as to whether a building consent needs to be applied for.

3.6 The notice to fix attached to the above letter stated that the authority was not satisfied that the building work complied with the consent, or with some clauses of the Building Code, or with the Building Act. The "particulars of contravention or non-compliance" attached to the notice listed defects and requirements under the following headings:

- Issues related to cladding
- Items not installed per the manufacturer's specifications
- Items not installed per the acceptable/alternative solutions approved for the building consent
- Items not installed per accepted trade practice
- Drainage and ventilation of the cladding
- Durability issues

The authority related the listed items to the cladding, the roof, the deck, the garage and the siteworks; and required the applicant to prepare a proposed scope of work to address the areas of non-compliance. The notice also attached a 'Photo file' containing 22 annotated photographs of various defects.

3.7 In a letter to the authority dated 9 November 2007 on behalf of the applicant, the architect attached drawings of the amendments to the wall cladding system. The architect responded to the items listed in the notice to fix by providing further explanation on some items, debating the validity of some items, and proposing changes in regard to other items. The letter also attached a request from the applicant for 'waiver' in regard to the durability provisions (refer paragraph 1.4.2).

3.8 The authority responded in a letter to the architect dated 10 March 2008, accepting some of the architect's proposals and requiring 'further clarification and detail' on other items. In regard to its concerns about the house roof, the garage roof and the deck membrane, the authority stated that it required a review and report by a named roof cladding specialist ("the roofing consultant") on whose opinion it would rely for either acceptance of or recommended remedial works for the membranes.

3.9 The authority also noted that it had not received amendments to the approved plans at the time of construction and listed specific concerns in regard to the stucco cladding, which included the following summarised issues:

- the lack of continuous concrete foundations under the stucco
- the lack of evidence of installed control joints
- the cracking 'evident to numerous areas'
- the lack of sill flashings that extend past the jambs
- the lack of clearances and base detail at the bottom of the cladding
- the lack of a drainage gap above the head flashings
- the head flashings buried in the plaster and not extended past the jambs

- the balustrade fixings into the deck upstand
- the lack of drip edges.

3.10 The architect responded in a letter to the authority dated 25 October 2008, which attached calculations and a producer statement from the engineer with regard to the support of the stucco and which proposed the addition of 'trimming joists' to the walls at the sub-floor section of the house. The architect also attached a report by the membrane supplier and installer that noted the satisfactory condition and performance of the membranes and included a quotation for upgrade work to cover deterioration due to age. The architect made various further proposals, including a proposed 'scope of work' in regard to the defects identified in the stucco cladding.

3.11 The authority responded in a letter to the architect dated 26 November 2008, stating that it could not proceed with the application for a code of compliance certificate as it was yet to be reasonably satisfied that the proposed scope of works presented would address the issues and comply with the Building Code. The authority added:

> Council strongly urges you to employ the services of a recognised independent building consultant/expert to address Council's concerns.

3.12 The Department received an application for a determination from the architect on behalf of the applicant on 26 February 2009.

4. The submissions

4.1 The architect outlined the background of the project and included copies of:

- the consent documentation
- the amended cladding details
- the engineer's structural amendments
- the inspection records
- the correspondence with the authority
- the notice to fix dated 5 October 2007.

4.2 The authority submitted a CD-Rom, entitled 'Property File', which contained documents pertinent to this determination.

4.3 A copy of a draft determination ("the first draft determination") was forwarded to the parties for comment on 24 April 2009. On behalf of the applicant, the architect accepted this draft 'without prejudice' on 14 May 2009.

4.4 The authority did not accept the first draft and responded in a letter to the Department dated 3 June 2009, outlining the background and making the following summarised comments:

- The cladding-related issues in the determination are accepted.

- The matters associated with Building Code Clauses B1, E1 and F4 have not been resolved as assumed in the first determination, and should therefore be considered as matters to be determined.
- The membrane peeling from the back wall of the garage allows the ingress of moisture and this can risk long-term durability of the reinforcing steel, and remedial work is therefore required.
- The authority had not received a report from the roofing consultant, and this matter is therefore not resolved and should be considered further.

4.5 The draft was amended to take account of this submission. With regard to the lack of resolution concerning the roof and the deck membrane I appointed the roofing consultant, with the agreement of the parties, to provide the Department with an independent report on the results of his inspection. The roofing consultant's report is outlined in paragraph 6.

4.6 A second draft determination was forwarded to the parties for comment on 2 July 2009. The authority accepted the second draft.

4.7 The architect responded to the second draft saying that he disputed the requirement for a 'Producer Statement – Construction Review' which had been discussed in paragraph 9.2.1 of the draft determination. The architect noted that this had not been a condition of the building consent, also noting observations and inspections made by him and the geotechnical engineers (refer paragraph 9.2.1). I acknowledge the submission and have amended the determination as appropriate.

5. The expert's report

5.1 As discussed in paragraph 1.5, I engaged an independent expert to provide an assessment of the condition of those building elements subject to the determination. The expert is a member of the New Zealand Institute of Building Surveyors. The expert inspected the house on 23 March 2009 and furnished a report that was completed on 31 March 2009. The expert did not comment in detail on those areas that were expected to be considered within the roofing consultant's report.

5.2 The expert noted the following variations from the consent drawings:

- The plastered polystyrene cladding has been replaced with stucco cladding, with changes to the detailing of the stucco base, windows, deck upstands and parapets.
- There are some changes to joinery openings in the basement level.
- A pergola above the entrance has been omitted.
- There is an additional water tank at the southeast corner.
- There is no barrier rail around the garage roof.
- The tanking to the garage retaining wall has changed.

5.3 The windows and doors

5.3.1 The expert noted that the windows were recessed, with metal head flashings, plastered reveals and a flat plastered sill.

5.3.2 The expert removed a small section of cladding at the sill to jamb junction of the upper level bathroom window ("cut-out 1"), and noted liquid-applied membrane and "Inseal tape" applied to the sill and jamb framing. I accept that the exposed junction is typical of similar locations elsewhere in the building.

5.4 Other cut-outs

5.4.1 The expert removed some of the soffit lining below the deck ("cut-out 2"), to observe the condition of the timber framing beneath the deck gutter and noted that the original deck joists were retained and cut down to accommodate the gutter. The new deck joists appeared to be treated, while other nogs and blocking appeared untreated.

5.4.2 The expert also removed small sections of cladding to inspect the underlying construction at the following locations:

- the junction of the deck upstand to the wall ("cut-out 3").
- the bottom of the cladding beside the south retaining wall ("cut-out 4")
- the bottom of the northeast deck column ("cut-out 5").

I accept that the exposed junctions are typical of similar locations elsewhere in the building.

5.5 Moisture

5.5.1 The expert inspected the interior of the house, taking non-invasive moisture readings internally, and no evidence of moisture penetration was noted.

5.5.2 The expert noted visual evidence of moisture in the following areas:

- severely corroded mesh within the plaster at the sill to jamb junction at cut-out 1
- wet framing, black stains on untreated nogs, and water stains on plywood substrate beneath the deck gutter at cut-out 2
- delaminating plaster, severely corroded mesh, 'soaked' plywood backing sheets, corroding corner and saddle flashings and decay in the untreated deck upstand framing at cut-out 3
- delaminating plaster, corroding mesh, water stains on the plywood backing sheets and a corroding corner flashing at cut-out 4
- delaminating plaster and corroding mesh in the column at cut-out 5
- at the top of the concrete block retaining wall to the south of the garage.

5.5.3 The expert took 20 invasive moisture readings through the cladding into framing at areas considered at risk, and 15 of these were elevated as follows:

The windows

- 17% and 24% below the jambs of the upper east bedroom window
- 20% below a jamb of the lower east bedroom window
- 18% below a jamb of the south window
- 21% to 32% below all four jambs of the upper west windows

The doors

- more than 40% in the bottom of the jamb of the upper bathroom doors
- 20% in the bottom of the jamb of the upper west entry doors
- 18% in the bottom of the jamb of the south doors

The bottom of the cladding

- 32% at the bottom of the deck column at cut-out 5
- 30% in the bottom plate at the upper bathroom east wall
- 20% in the bottom plate of the south wall at cut-out 4

The deck

- 40% in the plaster in the deck to wall junction at cut-out 3
- wet timber under the deck gutter at cut-out 2.

5.5.4 The expert considered that the equilibrium moisture level of the timber framing was about 12% at the time of his inspection. Moisture levels that vary significantly generally indicate that external moisture is entering the structure and further investigation is required.

5.5.5 I note that this inspection was carried out at the end of summer, and I therefore consider that moisture levels will likely increase at other times of year, with more areas likely to be elevated during periods of wet weather.

5.6 Commenting specifically on the wall cladding, the expert noted that:

The stucco system

- the stucco is a two coat system (rather than the three coat system required in NZS 4251[4])
- wire mesh reinforcement is corroding, as seen in the areas exposed by cut-outs
- the wire mesh reinforcement is not fully embedded in some areas
- the plaster delaminated at four areas where cut-outs were made
- there are no control joints installed in the stucco
- part of the framed wall is supported by piled foundations (allowing greater differential movement than continuous concrete foundations now required for stucco[5].)

[4] New Zealand Standard NZS 4251: Solid plastering; Part 1: 1998 Cement plasters for walls, ceilings and soffits
[5] New Zealand Standard NZS 3604:1999 Timber Framed Buildings

The bottom of the cladding

- there is no clearance from the bottom of the cladding to the ground or paving in most areas, with the plaster buried at the base
- the bottom of the cladding lacks drip edges and sufficient overlaps
- in some areas, there is insufficient clearance between the paving and the interior floor level

The windows and doors

- there is no provision for drainage above the metal head flashings
- the windows are recessed and lack sill and jamb flashings, with reliance on liquid-applied membrane and Inseal tape over the sill and jamb framing
- the layer of liquid-applied membrane is thin, not covering the fibreglass mesh
- there are cracks at some junctions of the plaster and the window flanges
- the plaster is taken over the sill flange, trapping any moisture that penetrates the jambs
- the plaster to the sill recesses is flat, which allows moisture to sit on the sills
- the reinforcing within the plaster at cut-out 1 is severely corroded

The deck

- the gutter at the north side is lined with liquid-applied membrane that is not weathertight, with leaking and decay apparent in the timber exposed at cut-out 2
- moisture is also likely to be penetrating into timber around the adjacent boxed steel beam under the deck
- the framing to the deck upstands is untreated, and the upstands are covered with plywood and liquid-applied membrane, which appears to be very thin
- the bottom of the cladding to the inner faces of the deck upstands butts against the raised timber decking and extends down to the bottom of the gutter
- the tops of the deck upstands lack cappings, with the glass balustrade frame fixed through the flat plastered top
- there is a large stucco crack running from the junction of the deck upstand to the wall
- although the junctions of the sides of the deck upstands with the wall include metal saddle flashings, these do not overlap the liquid-applied membrane applied over the plywood backing sheets, with high moisture levels recorded and decay observed in the untreated upstand framing
- the untreated framing around the 100 x 100 treated deck posts have high moisture levels, which will damage the untreated timber and may damage the post timber over time

The roof parapets

- the parapets have no cappings, with the plastered tops sloping at 7^{o}

- the framing to the roof parapets is likely to be untreated, in common with the other new framing, with weatherproofing reliant on liquid-applied membrane over plywood
- wrinkling of the membrane is apparent at the inside face of the parapet.

5.7 The garage

5.7.1 The expert noted that moisture penetration to the garage generally appeared to be limited to the rear retaining wall, where the 'peel and stick' membrane was observed to be peeling away from the back of the wall.

5.7.2 Other walls to the garage appeared to be 'clean and dry'. The expert noted that, in terms of Clause E2, the area is not a habitable space, and the moisture did not appear sufficient to cause 'undue dampness or damage'. However, the durability of the reinforcing steel also needed to be considered.

5.8 The expert commented in general on other issues raised by the authority, noting that some items appeared to be in the process of being resolved between the parties.

5.9 Surface water

5.9.1 The expert noted the drainage from the upper deck feeds into a field coil that runs down to the gravel driveway, where the discharge end is visible.

5.9.2 The expert made the following comments on surface water disposal:

- The internal gutter to the roof has single outlets at each end, with no provision for overflow.
- Some of the downpipes discharge directly onto the ground.
- Drainage from the planted garage roof could not be verified. I note that there is no indication of drainage holes through the parapets surrounding the garden.
- The drainage system from the overflow to the rainwater tank in the southeast corner could not be verified.

5.9.3 The expert also noted that the channel drain to the south drains through the side planter boxes and onto the path. However, the catchment is small and the limited water involved is unlikely to cause a problem.

5.10 Safety from falling

5.10.1 The expert made the following comments on safety from falling:

- The side planter boxes have timber decking to the tops, creating 'platforms', parts of which are more than 1m above adjacent paths and steps
- The main stairs beside the garage lack a handrail.
- there are no barriers installed around the perimeter of the garage roof garden.
- the metal balustrades to the curved concrete steps at the rear of the house are severely corroded.

5.11 A copy of the expert's report was provided to each of the parties on 12 February 2009.

6. The roofing consultant's report

6.1 At the request of the applicant, the roofing consultant had inspected the membranes on 31 March 2009. As explained in paragraph 4.5, I engaged the roofing consultant to provide me with a report on the roof and the deck membrane. The consultant is recognised within the industry as an independent specialist in roofing systems. The roofing consultant provided the Department with a report dated 24 June 2007 on the findings of his earlier inspection.

6.2 The roofing consultant noted that he was unable to inspect the deck membrane, as it was covered with timber decking.

6.3 The roofing consultant made the following comments on the roof cladding:

- Penetrations through the roofing have not been flashed with a boot flashing system that will allow for movement.
- The thermal movement of the plywood substrate has caused a loss of adhesion of the liquid-applied membrane ("LAM"), and created distorted wrinkles at the junction with the internal gutter.
- There is no provision for thermal movement and the LAM is wrinkling at joints in the plywood substrate, and starting to crack in some areas.
- The LAM is not taken over the top of the parapet, and the parapet plaster is cracking.

6.4 The roofing consultant concluded that a scope of works needed to be prepared to rectify the defects, including a decision on the type of membrane to be used, in order to provide 'a permanent watertight solution'.

6.5 A copy of the roofing consultant's report was provided to each of the parties on 25 July 2009.

6.6 The applicant responded to this report in a letter dated 29 July 2009 and emails dated 10 August 2009 and 2 October 2009. This correspondence confirmed the nature of the roof substrate and that there was a 10 year workmanship and application warranty in place from the installer in place for the roof. The installer indicated that any cracks in the membrane creases in the roof membrane were able to be repaired as part of normal maintenance some of which is now due.

6.7 The substrate of the roof was advised as 15mm ply treated to H3 with CCA type preservative. The ply is glued and screwed to the purlins and blocking which are at 600mm centres with No.10 x 45 mm stainless steel screws at 150mm on the edges and 200mm centres in the body of the plywood sheets. I note that E2/AS1 shows 17mm ply as the minimum allowed but this allows for roofs where the fall is as low as 1.5^{o} (1:40). In addition E2/AS1 requires a span of 400mm although this requirement was included subsequent to this house being built. In this case, as the roof slope is close to 6.5^{o} I consider the substrate well secured and the likelihood of

any sagging effecting roof drainage to be negligible. Although the use of 15mm ply spanning joists at 600 centres in part explains the movement observed in the substrate, the roof has not shown signs of deflecting to date and subject to appropriate maintenance should meet code requirements.

6.8 The maintenance which as now due should include in particular the bullet point items 1 and 4 in paragraph 6.3 as well as other general recoating and other proposed maintenance of the membrane.

7. Evaluation framework for code compliance

7.1 I have evaluated the code compliance of this building by considering the following two broad categories of the building work:

- The weathertightness of the external building envelope (clause E2) and durability (clause B2 insofar as it relates to clause E2).
- The other code clauses.

In the case of this house, weathertightness considerations are addressed first.

7.2 In evaluating the design of a building and its construction, it is useful to make some comparisons with the relevant Acceptable Solutions[6], which will assist in determining whether the features of these houses are code-compliant. However, in making this comparison, the following general observations are valid:

- Some Acceptable Solutions cover the worst case, so that they may be modified in less extreme cases and the resulting alternative solution will still comply with the Building Code.
- Usually, when there is non-compliance with one provision of an Acceptable Solution, it will be necessary to add one or more other provisions to compensate for that in order to comply with the Building Code.

Matter 1: The external envelope

8. Weathertightness

8.1 The approach in determining whether building work is weathertight and durable and is likely to remain so, is to apply the principles of weathertightness. This involves the examination of 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. The Department and its antecedent, the Building Industry Authority, have also described weathertightness risk factors in previous determinations (for example, Determination 2004/1) relating to cladding and these factors are also used in the evaluation process.

8.2 The consequences of a building demonstrating a high weathertightness risk is that building solutions that comply with the Building Code will need to be more robust.

[6] An Acceptable Solution is a prescriptive design solution approved by the Department that provides one way (but not the only way) of complying with the Building Code. The Acceptable Solutions are available from the Department's website at www.dbh.govt.nz.

Conversely, where there is a low weathertightness risk, the solutions may be less robust. In any event, there is a need for both the design of the cladding system and its installation to be carefully carried out.

8.3 Weathertightness risk

8.3.1 This house has the following environmental and design features which influence its weathertightness risk profile:

Increasing risk

- the house is in a high wind zone
- the house is 2-storeys high in part
- the house has roof parapets above all exterior walls
- the walls have monolithic cladding fixed directly to the framing
- an enclosed deck is attached to the upper level of the house
- the external wall framing is not treated to a level effective in resisting decay if it absorbs and retains moisture

Decreasing risk

- the house is simple in plan and form.

8.3.2 The house has been evaluated using the E2/AS1 risk matrix. The risk matrix allows the summing of a range of design and location factors applying to a specific building design. The resulting level of risk can range from "low" to "very high". The risk level is applied to determine what claddings can be used on a building in order to comply with E2/AS1. Higher levels of risk will require more rigorous weatherproof detailing; for example, a high risk level is likely to require a particular type of cladding to be installed over a drained cavity.

8.3.3 When evaluated using the E2/AS1 risk matrix, the weathertightness features outlined in paragraph 8.3.1 show that one elevation demonstrates a moderate weathertightness risk rating and the remaining elevations a high risk rating. I note that, although a drained cavity is now required by E2/AS1 for solid plaster cladding at all risk levels, this was not a requirement at the time the house was constructed.

8.4 Weathertightness conclusion

8.4.1 Taking into account the expert's report, I am satisfied that the current performance of the cladding installed on this house is inadequate because there is evidence of moisture penetration. In particular, the cladding demonstrates the key defects listed in paragraph 5.6, which are likely to have contributed to the moisture penetration and evidence of decay within the external walls of this building.

8.4.2 I have identified the presence of a range of known weathertightness risk factors in this house. The presence of the risk factors on their own is not necessarily a concern, but they have to be considered in combination with the significant faults identified in the cladding system. It is that combination of risk factors and faults that indicate that the structure does not have sufficient provisions that would compensate for the lack

of a drained and ventilated cavity. Consequently, I am not satisfied that the cladding system as installed on the house complies with either Clause B2 or Clause E2 of the Building Code.

8.4.3 It is clear from the expert's report that the monolithic cladding installed on the house is unsatisfactory in terms of its weathertightness. The two-coat solid plaster system does not comply with NZS 4251 in many respects, and shows signs of systemic de-lamination problems and corrosion of the reinforcement. The level of water penetration into the timber framing indicates systemic failures and considerable work will be required to make the building code compliant.

8.4.4 It is also clear from the roofing consultant's report that the liquid-applied roof membrane is in need of maintenance to ensure it remains code compliant

8.4.5 Investigation is necessary to establish the extent of the timber damage already sustained, the full extent of repairs required, and to ascertain the most appropriate method of remediation of the cladding. The deck membrane under the removable decking should also be included in this investigation).

8.4.6 The investigation should involve the systematic survey of all risk locations in order to determine the full extent of the repairs required and the method of remediation is decided. This will require a careful analysis by an appropriately qualified expert. Once that decision is made, the chosen repair option should be submitted to the authority for its consideration and approval.

8.4.7 I note that the Department has produced a guidance document on weathertightness remediation[7]. I consider that this guide will assist the owner in understanding the issues and processes involved in remediation work and in exploring various options that may be available to them when considering the upcoming work required to the house.

Matter 2: Other Building Code clauses

9. Discussion

9.1 I have taken account of the expert's comments on the other matters raised in the notice to fix, and I conclude that remedial work is necessary in respect of a number of areas as outlined below.

9.2 The garage

9.2.1 As outlined in paragraph 3.3 the engineer provided calculations and a 'Producer Statement – Design' to support the addition of a garden to the garage roof, which I note has been submitted to the authority. The excavation has been observed by the same geotechnical engineers who had completed the site investigation, and the architect confirmed he had inspected the exaction and observed the construction of the foundations. The geotechnical engineers have acknowledged this observation.

[7] External moisture – A guide to weathertightness remediation. This guide is available on the Department's website, or in hard copy by phoning 0800 242 243

9.2.2 I note the expert's comments on the moisture penetration into the garage, and accept that this appears to be limited to the top of the rear retaining wall and is not sufficient to cause 'undue dampness or damage' within the garage space. However, I also acknowledge the authority's concerns regarding the effect of the moisture on the durability of the steel reinforcing in the retaining wall.

9.2.3 I consider that the top of the rear retaining wall, where the membrane is peeling away from the concrete and allowing moisture to penetrate behind the following area, requires attention.

9.2.4 I consider there is sufficient evidence to establish that the garage complies with Clause B1. In addition, I consider that satisfactory resolution of the items outlined in paragraph 9.2.3 is likely to result in the garage wall being brought into compliance with Building Code Clauses E2 and B2 (insofar as they relate to B1).

9.3 Surface water

9.3.1 Taking account of the expert's report, I conclude that remedial work or further investigation is necessary in respect of the areas outlined in paragraph 5.9.2.

9.3.2 I consider that satisfactory rectification or resolution of the items outlined in paragraph 5.9.2 will result in the building work being brought into compliance with Clause E1 of the Building Code.

9.4 Safety from falling

9.4.1 Taking account of the expert's report, I conclude that remedial work is necessary in respect of the areas identified in paragraph 5.10.1.

9.4.2 I consider that satisfactory rectification of the areas identified in paragraph 5.10.1 will result in the building work being brought into compliance with Clause F4 of the Building Code.

10. What is to be done now?

10.1 This determination has identified a number of areas where remedial work or further investigation is required. These areas are described in the following paragraphs:

- Paragraph 5.6 (weathertightness of the wall cladding)
- Paragraph 6.3 bullet points 1 and 4(weathertightness of the roofing)
- Paragraph 9.2.3 (durability of the garage retaining walls)
- Paragraph 5.9.2 (surface water drainage)
- Paragraph 5.10.1 (safety from falling for the external siteworks).

10.2 The notice to fix should be modified to take into account the findings of this determination. The modified notice shall require the owners to bring the house into compliance with the Building Code identifying the matters identified above which require remedial work or further investigation, and referring to any further defects that might be discovered in the course of investigation and rectification.

10.3 I also note that under the Act, a notice to fix can require the owner to bring the house into compliance with the Building Code, but in previous determinations I have formed the view that a notice to fix cannot specify how compliance is to be achieved. It is important to note that the Building Code allows for more than one means of achieving code compliance.

10.4 The owners, in response to the modified notice to fix, should produce a detailed proposal, assisted by a suitably qualified person, as to the rectification or otherwise of the listed defects. The proposal is to be submitted to the authority for approval. Any outstanding items of disagreement can then be referred to the Chief Executive for a further binding determination.

11. The decision

11.1 In accordance with section 188 of the Building Act 2004, I hereby determine that:

- the external envelope does not comply with Building Code Clauses B2 and E2
- for the other building elements:
  - the garage rear walls do not comply with Building Code Clauses E2 and B2
  - the surface water drainage does not comply with Building Code Clause E1
  - the exterior siteworks do not comply with Building Code Clause F4.

and I accordingly confirm the authority's decision to refuse to issue a code compliance certificate.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 8 October 2009.

John Gardiner
Manager Determinations