Department of Building and Housing
Te Tari Kaupapa Whare

Determination 2009/114

The issue of a notice to fix and the code-compliance of mortar jointing of concrete block cladding at 1246 Matapouri Road, RD3, Whangarei

1. The matters 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 J Wooley ("the applicant") acting through the builder of the house ("the builder"), and the other party is the Whangarei City Council ("the authority"), carrying out its duties and functions as a territorial authority or a building consent authority.

1.2 This determination arises from the decision of the authority to issue a notice to fix for a new house because it was not satisfied that the concrete block veneer cladding ("the block veneer") had been installed in accordance with the building consent as required by section 40(1) of the Act[2].

1.3 In order to determine whether the decision to issue the notice to fix was correct, under section 177(b)(iv) of the Act, I must also consider whether the block veneer cladding to the house complies with the specifications approved under the building consent and with the Building Code. The cladding includes the components of the system (such

[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

[2] 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.

as the concrete blocks, the cavity, the ties and the mortar joints), as well as the way the components have been installed and work together.

1.4 I note that the notice to fix included the option of seeking a determination as a means of remedying the particulars of non-compliance listed in the notice (see paragraph 3.4.2). While a notice to fix may require a building to be brought into compliance with the Building Code, I consider that naming an application for a determination as a remedy is not appropriate. I consider that any suggestion of such a course of action is better suited to inclusion within a covering letter.

1.5 In making my decision, I have considered the submissions of the parties, the report of the expert commissioned by the Department to advise on this dispute ("the expert"), and the other evidence in this matter.

2. The building work

2.1 The building work consists of a single-storey house on a levelled platform in a large coastal rural site, which the authority has defined as a wind zone requiring 'specific engineering design' for the purposes of NZS 3604[3]. Construction is generally conventional light timber frame, with concrete slabs and foundations, profiled metal roofing and aluminium windows. The main wall cladding is concrete block veneer, with panels of fibre-cement weatherboards above windows and at clerestory walls. The weatherboards are installed over a drained cavity.

2.2 A 20^{o} pitch gable roof to most of the house steps up at the western end, with a monopitched clerestory section above the main entry. Eaves and verges are generally 600mm. The house is fairly simple in plan and form, and is assessed as having a low weathertightness risk.

2.3 I have received no information as to the timber framing to this house. The specification calls for the wall framing to be H1.2 and the authority's pre-line inspection on 19 August 2008 passes the 'framing timber treatment'. Given the date of construction in 2008, I consider that the external wall framing is treated.

2.4 The block veneer cladding

2.4.1 The main wall cladding is 90mm block veneer, with stainless steel ties that bridge a 40mm cavity and fix through the building wrap to the framing. The specification names the brand and colour of the 390mm x 190mm x 90mm (width x height x depth) concrete blocks and the mortar, and calls for the veneer to be installed in accordance with the manufacturer's instructions. Mortar mixes and tolerances are specified to be in accordance with NZS 4210[4].

2.4.2 I note that Section 2.9 of NZS 4210 covers veneer and cavity wall construction. The commentary to 2.9.3.2 describes the veneer as a rain screen with a drained and ventilated air gap. The Mortar tolerances earlier in the Standard may be considered to be less critical in this application.

[3] New Zealand Standard NZS 3604:1999 Timber Framed Buildings
[4] New Zealand Standard NZS 4210:2001 Masonry construction: Materials and workmanship

2.4.3 On 16 October 2009, the bricklayer, a 'NZ Registered Mason' provided a 'Brickwork Compliance Certificate' stating that the house complies with NZS 4210. The certificate also states:

> Expansion joints are situated as required. They follow the horizontal and vertical mortar joints and are not visible from the exterior of the building.

3. Background

3.1 The authority issued a building consent (No 106629) dated 31 March 2008 for the building work.

3.2 The authority carried out various inspections during construction, including a pre-cladding inspection on 10 September 2008 which included the partly-completed block veneer and the cavity. The authority has stated that the 'work inspected was on the front of the garage only'. The inspection record noted:

> Brick inspection – base rebate mulsealed – wrap is tight & fixed with PVC tape. Ties are S/S at correct spacings, two ties above horizontal slip joint. Cavity 40mm and clean. OK to continue veneer.

3.3 Following identification of some structural concerns in late 2008 (including horizontal cracks in mortar joints) building work stopped. Engineering investigations were subsequently carried out and the authority concluded that the mortar cracks were due to 'bad laying and the lack of tooling of joints'. Other structural matters were subsequently remedied and resolved by May 2009.

3.4 The notice to fix

3.4.1 Following an inspection, the authority issued a 'Field Advice Notice' dated 15 July 2009. According to the authority, the 'master mason' contracted for the blockwork, who had subcontracted the work, investigated the work and 'undertook to pull down and re-lay' the garage wall.

3.4.2 The authority issued a notice to fix dated 10 August 2009, which stated that the exterior brickwork did not comply with section 40(1) of the Act, with the particulars of contravention or non-compliance noted as:

> Exterior brickwork non compliant with NZ 4210 as referenced in approved documents (specifications) of building consent 106629, specifically
>
> 1. Mortar joints in excess of allowed tolerance as per Section 2.7.1.3 of NZS 4210
> 2. Joints not tooled in accordance with Section 2.7.7.1 either (a) or (b) of NZS 4210, ie. Flush face – trowelled only
> 3. Lack of control joints as required by manufacturer's specifications as referenced in Section 2.10.1.2 of NZS 4210
>
> To remedy the contravention or non-compliance you must:
>
> 1. Re-lay brick veneer complying with the above standard or seek a Determination from the Department of Building and Housing.

3.5 The Department received an application for a determination on 20 August 2009.

4. The submissions

4.1 The builder forwarded copies of:

- the drawings and specifications
- the consent documentation
- the inspection records
- the notice to fix dated 10 August 2009
- various other statements and information.

4.2 The authority acknowledged the application and made no submission in response. However the authority did provide a submission in response to the expert's report (refer paragraph 5.5).

4.3 A draft determination was issued to the parties for comment on 5 November 2009. The builder accepted the draft on 11 November 2009.

4.4 The authority responded to the draft determination in a submission to the Department dated 16 November 2009, which attached additional information and expanded on the background to the dispute. The authority considered that, while the mortar joints are generally from 5mm to 17mm, the blocks are supposed to have sharp edges and are not a 'rumbled type', and some joints were measured up to 19mm. I have considered the authority's comments and have amended the determination as I consider appropriate.

4.5 The builder responded to the authority's submission on 2 December 2009, attaching a statement from the block veneer manufacturer which is outlined in paragraph 0. The builder stated that the background provided by the authority is not relevant to the matter of the notice to fix, which required the block veneer to be re-laid as it did not comply with NZS 4210. The application for determination was therefore limited to determining whether the veneer complied with the Building Code.

5. The expert's report

5.1 As mentioned 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 2 October 2009 and provided a report on 7 October 2009.

5.2 The expert noted that, except for the brickwork, construction was generally of a 'high standard'. However the expert considered that there appeared to be 'insufficient care taken when setting out and laying the bricks'.

5.3 The block veneer

5.3.1 At various areas of the building, the expert measured the width of openings where joints were raked to provide weep holes between the blocks.

5.3.2 The expert made the following general comments on the block veneer:

- The concrete blocks have a 'rumbled type' finish, with no sharp edges. As joints are flush-finished, this results in the joints appearing to be larger than would be the case with conventional bricks.
- NZS 4210 calls for mortar joints to be 10mm ± 3mm (ie. from 7mm to 13mm), while the mortar joints vary in width from 5mm to 15mm in some locations.
- There are hair cracks appearing where pointing has not been consistently flushed with the block veneer face, leading to a colour variation in the joints.
- The presence of control joints cannot be confirmed.
- The bottom course includes weep holes and the top course includes open vertical joints as an alternative to a 10mm continuous gap. (I note that NZS 3604 provides for this method for ventilating brick veneer cavities).
- The block veneer surface has efflorescence and/or mortar stains in some areas.

5.3.3 The expert also made the following specific comments on the concrete block cladding:

- There is a crack in a cut block at the left of the lintel to the study east window.
- Above the other end of the study east window, there is a hole at the junction of the gutter to the south porch with the study wall.
- The lintel above the same window appears to be buried in the brickwork, with no allowance for expansion.

5.4 A copy of the expert's report was provided to the parties on 13 October 2009.

5.5 The authority responded in a letter dated 27 October 2009 including the following comments:

- The thickness of the mortar joints in some areas was up to 20mm.
- NZS 3604 provides for ventilation of the cavity by way of vents at the top and this is the system used on this house.

6. Discussion

6.1 Control joints

6.1.1 While the expert could not confirm that control joints have been installed, I make the following observations:

- The manufacturer's instructions show that control joints may be formed in a 'sawtooth' line using a polyethylene rod recessed 30mm back from the concrete block face, with mortar subsequently added to complete the joints. When control joints are completed in this manner, they will not be visible when completed.
- Although the veneer was inspected and 'passed' when it was partly completed, the authority has stated that control joints would not have been able to be seen.

- The bricklayer has confirmed that expansion joints were installed as required.

6.1.2 Based on the above and in the absence of any evidence to the contrary, I accept that control joints are likely to have been installed in accordance with the manufacturer's instructions.

6.2 Efflorescence

6.2.1 The expert has observed efflorescence stains to most of the brickwork which detracts from the quality appearance of the installation, and I make the following observations:

- The manufacturer's construction information states that efflorescence can occur to concrete bricks and notes that the staining 'does diminish over time'.
- The specification also refers to efflorescence and outlines cleaning requirements.
- The authority inspected and passed the cavity behind the veneer and the expert has noted no evidence of moisture penetration that could lead to efflorescence.

6.2.2 Based on the above, I consider that the stains to the brickwork are cosmetic, and do not indicate any failure of the brick veneer or of the cavity drainage.

6.3 The mortar joints

6.3.1 The expert's report notes that the concrete block veneer has been installed with variation in mortar joints that does not comply with the specification and the manufacturer's instructions in regards to variation in joint dimensions. I note the expert's comment that the nature of the concrete blocks and the flush pointing leads to the joints appearing to be larger than would be the case with conventional bricks. I also accept that the expert has established that the mortar joint widths vary from 5mm to 15mm in some locations, which does not comply with the requirements of NZS 4210 for mortar joint widths to be 10mm ± 3mm (from 7mm to 13mm).

6.3.2 As joint widths only minimally exceed the requirements, I am of the view that this minor variance is unlikely to have any significant effect on the veneer. I am also of the view that the flush pointing is essentially cosmetic and is not significant. However, I acknowledge that the authority does not accept the expert's opinions on the nature of the blocks and on the maximum joint width in some locations.

6.3.3 I therefore considered it prudent that a statement be provided by the concrete block manufacturer which specifically addresses the effects, if any, of the joint finish and widths in the veneer to this house.

The manufacturer's statement

6.3.4 Subsequent to the draft determination, the builder provided a letter from the 'National Technical Manager' (a registered engineer) for the concrete block manufacturer dated 24 November 2009 regarding the joint finish and widths described in paragraph 6.3.1.

6.3.5 The manufacturer noted that the practice of providing larger or smaller mortar thickness with a flushed mortar finish 'is not uncommon and is often adopted for aesthetic reasons'. The manufacturer also noted:

- that a veneer is a non structural element in terms of NZS3604 and NZS4210,
- the durability of mortar is influenced by the water cement ratio not the thickness of the mortar,
- as stated in NZS4210 veneers do not require waterproofing as the cavity and associated construction requirements ensure compliance with E2 of the NZBC.

6.3.6 The manufacturer concluded that, providing the mortar complied with the requirements of NZS 4210 in other respects, the joint finish and widths are 'likely to still comply with the performance intentions of B1 – Structure, B2 – Durability and E2 – External moisture'.

6.4 Conclusion

6.4.1 Taking account of the expert's report and the manufacturer's statement regarding the mortar joints, I am of the opinion that the block veneer to this house is likely to comply with the Building Code.

6.4.2 However, I also note the expert's specific comments as outlined in paragraph 5.3.3, and I am satisfied that these isolated areas require further investigation and/or rectification.

7. What is to be done now?

7.1 The notice to fix should be modified and reissued to the owner to take account the findings of this determination, identifying the areas listed in paragraph 5.3.3, and referring to any further defects that might be discovered in the course of investigation and rectification, but not specifying how those defects are to be fixed.

8. The decision

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

- the concrete block veneer may not comply with aspects the building consent but will meet the requirements of the Building Code.
- the authority is to modify the notice to fix, 10 August 2009, to take account of the findings of this determination.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 23 December 2009.

John Gardiner
Manager Determinations