Department of Building and Housing
Te Tari Kaupapa Whare

Determination 2009/104

Refusal to issue a building consent for a house with insulated concrete walls at 11 York Road, Riversdale, Southland

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 S Roberts ("the applicant"), acting through the structural engineer ("the engineer") and the other party is the Southland District Council ("the authority"), carrying out its duties as a territorial authority or building consent authority.

1.2 I consider that the matters for determination in terms of section 177(b)(i) of the Act[2] is whether the authority was correct in its decision to refuse to issue the building consent for a proposed house. The authority's decision arises from its view that it had received insufficient information in the supporting documentation for the building consent to be satisfied that it would comply with certain clauses of the Building Code (Schedule 1, Building Regulations 1992). The authority's concerns are in regard to the wall system itself and weathertightness detailing to be used in conjunction with the wall system.

1.3 I have received no evidence relating to a dispute about any other matters related to this proposed building, and this determination is therefore limited to the concrete wall system and the weathertightness detailing used in conjunction with the wall system. By "weathertightness detailing" I mean the windows, doors, and other penetrations, and how these are installed in the wall system. In making my decision, I have considered the submissions of the parties and the other evidence in this matter.

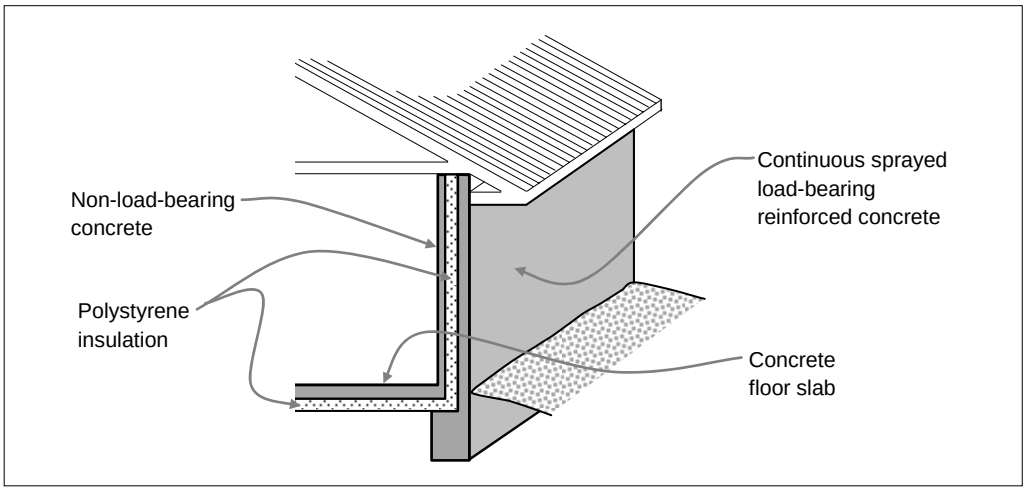
[1] The Building Act 2004 and the Building Code (which is set out in schedule 1 of the Building Regulations 1992) are available from the Department's website: www.dbh.govt.nz.
[2] In this determination, unless otherwise stated, references to sections are to sections of the Act and references to clauses are to clauses of the Building Code.

2. The building work

2.1 The building work covered by the consent consists of a large single-storey detached house situated on a flat rural site in a very high wind zone for the purposes of NZS 3604[3]. Construction is a mix of specifically engineered reinforced concrete and conventional light timber frame, with concrete slabs and foundations, concrete block foundation walls, aluminium windows, composite concrete walls and several panels of weatherboard cladding. The design of the house is assessed as having a low weathertightness risk.

2.2 The house plan is based on a crucible form, with an L-shaped garage wing and a T-shaped bedroom wing to the south. The hipped and gabled roof is single level with a pitch of 30°. Eaves projections are generally 600mm, apart from some garage walls, and there are no verge projections at gable ends.

2.3 The consent documents detail double glazed windows and doors, and 100mm polystyrene beneath the floor slab. The specification calls for a type of glass wool ceiling insulation that has an R-value of 3.6. The following shows the general wall system:



The proprietary concrete wall system

2.4 The proprietary 'sandwich' system ("the concrete wall system") provides 300mm thick composite walls, comprising an outer load-bearing layer of reinforced concrete against a core of expanded polystyrene. The concrete is sprayed on-site to provide a continuous wall system, with the polystyrene connected to the under-slab polystyrene

2.5 The concrete wall system supplier provides a general range of walls with varying thicknesses and thermal qualities. The supplier has had the range of wall types assessed by a product assessment company ("the product assessor") as complying with relevant clauses of the Building Code[4].

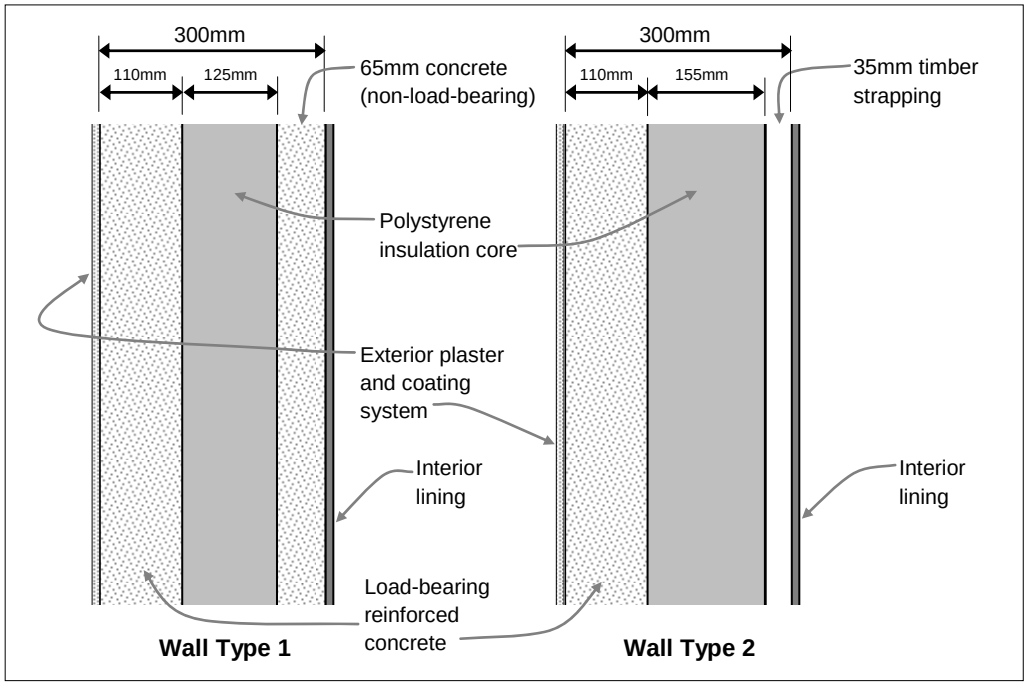
2.6 I note that this compliance assessment does not include Clause E2 in relation to architectural detailing such as windows, doors and other penetrations.

[3] New Zealand Standard NZS 3604:1999 Timber Framed Buildings
[4] Clauses B1, B2, C3, E2, E3, F2 and H1, according to the appraisal No. C903 completed June 2009.

2.7 Two types of concrete walls are proposed for this house:

- Wall Type 1 is a 'radiant' wall that incorporates an inner layer of mesh reinforced concrete, which is not load-bearing, with connector ties transferring loads to the outer concrete. The product assessor calculates the R-value of this wall type at 3.37.
- Wall Type 2 is a 'thermal wall' that has a thicker polystyrene core, and is strapped and lined on the inner face. Taking account of the product assessor's calculations, the R-value of this wall type is likely to be greater than 4.0.

2.8 The wall types proposed for this house are as follows:



2.9 Wall Type 1 is shown in the drawings for those walls with a general northerly aspect, while Type 2 is used for the more southerly walls.

2.10 A cement-based plaster system, finished with a 'high build' acrylic paint system, is specified for the exterior surface of the concrete. Both types are lined with plasterboard on the inside.

The windows and doors

2.11 Most window heads are directly beneath the 600mm soffits. Specifically designed bond beams act as lintels to the openings. At sills and jambs, the concrete outer layer extends over the polystyrene core to provide rebated reveals, with 15° sloping sills.

2.12 All exterior joinery is double glazed, with the specified aluminium profiles incorporating thermal breaks in the form of glass fibre reinforced nylon insulators. The joinery incorporates interior timber reveals, grooved to take the linings.

2.13 The general joinery installation details are similar to those used for conventional concrete block walls. Windows are recessed by about 160mm and face-fixed over the concrete rebate, with air seals and uPVC head, jamb and sill flashings shown.

2.14 At the gable end walls, the wall cladding above windows is rusticated horizontal timber weatherboards fixed through 35mm cavity battens to timber framing. Metal head flashings bridge the cavity and incorporate a 5mm drainage gap.

3. Background

3.1 Prior to applying for a building consent, the applicant communicated with the authority regarding its requirements in support of the application, and provided a preliminary set of drawings and specifications. In an email dated 2 April 2009, the authority listed various items that would be required, including additional information on, and verification of, the concrete wall system.

3.2 The design and development company for the house ("the designer") subsequently lodged an application for a building consent for the building work (No. BLD/2007/43922/1) on behalf of the applicant.

3.3 In order to provide independent verification of the concrete wall system, the supplier commissioned the product assessor to assess the compliance of the systems. An appraisal was completed in June 2009 and forwarded to the authority, which then warned that its requirements for assessing alternative solutions were likely to increase due to the lack of 'liability cover for E2 External Moisture as of 1/7/09'.

3.4 The approval of the concrete wall system as an alternative solution remained unresolved; and, on behalf of the applicants, the engineer submitted an application for a determination to the Department on 12 August 2009 and provided a copy to the authority.

3.5 On 14 August 2009, the authority issued an 'Application Notice' to the applicant, which outlined additional information required to support the application for the building consent. With respect to the determination, the authority explained that its 'internal risk assessment' had placed the concrete wall system at a level requiring independent verification of code compliance 'by way of Product Certification' from the Department.

4. The submissions

4.1 In a statement added to the submission on 14 August 2009, the engineer explained that the authority was becoming increasingly insistent on product certification for the concrete wall system. The engineer considered that this insistence was 'very unreasonable and rather heavy-handed', explaining that the wall system is:

> ...no different than a thermomass wall system or tilt slab panel system in the sense that these wall systems also perform as the external cladding element for the completed structure.

4.2 The engineer forwarded copies of:

- the consent drawings and specifications
- a Producer Statement for Design (PS1) and the appraisal from the product assessor

- correspondence from the authority and various other statements and information.

4.3 The Department sought clarification from the authority on the reasons for declining the building consent application, and on the particular Building Code clauses involved in that refusal.

4.4 In an email to the Department dated 25 August 2009, the engineer explained that the authority stated the reason for refusing the consent was the supporting information for the concrete wall system was insufficient 'verification of Building Code compliance'.

4.5 The Department continued to seek clarification from the authority as to which particular clauses required verification in regard to the concrete wall system.

4.6 In an email to the Department dated 28 August 2009, the authority explained that it had sufficient information about the concrete wall system for Clause B1 by way of the producer statement, but it was reliant on the appraisal for the other relevant clauses. The authority attached a copy of its 'Corporate Risk Matrix', which related the likelihood of failure to the potential for litigation, and confirmed that:

> ...our internal corporate risk assessment has determined that the level of verification required for Building Code compliance is product certification.

4.7 A draft determination was issued to the parties for comment on 21 September 2009.

Submissions in response to the draft

4.8 The engineer, on behalf of the applicant, did not accept the draft determination. In a letter dated 1 October 2009, the applicant provided some amended architectural drawings concerning the weathertightness details for the house.

4.9 The authority accepted the draft determination, however, in an email dated 25 September 2009 noted the following points:

- The [authority] is of the view that it is up to each individual building consent authority to determine what level of supporting information is appropriate in support of alternative solution applications, but determinations such as this perhaps offer some guidance as to where that level should be set.
- … we do not consider the outcome of requiring product certification in support of the concrete wall system as being overly conservative for a cladding system providing structural support to the exterior of the building. Remedying any delamination, structural or the consequences of external moisture failure would be a considerable undertaking for a structural cladding element.

4.10 The authority also attached a letter, dated 25 September 2009, that was sent to the applicant and engineer requesting further information. Throughout the determinations process the authority continued to engage with the applicant and engineer about the building consent. The authority noted specific points about weathertightness details that it considered to be inadequate, reviewed the appraisal by the product assessor and conducted a comprehensive assessment of the technical manual for the concrete wall system. The authority identified fourteen items that it

considered were inadequate and which required 'further information and consideration for inclusion or remedy in the technical manual'.

4.11 In an email dated 1 October 2009, the concrete wall system proprietors responded to the items raised by the authority, having updated a number of details and statements in the technical manual to address the concerns of the authority.

4.12 In an email dated 7 October 2009, the authority responded to the proprietors with further notes addressing the items that it considered the proprietor had not adequately addressed. The items raised by the authority that it considers are still outstanding are:

- Item 3 – the appraisal states the maximum risk score under E2/AS1 is 2, which is very limiting
- Item 8 – the manual states a minimum specified cover of 45m for 30mPa concrete to reinforcing mesh. 'Whilst this is achievable where the mesh is centrally placed in a 100mm thick external Thermal or Radiant wall system, it is not achievable for the 65mm thick Radiant exterior wall even with 60mPa concrete'.
- Item 9 – the washer sizing should be specified in the 'Components' section of the manual
- Item 11 – the manual does not state the nail plate sizing for junctions of the LVL wall plate, and are not temporary, as the LVL plates are a structural element for securing roof framing to for which the plate junctions need to be secured at corners and joins in straight runs
- Item 14 – the technical details do not include details for weatherproofing of a particular wall type, fitting of electrical flush boxes and conduit ducting for wiring, and sleeving of wiring where it has to penetrate the polystyrene core and exterior concrete.

4.13 Regarding Item 3, I note the appraisal states a score of two is the maximum risk score for the intersections of roof to cladding from E2/AS1. The roof to wall intersection design must therefore be low or medium risk, so either fully protected or only partly exposed.

4.14 The parties continued to correspond and in an email to the applicant dated 30 October 2009 the authority confirmed its approval of the concrete wall system in general as an alternative solution subject to a number of conditions.

4.15 In a letter to the applicant, dated 28 October 2009, the authority noted compliance matters other than the use of the concrete wall system. These matters do not appear to be in dispute and I leave their resolution to the parties to resolve.

5. The information provided in support of the building consent application

5.1 In order for the authority to form a view as to code compliance of the concrete wall system it needed to consider the evidence that was available. In this case, the evidence at the time the application for a building consent was made consisted of:

- the available technical information on the wall system, including:
  - the detailed drawings for the house
  - the engineer's descriptions of the wall system
  - the appraisal dated June 2009 from the product assessor.
- the history of use of comparable wall systems.

5.2 The history of use

5.2.1 The engineer maintains that the concrete wall system is no different from a thermomass wall or a concrete tilt slab panel system, where the outer concrete acts as the exterior cladding for the structure.

5.2.2 With regard to joinery installation details and other junctions within the wall, I consider that the wall system proposed for this house may also be compared to a reinforced concrete block structure. I also consider that the surface finishes are commonly used materials.

6. Evaluation of compliance

6.1 General

6.1.1 The authority required that the applicant apply for product certification for the concrete wall system before it would accept the system as compliant with the Building Code. The authority had noted in an earlier submission that it accepted that the wall system will comply with Clause B1 (refer paragraph 4.4). However, the authority subsequently undertook a comprehensive assessment of the wall system (refer paragraph 4.10).

6.1.2 Although the authority requested the applicant apply for product certification for the wall system, the engineer is of the view that the wall system does not include the weathertightness detailing as this is up to the designer to provide. I concur with this view which is also borne out in the proposed consent documentation. The wall system is detailed in the structural plans, specification and structural calculations; while the remaining details including the weathertightness details, are contained in the architectural plans and corresponding specification.

6.1.3 From my reading of the appraisal for the concrete wall system, while it says the system will comply with Building Code Clause E2, it does not specifically include weathertightness details. The weathertightness details should therefore have been considered on their merits and not as part of the concrete wall system.

6.2 Risk assessment

6.2.1 The authority stated in its submission of 28 August 2009 that its risk assessment for the wall system and its weathertightness detailing as an alternative solution included the use of an 'internal corporate risk assessment' to establish the 'level of verification' deemed necessary. The authority provided a copy of this document with its submission.

6.2.2 I note that the 'corporate risk assessment' provided by the authority is a document that addresses matters such as potential litigation not compliance with the building code. These may be relevant to aspects of the authority's activities but, under section 49 of the Act, the assessment of building work proposed by an applicant for a building consent shall be against the requirements of the Building Code. The decision an authority is required to make is whether it can be satisfied on reasonable grounds that the proposed work will comply with the Building Code when it is completed in accordance with the plans and specifications.

6.2.3 The evaluation of building work and the risk factors in regards to weathertightness have been described in numerous previous determinations[5] (for example, Determination 2004/1). This house has the following features which influence its weathertightness profile:

Features increasing risk

- the house is in a very high wind zone
- the house has several other claddings, resulting in inter-cladding junctions

Features decreasing risk

- the house is one-storey high
- the plan and form is fairly simple, with a continuous roof
- most walls have eaves projections to shelter the walls
- the external concrete walls are continuous, and finished with a plaster system
- timber wall framing is limited to small areas that incorporate drained cavities
- the external wall framing is treated to a level that provides resistance to decay if it absorbs and retains moisture

6.2.4 When evaluated using the E2/AS1 risk matrix, these features show that all elevations of the house demonstrate a low weathertightness risk rating.

6.3 Evaluation of compliance

The weathertightness detailing

6.3.1 Generally the drawings indicate that the wall systems, if installed in accord with the manufacturer's specifications and good trade practice will be weathertight and durable. However, I also note that there are several details that are unclear or not sufficient to ensure the weathertightness, including:

- the weatherboard to concrete wall junctions
- the junction of the weatherboard window head with the concrete jamb detail
- the relevance of the weatherboard jamb and sill details
- the chimney stone cladding to concrete junctions.

[5] Copies of all determinations issued by the Department can be obtained from the Department's website.

The concrete wall system

6.3.2 The authority had stated that it had sufficient information about the concrete wall system for Clause B1, but it was reliant on the appraisal for the other relevant clauses. I have reviewed the information supplied to the authority and considered the relevant clauses of the Building Code in the following paragraphs.

6.3.3 The documentation provided with the building consent application showed a variety of masonry fixings to be used to fix members to the concrete structure. In my view clarification is required to determine what masonry fixings are used and that the fixings used are installed with adequate edge distances to ensure ongoing compliance with Clause B1 and B2.

6.3.4 I note that the only information that appears to be lacking to provide verification that the building will comply with Clause H1, are calculations for the building envelope to establish the total thermal resistance of the concrete wall system. However, I consider it likely that the building will meet or significantly exceed the minimum R-values stated in H1/AS1.

6.3.5 For solid masonry walls, E3/AS1 accepts that an R-value of at least 0.6 will meet the Clause E3 requirements for thermal resistance. R-values established in the calculations for the thermal resistance will establish compliance with Clause E3.

6.3.6 I note that the surface finishes to the concrete wall system are a cement-based plaster system to the exterior and plasterboard linings to the interior, both of which are commonly-used finishes that will comply with the requirements of Clause C3.

6.3.7 The composite walls are made up from commonly used building materials, and I am therefore also satisfied that the concrete wall system will comply with the requirements of Clause F2.

6.4 Conclusion

6.4.1 I consider that this type of wall system uses common materials and techniques; and cannot therefore be described as particularly unusual. I take the view that the evidence included within the consent application, when supplemented with the remaining information described in this determination, will be sufficient for the authority to establish compliance with the Building Code.

6.4.2 I do not consider the authority was justified in requiring product certification for the concrete wall system in order to determine the code compliance of the proposed building. However, I welcome the authority's subsequent decision to undertake the comprehensive assessment.

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

7. What is to be done now?

7.1 I note that the authority has subsequently approved the concrete wall system subject to a number of conditions, and that the remaining outstanding matters do not appear to be in dispute.

7.2 If these remaining details cannot be agreed with the authority, any items of disagreement can then be referred to the Chief Executive for a further binding determination.

8. The decision

8.1 In accordance with section 188 of the Act, I hereby determine that the authority's decision to refuse to issue the building consent was correct based on inadequate information supplied to the authority with the building consent application to establish that:

- the weathertightness details would comply with Building Code Clauses B2 and E2
- the concrete wall system would comply with Building Code Clauses B1, H1, and E3.

8.2 I find that there was adequate information supplied to the authority with the building consent application to establish that the concrete wall system complies with Building Code Clauses C3 and F2.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 20 November 2009.

John Gardiner
Manager Determinations