



Determination 2014/017

Regarding the compliance of three types of schist wall cladding systems proposed for future houses located in the Queenstown and Arrowtown areas

1. The matters to be determined

1.1 This is a determination under Part 3 Subpart 1 of the Building Act 2004¹ (“the Act”) made under due authorisation by me, John Gardiner, Manager Determinations and Assurance, Ministry of Business, Innovation and Employment (“the Ministry”), for and on behalf of the Chief Executive of the Ministry.

1.2 The applicant is the designer of existing and proposed houses, M Scaife (“the designer”), who is a licensed building practitioner. The other party is Queenstown Lakes District Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.

1.3 The reason for the application

1.3.1 The application for this determination arises because:

- the authority had issued building consents and code compliance certificates for various existing houses that included wall cladding similar to the proposed schist wall claddings (“the schist cladding systems”)
- the authority’s proposed refusal to issue a building consent for construction of a house (“the 2013 house”) which specified schist claddings because it was not satisfied that the claddings would comply with certain clauses² of the Building Code (Schedule 1, Building Regulations 1992)
- although cladding details for the 2013 house were amended to incorporate a drained cavity, the designer has sought a determination on the compliance of the schist cladding systems as originally proposed.

1.4 The matter to be determined³ is therefore whether the proposed schist cladding systems will comply with Clause B1 Structure, Clause E2 External Moisture and Clause B2 Durability of the Building Code. The schist cladding systems include the components of the systems (such as the schist stone, the mortar, the backing materials, the drainage layer and the waterproofing membrane), as well as the way the components are proposed to be installed and work together.

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

² In this determination, unless otherwise stated, “sections” are sections of the Act and “clauses” are clauses of the Building Code.

³ Under section 177(1)(a) of the Act

1.5 Matters outside this determination

1.5.1 The application for this determination does not include documentation for specific building work and the proposed schist cladding systems are considered on a general basis. Although structural matters associated with the proposals are commented on, compliance with Clause B1 Structure will rely on engineering design for a specific building on a specific site at the time of building consent application.

1.5.2 There is no evidence of disputes about any other matters related to the proposed schist cladding systems and this determination is limited to the matter outlined in paragraph 1.4.

1.5.3 This determination refers to other houses proposed and/or constructed in the past. While not part of the matter to be determined, various aspects of their wall systems have informed the process of reaching conclusions about the subject schist cladding systems. In this determination, these other buildings are referred to as follows:

- a garage/sleepout completed in 2004 (“the 2004 house”)
- a house completed in 2010 (“the 2010 house”)
- a house consented in 2013 (“the 2013 house”)
- a house design currently underway (“the 2014 house”).

1.6 In making my decision, I have considered the designer’s submission, the report of the expert commissioned by the Ministry to advise on this dispute (“the expert”), and the other evidence in this matter.

2. The schist cladding systems

2.1 The proposed use

2.1.1 The designer proposes to use the schist wall cladding systems for a variety of future designs on a variety of building sites. Locations are expected to include sites in and around the Queenstown and Arrowtown areas that:

- may be elevated, exposed and of any orientation
- may have steeply sloping contours
- are in a wind zone up to very high for the purposes of NZS 3604⁴
- are predominantly in low corrosion zones for the purposes of NZS 3604
- may include onsite drainage or be connected to public services.

2.1.2 The schist wall cladding systems are intended to be installed on buildings that:

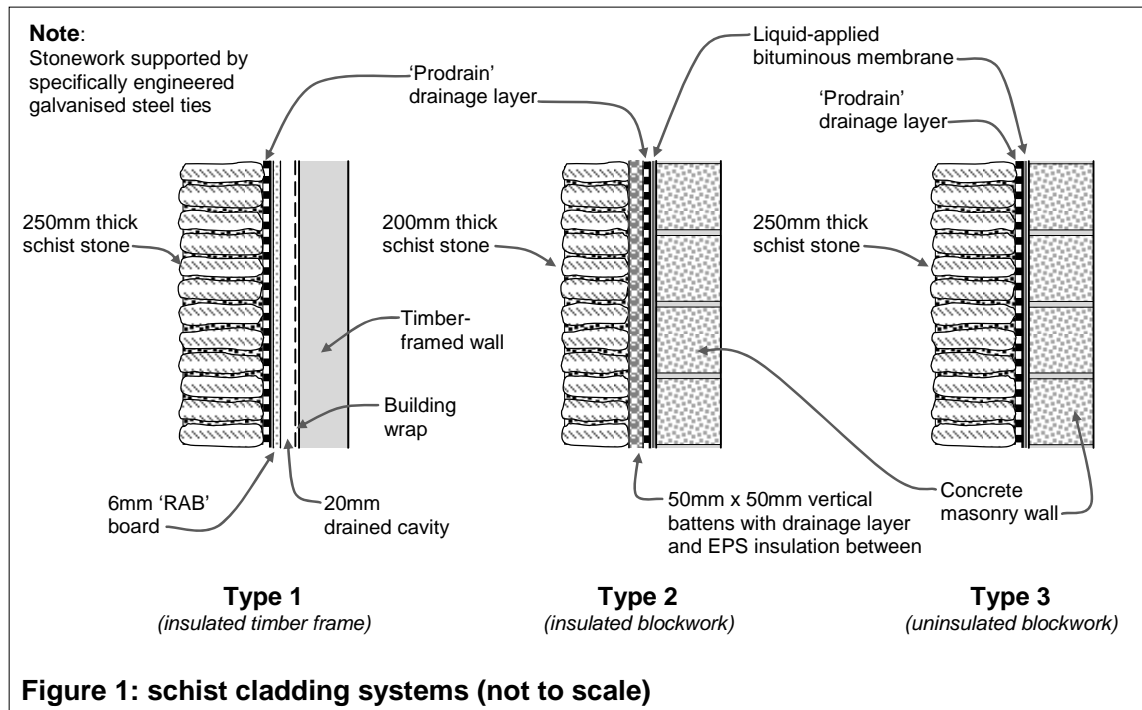
- are a maximum of two-storeys high
- have concrete ground floor slabs and foundations
- have concrete masonry and/or light timber frame construction
- may have a mix of schist cladding systems and/or other wall claddings
- have characteristics resulting in a maximum weathertightness risk of high⁵.

⁴ New Zealand Standard NZS 3604:2011 Timber Framed Buildings

⁵ A weathertightness risk score of 20 or less according to E2/AS1 Section 3

2.2 The cladding types

2.2.1 There are three types of schist cladding systems proposed as shown in Figure 1:



2.2.2 The characteristics of the different types are as follows:

- Type 1 (for use on timber framed construction)
 - Drainage sheets and fibre-cement backing sheets are fixed through 20mm H3 cavity battens and the building wrap to the framing.
 - The stonework is installed over the drainage layer and fixed to the framing with specifically engineering galvanised steel ties.
- Type 2 (for use on insulated concrete block construction)
 - The concrete blockwork is coated with a bituminous damp proof membrane, and 50mm x 50mm H3.2 treated vertical battens are fixed at 600mm centres through the membrane into the blockwork.
 - Drainage sheets are laid over the membrane between the battens and expanded polystyrene insulation is installed over the drainage sheets.
 - The stonework is supported from the battens with specifically engineered galvanised steel ties.
- Type 3 (for use on concrete block walls to uninsulated spaces):
 - The concrete blockwork is coated with a liquid-applied bituminous damp proof membrane and drainage sheets are installed over the surface.
 - The stonework is installed over the drainage layer and fixed to the blockwork using specifically engineered galvanised steel ties.

2.2.3 The drainage layer is provided by a polymer sheet with a non-woven geotextile attached to one side. The polymer sheet incorporates a dimpled surface that creates voids to allow moisture to freely drain down to the outside. The sheets are overlapped and glued at joints. The product is manufactured for use on vertical and horizontal applications.

3. Background

- 3.1 Over the past ten years the authority has issued building consents for buildings that incorporate schist wall cladding systems similar to those considered in this determination. Two examples provided by the designer are the 2004 house and the 2010 house. However, the authority has recently changed its position.
- 3.2 Prior to the designer applying for a building consent for the 2013 house, the authority apparently put forward its view that stone cladding systems should be based on brick veneer. On 28 February 2013, the authority sought further information regarding the cavity and whether it was completely filled.
- 3.3 The designer responded on the same day, noting that the cavity was provided by the drainage sheet just as it would be if behind a retaining wall allowing a cavity of approximately 20mm. The designer noted there are not schist ties bridging the drained space as all ties were to be fixed to vertical battens, and that therefore the drained space was uncompromised.
- 3.4 On 28 February 2013 the authority emailed the designer stating that
- 40mm cavity [the authority] will accept as an acceptable alternative solution (sic), 20mm cavity [the authority] will accept but with comprehensive documentation demonstrating compliance with E2, no cavity will need to go to the [Ministry] for a determination.
- 3.5 In response to a draft determination the authority submitted that its concern was that the cavity would be filled with EPS and would not provide a drained and ventilated cavity behind the schist. I have taken this as the authority's proposed refusal to grant a building consent.
- 3.6 Time constraints prevented the designer from seeking a determination on the matter and the 2013 house design was amended to suit the authority's requirements. The designer is currently preparing documentation for the 2014 house, which will be a second stage to the 2004 house. Wishing to use similar wall systems as used in the past, the designer has sought a determination on the compliance of the proposed schist cladding systems prior to applying for a building consent for the house.
- 3.7 The Ministry received the application for a determination from the designer on 19 November 2013 and sought clarification from the parties. In subsequent email correspondence, additional information on the proposed systems was provided.

4. The submissions

- 4.1 In his submission and subsequent emails, the designer described similar schist wall cladding used for the 2004 house and the 2010 house. He noted that the 2013 house design was amended to suit the authority's current requirement that schist cladding systems should accord with brick veneer detailing by incorporating a 40mm cavity. The designer also noted that neither of the existing houses had experienced any problems, with the owners of the 2004 house wanting to use a similar system in the 2014 house due to the good thermal performance of the existing building.
- 4.2 The designer forwarded copies of:
- extracts from drawings of the 2004 house and the 2010 house
 - the original specification for the 2013 house (subsequently amended)
 - proposed details of schist wall cladding for the 2014 house.

- 4.3 The authority acknowledged the application, but made no formal submission. In subsequent email correspondence the authority explained that it required a specific alternative solution application to show how the cladding complies with the Building Code. The authority noted that the closest Acceptable Solution was that for brick veneer, and proposals for schist cladding with less than a 40mm cavity must therefore demonstrate how adequate drainage and drying is provided. The authority also noted that ‘because we have approved something before does not necessarily mean that we will approve the same design in the future’.
- 4.4 On 10 February 2014 the designer emailed the Ministry in response to the expert’s report; noting that his understanding of the findings was that:
- the basic construction method concerning drainage, with and without the specified cavity and/or drainage board, is acceptable
 - other construction details, such as junctions, will need to be specifically detailed, specified and assessed by building consent authorities on a case by case basis
 - where the schist cladding is in excess of 220kg/sqm, all structural aspects of the schist veneer construction for residential buildings will need to be designed, assessed and certified by a structural engineer on a case by case basis.
- 4.5 A draft determination was issued to the parties for comment on 17 February 2014.
- 4.6 On 25 February 2014 the designer accepted the draft determination without further comment.
- 4.7 The authority responded by email on 4 April 2014, noting that it had not made a formal refusal to issue the consent (refer paragraphs 1.3.1 and 3.5) but that it believed there wasn’t appropriate information to demonstrate compliance. The authority stated its view regarding the background to the dispute (refer paragraph 3.5) and that the authority considered the type 1 design would be approved as an Acceptable Solution, but types 2 and 3 did not have a sufficient level of information to establish compliance as an alternative solution.

5. The evidence available to establish compliance

- 5.1 In order for me to form a view as to the likely compliance of the proposed schist wall systems with the Building Code I need to establish what evidence is available. In this case, the evidence includes:
- annotated details of proposed schist cladding types provided by the designer, which are based on similar details used in existing houses
 - the history of use of comparable wall systems, which includes details and specifications for houses proposed or constructed in the past
 - the expert’s report on the proposed wall systems, which includes visits to two existing houses constructed with comparable wall systems (see paragraph 6).
- 5.2 It is accepted that stone cladding systems have been and are still commonly used in many other countries. In addition, schist wall cladding systems have been used in the Otago region over many years, with examples of older buildings relatively common. The predicted performance of these proposed wall systems over an expected lifetime of 50 years may therefore be compared with those of existing systems.

6. The expert's report

6.1 General

- 6.1.1 As mentioned in paragraph 1.6, I engaged an independent expert to assist me. The expert is a member of the New Zealand Institute of Architects and inspected the 2004 house and the 2010 house on 20 January 2014, providing a report completed on 28 January 2014 which was forwarded to the parties on 30 January 2014.
- 6.1.2 The expert noted that his investigation included discussions with the designer, inspections of schist cladding on the 2004 and the 2010 houses, meeting with authority officials, and literature research on schist stone. The expert also described the range of building types and building sites applicable to the designer's proposed cladding systems.
- 6.1.3 The expert made the following general comments on the characteristics of schist:
- As a material, schist
 - is a metamorphic rock which often contains significant amounts of mica which allows the rock to split into thin pieces
 - is formed from other rocks by the metamorphic processes of heat and pressure, so its properties can vary considerably.
 - As a building material
 - schist has been used to construct walls of buildings in the Otago region and elsewhere for over 150 years
 - there is a shorter history for the use of schist on timber-framed and concrete block buildings
 - its use tends to remain as a 'craft business dependent upon the experience and integrity of the quarryman and the stonemason'
 - formal quality assurance and testing regimes are not standard practice and not all stonemasons belong to a trade organisation.

6.2 The proposed schist cladding systems

- 6.2.1 The expert described the three proposed types of schist cladding, based on the annotated details submitted for the determination and also on his discussions with the designer. These are shown in Figure 1 and described in paragraph 2.2.
- 6.2.2 The expert noted that information provided by the designer did not cover the schist itself, with no description of 'its source, size limits and physical, chemical and petrographic properties, or which of the various ways of laying it are intended.' The expert also noted that the mortar mix and joint size were not stated.

6.3 The 2004 schist cladding

- 6.3.1 The expert visited the 2004 house, which is a concrete block building set into an excavated sloping site with a basement garage that extends out to form a roof deck from the upper floor. The expert noted that wall surfaces had a partially plastered finish with relatively small areas of exposed schist.
- 6.3.2 The expert observed that the garage walls extend up to form parapet balustrades capped with flat capping stones. Schist cladding similar to Type 2 had been applied to upper walls, with Type 3 to the garage/balustrade walls. However, the latter have stones fixed directly over the membrane, with no drainage layer incorporated.

- 6.3.3 The expert observed water staining to the garage/balustrade walls and considered that these resulted from moisture entering the flat unsealed balustrade capping. As there was no drainage layer, moisture can be trapped within the mortar for long periods and result in efflorescence. However there was no sign of moisture reaching the painted concrete block surfaces of the garage interior below the balustrade wall.
- 6.3.4 The expert inspected the interior of the house and took non-invasive moisture readings. He saw no evidence of moisture penetration and noted that all readings were low, including two locations where the stone cladding was wet on the outside.
- 6.3.5 The expert concluded that the lack of evidence of any moisture ingress into the interior over the past nine years indicated that the cladding had remained adequately weathertight.

6.4 The 2010 schist cladding

- 6.4.1 The expert also visited the 2010 house, which was a single-storey detached house on a level site with concrete block walls and schist cladding similar to Type 2. The expert noted the lack of weep holes to the base of the cladding and the inclusion of some perpendicular stones to the cladding surface, rather than all stones being laid parallel to the bedding plane⁶.
- 6.4.2 The expert inspected the interior of the house and noted that the interior linings were free from blistered paint, discolouration, or swollen trim. No other evidence of moisture penetration was noted and the expert considered this indicated adequate weathertightness performance over the past two to three years.

6.5 Clauses B1 and B2

- 6.5.1 The expert noted that the authority had elected to compare schist cladding to the Acceptable Solutions for brick veneer. However, Type 1 cladding has a cavity of only 20mm, while Types 2 and 3 have no cavity.
- 6.5.2 The expert considered the compliance of the cladding systems with Clause B1 Structure. All three cladding systems incorporate 200-250mm thick schist that would weigh approximately 480-750kg/m². The expert noted this placed the veneer outside the scope of E2/AS1, NZS 3604, and the masonry veneer section of NZS 4229, which are limited to veneers with a mass of less than 220kg/m². Consequently specific engineering design was considered necessary in respect of:
- vertical loads, such as foundation and upper floor nibs etc
 - horizontal loads, such as design, spacing and fixing of ties
 - bracing design to accommodate the weight of the stone cladding
 - the size and spacing of control joints
 - the mix and strength specified for the mortar.
- 6.5.3 The expert assessed the compliance of the cladding systems with Clause B2 Durability, noting that:
- based on discussions with BRANZ and a building surveyor operating in the region over the past 40 years, along with other searches, there are no records of schist failures

⁶ Contrary to NZS 4210, para C2.1.4.4 (New Zealand Standard NZS 4210:2001 Masonry construction: Materials and workmanship)

- ties for Type 2 are proposed to be fixed to battens, which are intended to be H3.2 treated, so ties should be either separated by DPC or be specified as stainless steel to prevent corrosion to the steel ties.

6.6 Clauses E2 and B2

6.6.1 The expert assessed the weathertightness and durability of the three types of proposed cladding systems.

6.6.2 In regard to Type 1, the expert made the following comments:

- The schist is installed against a backing board and a 20mm drained cavity separates the cladding from the timber framing.
- The 40mm cavity required for brick veneer arises from the need to allow for potential narrowing of the cavity by mortar and practical requirements of bricklaying; the backing sheets for Type 1 prevent such problems.
- Brick veneers are porous and the cavity design assumes that the back of the masonry may be wet. However, Type 1 incorporates a drainage layer over backing sheets to allow moisture to escape before reaching the cavity.

6.6.3 In regard to Type 2, the expert made the following comments:

- A bituminous membrane is applied over the concrete block surface, with drainage sheets installed. The membrane and drainage layer are manufactured for high risk applications such as below-ground tanking.
- Although timber battens are fixed through the membrane, the drainage layer installed between battens will drain moisture away. Moisture would need to penetrate stone and the batten in order to reach the batten fixings.
- Given that the concrete block wall is not vulnerable to water damage, any rare minor leak would not be likely to result in a lack of adequate weathertightness.

6.6.4 In regard to Type 3, the expert noted that weather resistant elements are similar to those of Type 2 would also be expected to provide adequate weathertightness. (I also note that the lack of battens allows a continuous drainage layer over the continuous membrane weatherproof layer.)

6.7 Documentation

6.7.1 The expert noted that code compliance certificates for future buildings using the proposed cladding would be issued under the Act on the basis of compliance with the building consent. The standard of documentation required for the building consent is therefore higher than was necessary under the Building Act 1991.

6.7.2 For buildings using the subject cladding systems, the expert considered that an application for a building consent should include:

- details of joinery details, control joints, eaves and other relevant junctions; provided at an appropriate scale to demonstrate compliance with Clause E2
- structural calculations and details to demonstrate compliance with Clause B1
- specifications and drawing notes to demonstrate compliance with Clause B2, including adequate specification of the schist materials and installation.

6.8 Outcome

- 6.8.1 The expert considered that schist masonry has an established service record and, given appropriate control on stone selection and masonry techniques, the material is expected to be adequately durable.
- 6.8.2 The expert also expected that the subject schist cladding systems would meet the relevant requirements of the Building Code, subject to the provision of the following for each application for building consent:
- specific engineering design covering the stability and support of the schist cladding and its effects on the building structure
 - appropriate detailing and specification of all junctions and intersections
 - assurance of adequate quarrying, stone selection and masonry application.

7. Discussion

- 7.1 The expert's report, the established service record of schist construction and the absence of any evidence to the contrary provide me with reasonable grounds to conclude that the proposed schist cladding systems will comply with the Building Code if appropriately documented and installed for each consent application in accordance with the criteria identified by the expert in paragraph 6.8.2.
- 7.2 I also note that the Act allows the authority to set reasonable requirements for the documentation that accompanies applications for building consents. The authority is entitled to set minimum requirements to ensure that the proposed building work is clearly documented and to require the applicant to clearly demonstrate and document how compliance is to be achieved for those areas it considers unclear.
- 7.3 Documentation in support of a building consent must provide a compliant solution and also be sufficiently clear to describe how that solution is to be achieved through the construction process, and must detail critical features in order to allow the authority to appropriately inspect the construction of that work and to assess it against a coherent set of consent documents.

8. The decision

- 8.1 In accordance with section 188 of the Building Act 2004, I hereby determine that the proposed schist wall cladding systems Type 1, Type 2 and Type 3 as described in this determination will comply with Clauses B1, B2 and E2 of the Building Code, if adequately documented for each future application for building consent.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 8 April 2014.

John Gardiner
Manager Determinations and Assurance