

Determination 2004/81

Refusal of a building consent for a building with a “monolithic” cladding system: House 64

1 THE DISPUTE TO BE DETERMINED

- 1.1 This is a determination under section 17 of the Building Act 1991 as amended by section 424 of the Building Act 2004 (“the Act”). The application was made by the owner who subsequently appointed the manufacturer of a polystyrene sheet cladding system used in the building to be the owner’s agent. Throughout this determination I refer to the owner and agent as “the owner”. The other party is the territorial authority (“TA”). The application arises from the refusal by the territorial authority to issue a building consent for a proposed new house unless changes are made to its monolithic cladding system as proposed by the owner.
- 1.2 My task is to consider whether there exist reasonable grounds to suppose that the external wall cladding (the “cladding”) as proposed in the plans and specifications for this house will, if properly completed in accordance with those plans and specifications, meet the provisions of the building code (section 34 (3) of the Act). In this context “external wall cladding as proposed” means the components of the system (such as the backing sheets, the flashings, the joints and the coatings) as well as the way in which the components are proposed to be installed and to work together.
- 1.3 In making a decision, no consideration was given to any other aspects of the Building Act or the building code (The First Schedule to the Building Regulations 1992).
- 1.4 The house itself described in paragraphs 2.1 to 2.4, and section 7 sets out the final decision.
- 1.5 This determination is made under the Building Act 1991 subject to section 424 of the Building Act 2004. That section came into force (“commenced”) on 30 November 2004, and its relevant provisions are:

“... on and after the commencement of this section, --

“(a) a reference to the Authority in the Building Act 1991 must be read as a reference to the chief executive; and

“(b) the Building Act 1991 must be read with all necessary modifications to enable the chief executive to perform the functions and duties, and exercise the powers, of the Authority....”
- 1.6 This determination refers to the former Building Industry Authority:
 - (a) When quoting from documents received in the course of the determination, and

- (b) When referring to determinations made by the Authority before section 424 came into force.

2 PROCEDURE

The building

- 2.1 The proposed building is a single-storey detached house situated on a slightly sloping site in a medium wind zone in terms of NZS 3604: 1999 “Timber framed buildings. The building is to be of conventional light timber frame construction. Part of the building will be supported on three concrete foundation slabs constructed at three different levels, with concrete retaining walls at the level changes between the slabs. The lowest level floor slab is the floor to the garage. The remainder of the building will be supported on a suspended timber floor. An external open-boarded deck on two levels will be supported on a timber frame fixed to the timber boundary piles. The roof will be largely clad with pre-coated long-run roofing, but a small part of the roof will be clad with a butyl rubber membrane over a plywood substrate. There are 600 mm wide eaves proposed around the perimeter of the building except to one small length of wall where the eaves are to be 645 mm wide. There will be 3 internal gutters draining the roof. The relatively complex roof forms lead to the presence of upward sloping eaves and a plywood and butyl rubber gutter adjacent to a parapet. These will be constructed of plywood and lined with a butyl rubber membrane. A cylindrical stainless steel flue from a gas heater in the house will penetrate the roof and be enclosed in a timber-framed, fibre-cement weatherboard-clad false chimney of rectangular section. The joinery will be aluminium. The walls will be partly clad with fibre-cement weatherboards and partly with a monolithic system using 50 mm polystyrene sheets, with a protective coating system. There will be no junctions of the one cladding with the other. There will be no balconies.
- 2.2 The designer’s specification requires the use of H 1.2 treated exterior framing. In the absence of any evidence to the contrary in the submission received from the territorial authority (TA), it is accepted that the house will be constructed using timber treated to the equivalent of H 1.2 for framing of the external walls.
- 2.3 The building is designed to be partially clad with what is described as monolithic cladding. The intended cladding is a particular proprietary product, installed in accordance with the manufacturer’s instructions, which include flashings to heads, jambs, sills, trims and corners. As detailed in that manufacturer’s instructions (“the instructions”), it incorporates 50 mm thick expanded polystyrene (EPS) backing sheets fixed through building wrap directly to framing timbers and finished with a proprietary mesh reinforced product plaster system supplied by the manufacturer of the backing sheet system. The polystyrene backing sheets have a 10 mm deep pattern of grooves on the side that is fixed against the building wrap. The grooves are, according to the manufacturer, equivalent to a drained cavity being constructed behind the sheets.
- 2.4 The other cladding system proposed for use on the building is a proprietary fibre-cement weatherboard system in which horizontally fixed fibre-cement planks are fixed over the building wrap directly to the wall framing, without a drained cavity.

Sequence of events

- 2.5 It appears that the TA received a building consent application and a certificate from a private building certifier, employed by the owner, early in October 2004.

2.6 In a faxed letter to the certifier, dated 12 October 2004, the TA said ...

Thank you for lodging the above application. Council's policy is to require a drainage cavity for all monolithic claddings until the proposed E2 changes next year. At this stage the (brand name) cladding system will only be accepted by the Council if it is installed on a 20 mm cavity.

Please provide manufacturer details and specifications for the installation of the (brand name) cladding system on a cavity to comply with the New Zealand Building Code....

2.7 On 15 October 2004 the owner applied for a determination.

3 THE SUBMISSIONS

3.1 The owner's application was initially supported by:

- The plans and relevant details for the polystyrene claddings for the house;
- A folder of information, entitled "(Brand) E2 External Moisture Folder" which enclosed:
 - A proforma Producer Statement published by the manufacturer;
 - A form of specification for the system based on the Authority's E2/AS1 document;
 - A conference paper written by the principals of the manufacturing company;
 - A document describing a test carried out on the product by the manufacturer;
 - Four Parts of a document produced by the manufacturer describing a "Microclimate Analysis" of a wall construction using the subject system; and
 - A sample warranty and maintenance manual for the subject system.
- The manufacturer's "Audit trail" document with a supporting suite of documents to be completed during the process of applying the subject system, culminating in a sample "Warranty of Fitness".

3.2 Subsequently the manufacturer of the polystyrene sheet system was nominated by the owner to be the owner's agent for the purposes of this determination and simultaneously submitted an additional file of information by way of submission. Although the file was described by its author as containing "Evidence submitted by (Manufacturer's name)" it is understood that the owner wished it to be treated as part of the owner's submission, and it has been so treated. The file contained:

- A covering letter setting out the manufacturer's views about why the TA was refusing to issue a building consent, explaining how the manufacturer's cladding system met the requirements of the building code, and relating those views to three case studies investigated by the manufacturer;
- A document setting out the manufacturer's views on the general requirements for an Alternative Solution, the principles of the four D's (Deflection, Drainage, Drying, and Durability), reports on houses investigated, and an explanation of a system for long-term monitoring of moisture levels in timber frames;

- A document linking references to an earlier determination involving the cladding product with statements about the development and testing of the product in relation to building science, methods of such testing, and a detailed argument as to how the product properly used can achieve compliance with the code; and
- Reports on a series of houses on which a commercial organisation, specialising in long-term monitoring of moisture levels in timber framing, had installed a moisture measuring probe system for that purpose.

3.3 The TA's submission was in the form of a letter which said,

The new E2 requirement involves a risk assessment for building projects using a monolithic cladding system. Some considerable training is required before designers become fully conversant with these requirements.

While Council has no option but to approve both acceptable solutions and assess alternative solutions based on current acceptable solutions, Council does not believe that it is prudent to approve monolithic cladding without a cavity system until the new regulation (sic) comes into force on the 1st February 2005.

We could be potentially swayed if the applicant provided a full risk assessment for each location. (Manufacturer of the system) have submitted to us that their system has been tested and does not require the 20 mm ventilated cavity.

As a matter of course Council would evaluate an alternative solution based on and compared with acceptable solutions in The New Zealand Building Code.

Council is currently not persuaded that the minimal cavity provided in the (Brand name) cladding system compares with the 20 mm cavity system in the proposed acceptable solution given that the 20 mm cavity provides for ventilation and drainage...

3.4 Copies of the submissions and other evidence were provided to each of the parties.

4 THE RELEVANT PROVISIONS OF THE BUILDING CODE

4.1 The dispute for determination is whether the territorial authority's decision to refuse to issue a building consent, because it was not satisfied in accordance with s 34 of the Act that the provisions of clauses B2 and E2 of the building code (First Schedule, Building Regulations 1992) will be met if the building work is properly completed in accordance with the plans and specifications submitted with the application for consent, is correct. Those provisions of the building code provide:

Clause B2—DURABILITY

B2.3.1 Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building, if stated, or:

- (a) The life of the building, being not less than 50 years, if:
 - (i) Those building elements (including floors, walls, and fixings) provide structural stability to the building, or
 - (ii) Those building elements are difficult to access or replace, or
 - (iii) Failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.
- (b) 15 years if:

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

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

Clause E2—EXTERNAL MOISTURE

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

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

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

4.2 There are no Acceptable Solutions that have been approved under section 49 of the Act that cover this cladding. The cladding is not accredited under section 59 of the Act. The cladding system as installed must therefore be considered to be an alternative solution.

4.3 In several previous determinations, the Authority has made the following general observations, which in my view remain valid, about acceptable solutions and alternative solutions;

- Some acceptable solutions cover the worst case, so that in less extreme cases they may be modified and the resulting alternative solution will still comply with the building code.
- Usually, however, when there is non-compliance with one provision of an acceptable solution, it will be necessary to add some other provision to compensate for that in order to comply with the building code.

5 DISCUSSION

General

5.1 The submissions of the parties and the other evidence in this matter have been considered. The approach that was taken to determining whether proposed building work will comply with clauses B2 and E2 was to examine the documented proposed 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 proposed external framing. In effect the proposed building was assessed using the risk matrix published in the compliance document E2/AS1.

Weathertightness risk

5.2 Recent New Zealand data and experience indicates that the impact of weathertightness problems in monolithic clad houses can be minimised if good and effective design and construction practices are followed.

- 5.3 The installation of exterior cladding to manufacturer's specifications and to accepted good trade practice is an important, but not the only, consideration to ensure good weathertightness performance.
- 5.4 The next priority is to reduce the ability of moisture to get through the cladding by using design measures that minimise the effects of the rain impacting on the walls:
- 5.5 Experience suggests it is important to note that:
- Data shows a strong relationship between the width of the eaves and the incidence of wall leaks. An effective deflection mechanism, such as eaves greater than 600 mm wide, has been shown by Canadian data to manage more than 90% of rain incidence;
 - While most reported leaks are substantially caused by defects in the cladding that require little or no wind pressure differential, I believe that buildings in high and very high wind zones (as defined by NZS 3604) are likely to experience wind pressure differentials and thus a higher risk of water ingress;
 - Taller buildings result in an effective increase in the catchment area of the wall. Available data suggests a clear correlation between higher number of storeys and an increased incidence of leaking;
 - Complex roofs and overall envelope shapes where the roofs frequently intersect with the walls on upper floors create opportunities for leaks into the wall; and
 - Recent data also shows that decks and balconies that are exposed in plan and/or cantilevered from the external walls are the most frequent location for water leaks.
- 5.6 Any likely penetration of moisture through the cladding can then be countered by a combination of effective drainage, ventilation of the drainage cavity and moisture tolerance in the external wall framing timber. Desirable characteristics of a wall system are that:
- The structure should allow water that has penetrated the cladding to drain out as quickly as possible. I believe that generally a drainage cavity should be provided behind the outer cladding barrier in monolithic construction;
 - The design of the outer walls should allow walls to dry to the outside once moisture penetrates the cladding and the moisture barrier. If walls do not dry, decay fungi can become established in as little as 3 months. Until scientific data on the optimum depth and configuration of the ventilation mechanism in New Zealand conditions is available, I consider the drainage cavity should be not less than 20 mm deep; and
 - The external walls should have some degree of decay resistance or moisture tolerance to allow for situations when moisture circumvents the cladding and moisture barriers and moisture levels in the timber rise to more than 18%.
- 5.7 In relation to these characteristics, I observe that this house:
- Has eaves overhangs of at least 600 mm to most of the walls so that significant areas of wall have some effective shielding from rain;
 - Is in a medium wind zone;

- Is effectively constructed to one storey with three floor levels;
- Has external timber decks attached to the external framing, but not built over habitable space;
- Has three valley gutters;
- Has several wall/roof intersections;
- Has some face-fixed fibre-cement weatherboard cladding with no drainage cavity;
- Has some face-fixed polystyrene sheet cladding incorporating drainage grooves on the rear face of the sheets;
- Has external walls that are constructed from timber treated to the equivalent of H1.2, which provides some initial protection from decay should it absorb and retain moisture; and
- Has been designed and documented in detail which assists in assessing the building for consent purposes and provides some assurance that it can be built to comply with the building code.

Weathertightness performance

- 5.8 I note that assessment of the proposed building using the risk matrix approach described in E2/AS1 shows the building to be a low risk building. The matrix is an assessment tool intended to be used at the time of application for consent and therefore appropriate to use in this context. An aspect of apparent complexity is the use of two different claddings on the building, but in reality the complexity is diminished because the two claddings are used on different parts of the building and there are no junctions between the two. In addition, the wall to roof junctions involve only the weatherboard cladding in every case. Although there is a chimney, it penetrates the roof rather than the wall cladding, and a proper flashing has been designed for that penetration.
- 5.9 Because the building is a low risk one, the compliance document E2/AS1 indicates that a cavity is not needed behind the polystyrene cladding system. I observe that the use of polystyrene sheets with some capacity to facilitate drainage via the rear face may provide additional protection against the consequences of leaking. I note the manufacturer's extensive suite of detail design drawings, which has been incorporated in the consent application documentation. If the system is carefully installed as designed and documented in the consent application it can reasonably be expected to exclude moisture and thus lead to compliance with the building code, in particular clause E2, and if properly maintained, clause B2.
- 5.10 The fibre-cement weatherboard system has been similarly well documented in detail in the application for consent. I believe that if the system is carefully installed as designed and documented in the consent application it can reasonably be expected to exclude moisture and thus lead to compliance with the building code, in particular clause E2, and if properly maintained, clause B2.
- 5.11 As the recently approved new E2 /AS1 makes clear, there are circumstances where the combination of risk factors applying to a particular building on a particular site may mean that the building will perform satisfactorily, and therefore be code compliant, without a drained and ventilated wall cavity. It is essential that buildings are considered on a case-

by-case basis, as the Act requires, to ensure that all the circumstances are considered properly.

- 5.12 It is in the interests of all the parties to ensure that inspections of work critical to the eventual compliance of the building with the building code are specified by the consenting authority and carried out at the appropriate stages in the construction. For that to happen the owner must give appropriate notice that work is ready to inspect and generally cooperate with the inspector to ensure that the maximum benefit is gained from this element of quality control.
- 5.13 The building code assumes maintenance of buildings will be carried out to ensure that the durability requirements of clause B2 are achieved. It is the responsibility of the building owner to carry out that maintenance. Clause B2.3.1 of the building code requires that the building be subject to “normal maintenance”. That term is not defined but it is reasonable to take the view that it must be given its ordinary and natural meaning in context. In other words, normal maintenance of the cladding means inspections and activities such as regular cleaning, repainting, replacing sealants, and so on. I recognise that a territorial authority does not have any statutory responsibility for the ongoing maintenance of a building. However the maintenance programme adopted by the owner could be undertaken after consultation with the territorial authority, bearing in mind that the nature of the advice, and the basis on which it is provided to the owner, are for the territorial authority to decide.

6 CONCLUSION

- 6.1 There are factors in the case of this building that compensate for the absence of a drained and ventilated cavity behind the cladding sheets. These are:
- The very thorough documentation submitted with the consent application which shows that consideration has been given as to how the joints, intersections, and penetrations are to be constructed;
 - The low risk score resulting from the assessment of the building using the E2/AS1 risk matrix; and
 - The additional assurance that the grooved backs of the polystyrene sheets provide as a means of draining moisture that might leak through the cladding.
- 6.2 I note the importance of the owner’s responsibility for ongoing maintenance to the cladding. The code assumes that normal maintenance necessary to ensure the durability of the cladding is carried out, and thus clause B2.3.1 of the building code requires the cladding to be subject to “normal maintenance”. That term is not defined, so it is reasonable to take the view that it must be given its ordinary and natural meaning in context. In other words, normal maintenance of the cladding means inspections and activities such as regular cleaning, repainting, replacing sealants, and so on.
- 6.3 It is emphasised that each determination is conducted on a case-by-case basis. The fact that use of a particular cladding system has been established as being potentially code compliant in relation to a particular building does not necessarily mean that the same cladding system will be potentially code compliant in another situation.
- 6.4 No waiver or modification of the building code has been incorporated in this determination.

7 THE DECISION

- 7.1 In accordance with section 20 of the Building Act, I determine that there are reasonable grounds to suppose that if carefully built in accordance with the documents submitted with the application for building consent, and subject to normal maintenance, the building will comply with the requirements of clauses B2 and E2 of the building code. Accordingly, I reverse the territorial authority's decision to refuse to issue a building consent.
- 7.1 I find that because of the compensating factors in this case, the lack of a drained cavity behind the cladding is not, on its own, sufficient grounds to refuse to issue a building consent.
- 7.2 I remind the parties of the importance to them both of an appropriate schedule of inspections of the building work at stages and times to be agreed by the parties. Such inspections form an important part of the evidence the TA needs before it can confidently issue a code compliance certificate.
- 7.3 I consider that the cladding will require on-going maintenance to ensure its continuing code compliance.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 22 December 2004 by John Gardiner, Determinations Manager.

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