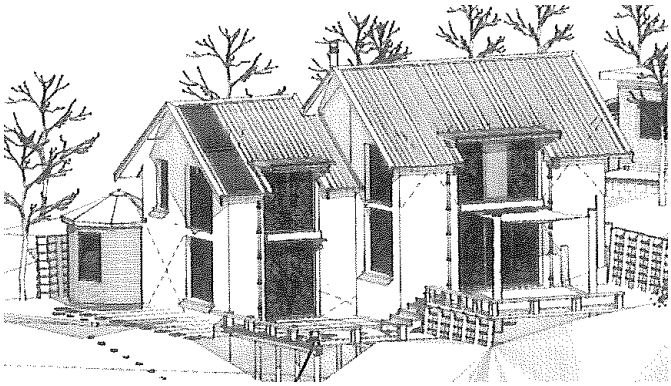
Department of Building and Housing
Te Tari Kaupapa Whare

Determination 2010/136

Refusal to issue a building consent for a house with straw bale walls at 13 Hays Rise, Governor's Bay, Lyttelton



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 applicants are the owners of the proposed house, A and D Johnson ("the applicants"), acting via the designer for the building work ("the designer"), and the other party is the Christchurch City Council ("the authority"), carrying out its duties as a territorial authority or building consent authority.

1.2 This determination arises from a decision by the authority to refuse to grant a building consent for a house because it was not satisfied that the proposed building would comply with certain clauses[2] of the Building Code (Schedule 1, Building Regulations 1992). The authority's concerns are primarily about the resistance of the straw bale wall system to external and internal moisture ingress.

1.3 The matter to be determined[3] is therefore whether the authority's decision to refuse to issue a building consent is correct. In deciding this matter, I must consider whether the plastered straw bale wall systems proposed for the exterior walls of this house ("the straw bale walls"), will comply with Clause B2 Durability, Clause E2 External Moisture and Clause E3 Internal Moisture of the Building Code. By "the

[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 and clauses are to sections of the Act and clauses of the Building Code.
[3] Under section 177(b)(i) of the Act (prior to 7 July 2010)

plastered straw bale wall system" I mean the components of the system (such as the straw bales, the plaster systems, the timber posts and beams, the windows, the junctions and the flashings) as well as the way the components are to be installed and work together.

1.4 I note that the authority's concerns in regard to compliance with Clause E3 Internal Moisture of the Building Code appear to be associated with the effects of internal moisture penetration into the stawbale walls and I have therefore included those issues within the above matter.

1.5 Matters outside this determination

1.5.1 The authority has queried some aspects of the design relating to compliance with other clauses of the Building Code, which appear to be in the process of being resolved between the parties. This determination is therefore restricted to matters associated with the straw bale wall system.

1.5.2 I note that the application includes a detached garage building. However, I have received no drawings or information regarding that building; and this determination is therefore limited to the detached house.

1.6 In making my decision, I have considered the submission by the designer on behalf of the owner/builder, the report of an independent specialist experienced in straw bale building construction commissioned by the Department to advise on this dispute ("the specialist") and the other evidence in this matter. I have evaluated this information using a framework that I describe more fully in paragraph 6.1.

2. The building work

2.1 The proposed building work includes a detached house set into a northeast sloping site in a large rural site, which is in a high to very high wind zone for the purposes of NZS 3604[4]. Most of the house is two-storeys high except at the highest point of the building platform, where southwest corner walls of the lower floor are set in from the upper floor. The north and east walls are two-storeys above ground level, while the south and west walls are one-storey above the ground.

2.2 In the consent drawings, the designer assessed the design as having a low weathertightness risk. However, taking into account the straw bale construction and its particular risks, I have assessed the design as having a moderate to high weathertightness risk (see paragraph 6.2).

2.3 Based on the architectural drawings, the proposed house is a specifically engineered steel-braced timber post and beam structure with reinforced concrete foundations and floor slab, concrete block retaining walls, straw bale exterior walls, timber framed interior walls, profiled metal roofing and timber windows.

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

2.4 General construction

2.4.1 The upper level of the house is L-shaped and made up of two off-set 35° pitch gabled roofs, with the east gable about 1 metre lower than the west gable. The slope of the larger west roof reduces to 5° pitch along the south, and extends as a monopitch to provide a covered entry to the west. Eaves and verge projections are about 600mm. The lower level floor is smaller, with concrete block retaining walls to the south and west. The floors are split-level to suit the slope of the site.

2.4.2 The construction of the two-storey-high walls appears to be as shown in Figure 1:

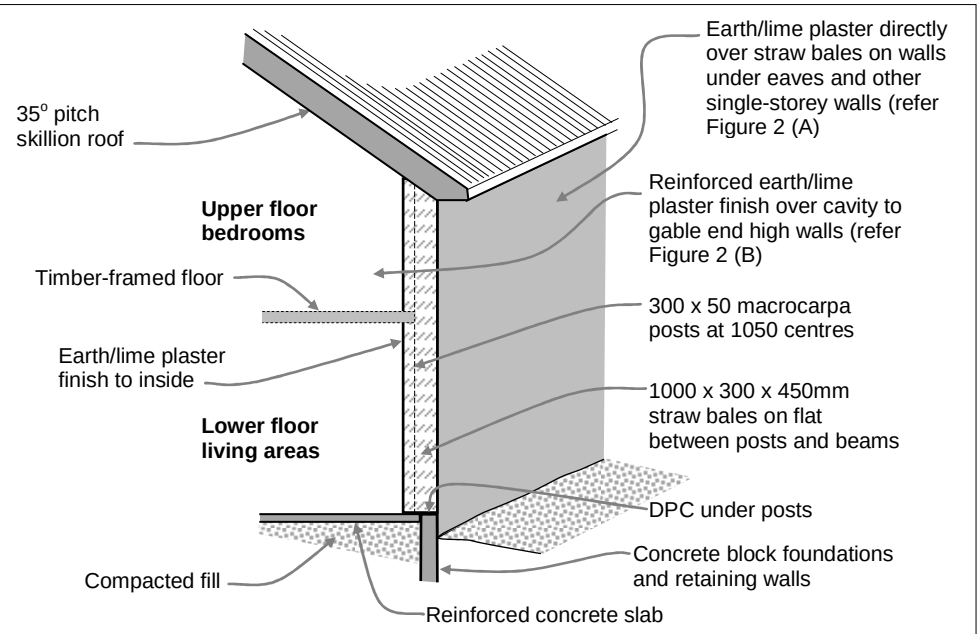


Figure 1: General construction (not to scale)

2.4.3 The exterior straw bale walls are formed from post and beams braced with metal cross bracing, with 300mm x 50mm macrocarpa posts at 1050mm centres, and straw bales between the timber members. At the posts, straw is stuffed into the gaps between the bale infills and netting is applied to bridge between the bales.

2.4.4 Both sides of the single-storey south and west walls and the two-storey north walls (beneath the eaves) are finished with earth/lime plaster applied directly to the bales ("the directly plastered straw bale walls"). The two-storey high walls to the east gable end walls are clad with a mesh reinforced lime-based solid plaster, which is installed over a cavity ("the straw bale cavity walls").

2.4.5 The plaster and cavity to the end wall of the upper gable continues over the timber framing above the lower gable roof. The interior walls are conventional timber framing, with loose straw stuffed between the framing and metal mesh reinforced lime/earth plaster applied to both sides.

2.5 The straw bale walls

2.5.1 The timber post and beam structure is in-filled with non-loadbearing straw bales to form mass walls about 500mm thick overall. The straw bale infill walls are formed from 1000mm x 450mm x 350mm straw bales stacked on the flat within the posts.

2.5.2 The general construction of the directly plastered straw bale walls and the straw bale cavity walls is shown in the sketches in Figure 2:

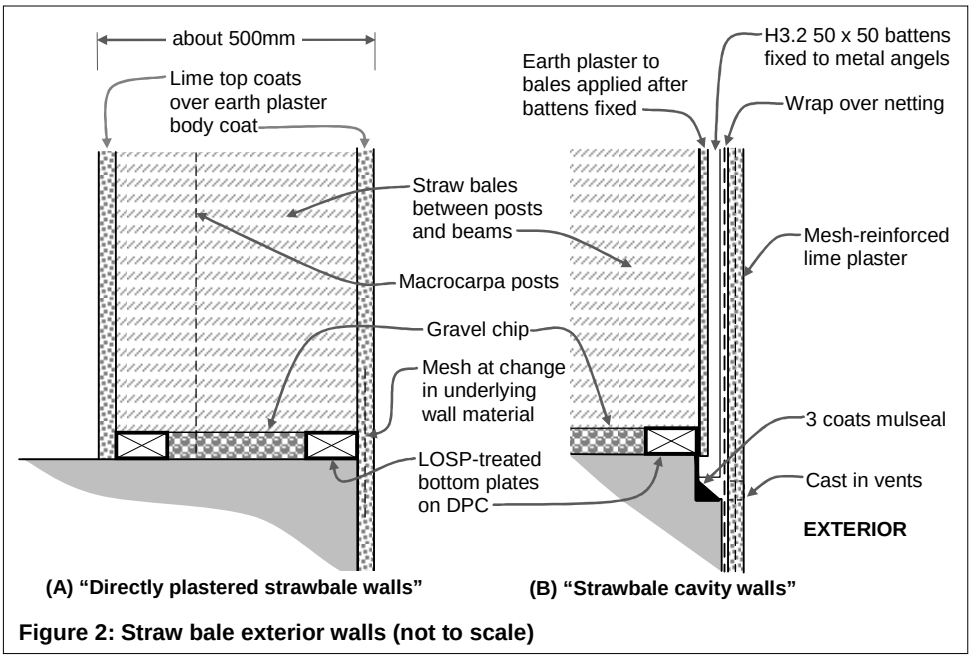


Figure 2: Straw bale exterior walls (not to scale)

2.5.3 A base to the walls is formed from 100 x 50 bottom plates on DPC with drainage gravel between. The exterior plaster extends from the straw bales over the bottom plate and the concrete block foundation and retaining walls. Timber elements within the straw bale walls are specified as untreated macrocarpa.

2.5.4 The exterior of the directly plastered straw bale walls and the interior faces of walls are finished with a three-coat plaster system that is about 30mm thick overall, with an 'adhesion coat' of manure, sand and flour paste and two coats of earth/lime plaster. The plaster systems are vapour permeable, with a lime wash finish.

2.6 The east gable cavity walls

2.6.1 At the east gable end walls, a reinforced lime-based solid plaster system is installed over a drained cavity. The cavity is formed from H3.2 treated 50mm x 50mm battens at 500mm centres screw-fixed to a metal angle set into the timber posts. The specification states:

> After the battens are fixed, a 10-15mm render coat of earth plaster is applied to the bales and sides and faces of vert battens. This encapsulation of the bales provides an internal barrier to moisture in the cavity behind the rain screen.

2.7 The specification also calls for netting to be installed over the battens, then building wrap to form the slip layer for a three-coat lime/cement polypropylene mesh-reinforced solid plaster system with a lime wash finish.

3. Background

3.1 The designer lodged an application for a building consent for the building work (No. 10099712). I have not seen a copy of the application, but I note that the drawings are dated 2 January 2010.

3.2 The authority's comments

3.2.1 In a 'Request for Information' to the designer dated 13 May 2010, the authority stated that the building consent could not be issued as the proposed building 'will not comply with NZBC B2 and E2 along with other non-compliances with other code clauses'. The authority identified 37 items requiring clarification or amendments, some of which appear to have been subsequently addressed by revisions to the drawings dated 24 May 2010.

3.2.2 In regard to the clauses considered in this determination, the remaining items appear to include in summary (with the authority's references provided in brackets):

- 600mm eaves provide insufficient shelter to lime-plastered straw bales (item 2)
- gravel base to walls not protected from moisture migrating into bales (item 5)
- the straw bale cavity walls (item 3)
  - fixings and spacing of the vertical battens(item 24)
  - possibility of moisture migration into straw bales (item 25)
- plastered straw bale bathroom walls not impervious to water splash (item 6)
- risk of condensation moisture damage to straw bale walls from:
  - metal bracing to outer face of bales (item 4)
  - water pipes within straw bale walls (item 13)
- confirmation of structural grade heartwood macrocarpa (item 32).

3.3 I have not seen any further correspondence between the designer and the authority, and the Department received an application for a determination from the designer on 23 June 2010. The Department sought further information about the full list of questions raised by the authority, which was received on 30 August 2010.

4. The submissions

4.1 The designer forwarded copies of:

- drawings and specifications relating to the straw bale walls
- the list of the authority's original concerns
- other information on the metal bracing, straw bales and lime plaster.

4.2 A draft determination was issued to the parties for comment on 8 November 2010.

4.3 The authority responded to the draft determination in a submission received on 26 November 2010. The authority accepted the draft but noted the date on which it sought information from the designer and the date of the drawings received in response. I have amended the determination accordingly.

4.4 The designer accepted the draft without comment in a submission received on 10 December 2010.

5. The expert's report

5.1 I sought advice from an independent expert who has considerable experience with alternative construction methods including earth and straw bale construction. The expert is the Chairman of the Standards Technical Committee for earth building and has been the primary author for BRANZ[5] on straw bale guidelines.

5.2 The expert examined the specification and drawings, drawing also on past and recent discussions with colleagues 'with good building science knowledge who also have knowledge of strawbale design'. The expert provided a report dated 22 September 2010, which outlined the construction of the proposed house and described the site as being open to the northeast and exposed to wind-driven rain.

5.3 The expert considered the following aspects of the design:

- roof overhangs above directly plastered straw bale walls
- straw bale wall construction
- straw bale cavity walls
- plaster systems
- joinery junctions
- internal moisture.

5.4 Roof overhangs and directly-plastered straw bales

5.4.1 The expert made the following comments on roof overhangs generally and on the overhangs proposed for this house:

- Deep roof overhangs limit the amount of rain reaching the wall surface, so these are the best defence against water penetration into straw bale walls. As straw bale construction is more sensitive to moisture than earth construction, roof overhangs should be at least that required by the earth standards.
- For this design, its location, exposure and the high to very high wind zone of the site, the earth standards (which cover straw bale buildings) recommend roof overhangs at a wall height to eaves width ratio of 1:1.
- To reduce the weathertightness risks, 'the weather protection of the whole building needs to be re-addressed either in terms of larger eaves, or design for a full drained cavity system'.

I note that the two-storey walls extend to about 4m height under the north eaves and more than 7m at the apex of the gable end east walls. For this house, use of the earth standards recommendations would imply roof overhangs far beyond that provided by the proposed 600 mm roof overhangs and points strongly to the need to employ additional rain-screening techniques such as cavities on all walls.

[5] Building Research Association of New Zealand

5.4.2 In regard to the use of the E2/AS1 risk matrix, the expert noted that:

- The use of the matrix only serves to highlight differences in risk between elevations, as using the matrix for claddings outside E2/AS1 is not appropriate due to the risks involved in straw bale construction being 'quite different'.
- An example of this variation in risk is 'what may be a low risk 600mm eave to fibre-cement is not applicable to strawbale'.

5.4.3 The expert noted the inclusion of cavities to the two-storey north walls and concluded that all of the walls to the proposed building 'should have a rain screen cavity system incorporated over all strawbale walls'. Having reached this conclusion, the expert did not comment further on the details for the directly plastered exterior straw bale walls.

5.5 The straw bale wall construction

5.5.1 The expert noted that straw bales would be laid on the flat between the bottom plates, posts and beams. Commenting specifically on the documents, the specialist noted that:

- there is no mention of how the straw bales are to be attached to post, beams and other structural elements
- netting is not required providing bales are very tightly compressed and it is not clear how straw bales will be compressed
- at the bottom of the straw bale walls, the extension of the DPC under the full width of the wall is recommended.

5.6 The straw bale cavity walls

5.6.1 The expert noted that the proposal included a lime-based solid plaster system over a non-rigid backing, with cavity battens at 500mm centres. The specialist consulted with a colleague experienced in such systems and concluded that lime-based solid plaster over a cavity can provide a satisfactory cladding system.

5.6.2 Commenting specifically on the proposed cavity system, the expert noted that:

- building paper should be installed over netting and pulled tight, and the cavity battens should be spaced at 300mm centres maximum
- batten fixings appear to remain unresolved, and these should be confirmed by a structural engineer as adequate for the weight of the solid plaster
- there is no mention of the proposed paint or coating system, which needs to remain 'highly breathable' over the lime-based plaster, even for a cavity situation, to help keep the cavity and wall behind dry.

5.7 The plaster systems

5.7.1 In regard to the polypropylene mesh proposed as reinforcement to some lime-based plaster, the specialist investigated the product and consulted with an experienced colleague; concluding that the product is likely to prove satisfactory if 'adequately

attached to all adjacent structure with stainless steel staples'. The specialist also investigated the plaster 'adhesion coat', noting that the proposed mix is referred to in some textbooks, so implying a history of successful use.

5.7.2 Commenting specifically on the proposed plaster systems, the specialist noted that:

- the fixing of the polypropylene mesh is only partially specified
- the locations, extent and types of netting is not clear, with notes in the documents including:
  - 'netting to be advised'
  - mesh to be used in areas 'of stress and movement in plaster'
  - mesh 'only at critical corners and edges'
  - use mesh at 'change of base material'
- there is no consistent specification for various plaster mixes, with inconsistent labelling used, for example 'earth plaster', lime plaster', 'earth/lime plaster'
- the proposed paint and/or coating systems are not specified.

5.8 Joinery junctions

5.8.1 The window and door openings within the straw bale walls are lined with a 50mm lightweight aerated concrete panel product that can be cut and shaped on site. The aerated concrete provides a substrate to the plaster at jamb and head reveals, along with a sloping sill that projects beyond the face of the wall.

5.8.2 In regard to the joinery details in the straw bale cavity walls, the specialist noted that:

- the front of the concrete jamb extends past the cavity, resulting in thin plaster at the rounded corner, which will be prone to cracking
- the jamb flashing is well back behind the head flashing, and it is not clear what happens at the junction
- with jamb flashings extending into rebates in the timber jambs, it is not clear how the windows can be installed
- the jamb flashings cannot overlap the sill flashing above the concrete sill, so it is not clear how water reaching jamb flashings can be directed to the outside.

5.9 Internal moisture

5.9.1 The expert noted that either earth or lime plasters can be satisfactorily used for non-splash areas within bathrooms. However, the drawings provided insufficient detail for him to comment on the treatment proposed, if any, to splash prone areas.

5.9.2 The expert also noted that the embedment of water pipes within straw bale walls needs to be expressly prohibited, due to the risks of plumbing leaks and/or condensation moisture.

5.10 The metal bracing

5.10.1 The expert considered that condensation is a potential hazard that can be created by 'placing highly conductive and non-porous materials such as steel within a straw bale wall'.

5.10.2 However, in the case of this proposed house, the expert considered that the risk is very low given:

- the small mass of the steel
- the ability of the straw to absorb at least some moisture
- the use of highly breathable plasters immediately adjacent to the metal
- that any moisture which might condense should evaporate and pass through the outer solid plaster to the outside.

5.11 The expert's report was forwarded to the parties on 22 September 2010. The authority generally accepted the specialist's findings in a letter dated 1 October 2010.

5.12 The designer's response

5.12.1 The designer responded to the expert's report in a letter dated 7 October 2010, noting that the purpose of the determination is to assess the suitability of the direct plastering of the straw bale walls. The designer noted that the other aspects raised by the expert were 'appreciated, and in most part agreed with'; and the drawings and specification had been revised accordingly.

5.12.2 The designer considered that the major issue about the plastered walls was the risk regarding exposure to weather, and included the following comments:

- The wind zone classification does not really reflect the site's location, which is in a 'small sheltered pocket among other houses', with shelter from all directions apart from the northeast.
- The need for battens to be at 300mm centres is not based on any evidence and most cracking in solid plaster will occur at a batten or stud line.
- A specification of the lime wash coating proposed for plastered walls has now been included in the specification.
- Sufficient bale compression is provided by the bales being typically 950mm to 1000mm long and being pushed into the space between the posts. The length of straw bale wall is never more than one bale long, mitigating the need to further compress the bales.
- To cater for variations in bale lengths, a note has been added calling for bales to be pegged with 20mm wooden dowels through the posts.

5.12.3 The designer attached:

- a revised detail showing pegs connecting the bales to the posts
- the specification for the exterior and interior painting, calling for lime wash to plaster surfaces
- information about the qualities and use of lime wash coatings.

5.13 The expert's response

5.14 The designer's comments were forwarded to the expert, who responded in an email to the Department dated 27 October 2010. The expert confirmed his opinion on the need for a cavity to all walls and included the following comments (in summary):

- The wind zone was cross checked against NZS 4299[6] Table 2.1, and even an 'urban exposed' site would be a high wind zone. The particular exposure of the site was also discussed with a local architect familiar with the area, who suggested that this site would be assessed as partly high and partly very high. Even the most sheltered west elevation still has a high gable.
- The requirement for batten centres to be reduced to 300mm is opinion based on considering the relative properties of lime and cement plasters, together with consulting with a lime plastering colleague. Cracking along battens is likely to be due to 'out-of-plane movement in the plaster and its non-rigid substrate', and such cracking should be reduced by closer batten spacing.
- The lime wash specification appears satisfactory, but a table showing proposed plaster mixes is also needed, as this would remove anomalies. The use of a breathable paint is also recommended as the height of walls would make regular applications of exterior whitewash very difficult.
- The addition of dowels to pin bales appears to be satisfactory, but the revised detail does not show a cavity system.

6. The establishment of code compliance

6.1 Assessment methodology

6.1.1 The straw bale wall system is an alternative solution. When evaluating an alternative solution it is useful to compare it with the relevant Acceptable Solution[7], which in this case is E2/AS1. In doing so, when there is non-compliance with one provision of an Acceptable Solution, it may be necessary to add compensating features in order to comply with the requirements of the Building Code.

6.1.2 In this case the design of the straw bale wall system needs to take account of the following:

- the exposure of the building elements
- the durability requirements of any hidden building elements, including the treatment of structural timber members
- the straw bale's susceptibility to the effects of moisture
- the monitoring and maintenance of the plaster system.

6.1.3 The exposure of the straw bale walls to the weather needs to be balanced against the features that protect the building elements from the effects of the weather; i.e. the greater the exposure, the more compensating features are provided.

[6] New Zealand Standard NZS 4299: 1998 Earth buildings not requiring specific design.
[7] 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.

6.1.4 In addition I need to establish what evidence is available to assist me. In this case, the evidence includes:

- the technical information in the consent application and subsequent correspondence, which includes detailed drawings and specifications for the wall system and other general information about straw bale construction
- the history of approval and/or use of comparable wall systems
- the specialist's report on the proposed wall system (see paragraph 5).

6.1.5 With regard to joinery installation details within the exterior envelope, I consider that the weathertightness detailing shown in the drawings may be assessed on a similar basis to timber joinery installed within plastered solid masonry walls.

6.1.6 While it is accepted that this type of straw bale wall system has been used in some other countries for many years, its use in New Zealand is relatively recent and examples of older buildings are relatively rare. The ability to predict the performance of this particular wall system over an expected lifetime of 50 years or more is limited when compared to more common local systems.

6.2 Weathertightness risk

6.2.1 The evaluation of building work for compliance with the Building Code and the risk factors considered in regards to weathertightness have been described in numerous previous determinations (for example, Determination 2004/1).

6.2.2 The use of the E2/AS1 risk matrix is limited to buildings and claddings within the scope of that acceptable solution[8]. It is therefore not appropriate to use the risk matrix for assessing the weathertightness risk of other forms of construction such as earth and straw bale, without careful adjustment to allow for their particular nature and inherent risks.

6.2.3 Taking into account the straw bale construction, this proposed house has the following environmental and design features which influence its weathertightness risk profile:

Increasing risk

- the house is in a high to very high wind zone
- most walls are two-storeys high, with north eaves at about 4m height and the apex of the gable end east walls at more than 7m height
- most exterior walls are directly plastered straw bale, which are particularly vulnerable to damage from wind-blown rain
- roof projections are considerably less than those recommended in the earth standards as providing sufficient shelter to straw bale walls
- the post and beam structure is untreated macrocarpa
- although fairly simple in form, the design incorporates some complex junctions

[8] Risk definitions and scores in E2/AS1 Table 1 and Table 2 are limited to claddings specified in E2/AS1 Para 3.3, which are installed over conventional timber frame construction.

Decreasing risk

- the two-storey high gable end walls incorporate a drained cavity behind a lime based solid plaster cladding
- the straw bales form infills to the timber post and beam structure.

6.2.4 When evaluated using the E2/AS1 risk matrix, but adjusted to allow for the particular risk factors inherent in straw bale construction[9], these features show that two elevations of the house demonstrate a medium weathertightness risk rating and the remaining elevations a high risk rating.

6.3 Compliance with Clause E2 External moisture

The straw bale walls

6.3.1 Taking into account the expert's report, there are other areas where I consider that some details in the original consent documentation are missing, unclear or are not sufficient to ensure the resistance to external moisture, including:

- in regard to the straw bale wall construction:
  - clarification of junctions of straw bales with the structural elements
  - clarification of the installation and compression of straw bales
  - the lack of a damp proof membrane under the full width of the walls
- in regard to the straw bale cavity walls:
  - the inadequate spacing of the cavity battens
  - engineer's confirmation of the adequacy of batten fixings
  - the specification of paint and coating finishes to the solid plaster
- in regard to the plaster systems, the lack of clarity regarding:
  - the fixing of the polypropylene mesh
  - the locations, extent and specification of mesh and netting
  - the locations and specification of various plaster systems
  - the specification of paint and coating finishes to all plaster systems
- in regard to external window and door joinery:
  - the thin plaster at the rounded corner to the jambs
  - the lack of details of head to jamb flashing junctions
  - the rebated jamb flashings and the method of joinery installation
  - the inadequate jamb to sill flashing junctions

6.3.2 I accept the specialist's opinion that the risk of damage resulting from condensation on the metal bracing is low in the case of this particular house, providing a cavity is provided to all of the straw bale exterior walls.

[9] Strawbale walls are beyond the scope of E2/AS1, so the eaves risk factor is adjusted accordingly.

The protection to the walls offered by the roof

6.3.3 I note the specialist's primary concern about the weathertightness of the proposed straw bale walls relate to the lack of protection afforded by roof overhangs to the directly plastered straw bale walls (see paragraph 5.4).

6.3.4 In particular, the directly-plastered straw bale walls are exposed to windblown rain which can affect the surface integrity of the plaster finish and adversely affect its ability to resist the ingress of water. I accept the specialist's advice (see paragraph 5.4.3) that the weather protection of the proposed building should be re-addressed to incorporate drained cavities to all exterior straw bale walls.

6.4 Compliance with Clause E3 Internal moisture

6.4.1 Taking into account the expert's report, I consider that some details in the original consent documentation are missing, unclear or are not sufficient to ensure the resistance to internal moisture (Clause E3), including:

- the lack of detail for splash backs in bathrooms, kitchen and laundry areas
- the lack of detail for plumbing fixtures and pipes in straw bale walls.

6.5 Durability and maintenance

6.5.1 The effective maintenance and monitoring of the external straw bale wall system, including the plaster system, is important to ensure ongoing compliance with Clauses B2 and E2 of the Building Code. A building's maintenance is the responsibility of the building owner.

6.5.2 I note a statement on maintenance was submitted by the designer. This should be expanded upon and incorporated into the consent documentation in order to specify:

- regular monitoring of the exterior envelope
- regular inspection of the plaster to the straw bale walls, including a repair methodology.

I strongly suggest that this is augmented by the monitoring of the moisture levels in the straw bales themselves.

6.6 Conclusion

6.6.1 The weathertightness of the straw bale wall system is dependent on the weathertightness risk features of the house as a whole, the features that protect the walls from the weather, the application of the plaster systems, the complexity detailing to the building envelope, and the consequences and likelihood of failure of the building elements themselves.

6.6.2 The straw bale wall system requires compensating features to allow for the level of exposure to the weather, these features may include eaves protection, cavity construction, treatment of the hidden elements, and a prescribed methodology for maintenance and monitoring.

6.6.3 Taking account of the expert's report, I consider I do not have reasonable grounds to conclude that, if constructed in accordance with the consent application documents, the straw bale walls will comply with Clauses B2, E2 and E3 of the Building Code.

7. What is to be done now?

7.1 I suggest that the designer should now modify the building consent application, taking into account the findings of this determination and including the items outlined in paragraphs 6.3.1, 6.3.4, and 6.4.1. If 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.

7.2 The building consent documentation should be amended to include a maintenance schedule for the straw bale wall system, as outlined in paragraph 6.5.2. It is recommended that the need for the maintenance schedule be recorded on the property file and also on any LIM issued concerning this property.

8. The decision

8.1 In accordance with section 188 of the Act, I hereby confirm the authority's decision to refuse to issue the building consent, based on inadequate documentation to establish that the proposed straw bale wall details would comply with Building Code Clauses B2, E2 and E3.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 22 December 2010.

John Gardiner
Manager Determinations