Submission to BIA On
Proposed Changes to E2, VM1 and AS1

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SUBMISSION ON DRAINED VENTILATED CAVITIES

This submission is restricted to comment on "Drained Ventilated Cavities" only (clause 8.5 on page 44). HITEX Plastering has made a separate submission covering a wider range of NZBC issues and has attached to their submission documentation that also supports this submission. This separate submission has been done to emphasise the issues of drained ventilated cavities.

1. Prescribing a one design drained ventilated cavity is inappropriate. As the BIA is dictating the design of the cavity, then the BIA is accepting the liability if the cavity does not work and causes associated damage. Based on the research that HITEX has done and the MEWS reports, the design prescribed by the BIA has many limitations and the BIA will be exposed to large liabilities in the future.

2. Cavity is Required: There is no doubt that a cavity is required and the introduction of a cavity is supported. All buildings can leak, not just high risk ones. Therefore personally I believe that a cavity is required on all buildings where the timber frame is encapsulated with linings both sides. The cavity has a very important function in acting as the second line of defence for any moisture breach through the outer cladding. Moisture breaches of the cladding or leaks are legally a "foreseeable" event based on historical data. The MEWS reports clearly identify that a cavity assists drainage, and show that almost any design of cavity from just a few millimetres thick to 50mm thick will assist drainage and act as a second line of defence for any moisture breach.

3. Cavity Must Allow a Wall to Dry Out: The second important function of the cavity is for allowing a wet wall to dry out. As leaks are a legally "foreseeable" event, then a wall must be designed so that once the leak is stopped, the wall can be dried out. The Hunn report stated that one of the functions of a wall needed to be that it would allow moisture to be dried out. This can only realistically be done via the ventilated cavity. This Hunn report recommendation has been missed by the BIA and needs addressing. The research that HITEX has done with its Diamond system has shown that a cavity can be designed to achieve this successfully. However it must be noted that the cavity design is far different from that prescribed by the BIA.

4. Cavity Design Needs to be Specifically Engineered: The cavity for each cladding system needs to be specifically designed. Insufficient engineering input has gone into the cavity design prescribed by the BIA. To properly engineer a cavity requires research and testing. Developing a cavity that acts as a second line of defence is relatively straight forward, but developing one that allows a wall to dry out and stay dry is far more difficult. The MEWS research shows that a cavity of the style proposed by the BIA can actually cause a wall to take up additional moisture rather than dry out (results from stucco). HITEX field measurements on actual installations of timber battened cavities in the Auckland area have already found walls where the moisture load in the wall is in excess of the prescribed 20% for lining. Very few cladding manufacturers other than HITEX have done research on a cavity, to show if their cladding can dry out a wet wall and also keep a dry wall dry.

5. Use of Timber Battens in the Cavity: Using timber battens in a cavity poses difficulties. Firstly the timber battens are able to take up moisture, and as they are closely connected to the outside atmosphere, there will be many instances where the timber battens will contribute to moisture uptake, i.e. the EMC will be greater than the E2 requirement of 18%. This moisture from the timber battens will diffuse into the timber frame and cause the timber frame to become wet - just as the MEWS reports show. The materials used to form the cavity may need to be non hydroscopic in order to avoid this.

6. Placement of Timber Battens in Cavity: In order to achieve the appropriate support for the cladding, large numbers of both vertical and horizontal battens are required. This is happening based on observations on sites installing timber battens. The large numbers of battens used, especially the horizontal ones, act to restrict the function of the cavity as a second line of defence. Some of the leaking water will be “hung up” on and absorb into the timber battens and will have the effect of accelerating the movement of moisture into the timber frame wall.

7. Cavity for Masonry: Part of the rationale for the cavity is based on its successful use with masonry and bricks. Years of development were needed to arrive at the current design that uses non-water absorbing metal ties to create the cavity. It is understood that timber battens were used at one stage but that this transferred moisture from the masonry into the wall, and hence the timber battens were discontinued.

8. Cavities for Water Absorbing Claddings: The problems identified with masonry apply to other claddings that absorb water, for example stucco, plywood, fibre cement board, etc. Cavities for these systems need specific research and to our knowledge have yet to be developed successfully.

9. Suggestion for Incorporation: It is suggested that the BIA use the following wording for section 8.5 and delete the prescribed detail:
“Drained ventilated cavities are required on all buildings to act as the second line of defence in the case of a breach of the outer cladding. The cavity is also required to allow a wet wall to dry out and must avoid moisture uptake into a dry wall. The cavity must be able to demonstrate that it can achieve these requirements through an approved research programme before it can become an Acceptable Solution. Further acceptable ongoing monitoring of representative actual installations is required for the cavity to retain Acceptable Solution status.”

10. Suggested Testing Programmes: Suitable testing programmes need to be developed to give both generic understanding of the design of a drained ventilated cavity, and to set testing benchmarks for cavity designs to achieve Acceptable Solution status. The starting points for developing these testing programmes can be the MEWS reports and the HITEX research test methods. It is suggested that some or all of the following should be considered:

10.1. 4 Litre Water Test: Used by the Canadians, and used by HITEX, this involves pouring 4 litres of water into the space between the building paper and the cladding to simulate the breach of the outer cladding. Of importance is the amount of water retained by the wall, as this is the amount that has to be dried out subsequently by the cavity itself.

10.2. BRANZ AS/NZS 4284 Test: This is of lesser importance with claddings with a cavity for the second line of defence. This test method needs modification if it is to continue being of use, as there is no quantification of the water entering a defect compared to the water exiting the system.

10.3. Diffusion Chamber: The Diffusion Chamber used by HITEX and used at the Auckland University Chemical and Materials Engineering Department is reported on in HITEX Research Bulletin RB 310. This test method could be developed to test many claddings and cavity designs. The test rig is small and relatively inexpensive and can produce test results in a matter of days.

10.4. Wall Drying Test Rig: The test rig used by HITEX and operated by the Auckland University Physics Department is reported on in HITEX Research Bulletins RB 301 through RB 307. Again this test method could be developed to test many claddings and cavity designs as constructed on actual buildings. The test rig is larger but is still relatively inexpensive and can produce test results in a matter of weeks.

10.5. Field Measurements: What really matters is that the claddings and cavities used on actual buildings are able to achieve moisture contents in the timber of less than that required to maintain a durable and healthy building. Therefore testing programmes are required to measure the moisture contents of timber in actual buildings. One suggestion is for the BIA to fund Unitec to do this on several hundred buildings in the Auckland area. HITEX research has shown that the key is the bottom plate, and that the moisture content of this can be measured in a non-destructive way. Selective buildings could have sensors installed for ongoing measurements. HITEX is procuring equipment to capture data from actual building sites and this will be available shortly. Useful data from field measurements can be gathered in a period of a few months, and can be ongoing for years.

10.6. Use of Above Test Data by Computer Models: Data from the above can then become input data for computer models such as WUFI (used by BRANZ and Germany) and hygIRC (used by MEWS projects in Canada). This will expand the use of the computer models and increase the reliability of their predictions for various climatic conditions and various wall systems.

If additional information about any of the detail in this submission is required, please feel free to contact the writer.

Yours sincerely

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