# EXAMINING DRYING RATES IN WALLS

**The weathertightness team at BRANZ has been continuing their research measuring drying rates in different types of walls. The results show the importance of wall design to speed drying.**

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Figure 1: Experimental building at BRANZ showing the meteorological station in the foreground and experimental wall panels on the north and east faces.

In early 2005, BRANZ started collecting data from a specially designed experimental building built for weathertightness research (see *Build* August/September 2005, pages 68–69). The building has 1.2 m wide by 2.4 m panels on all four sides representing a range of claddings and approaches to water management (see Figure 1).

The experimental walls fall into four water management categories:

- Drained and ventilated walls with a cavity vented at the top and bottom (for example, brick veneer).
- Open rainscreen walls with a cavity vented only at the base of the wall.
- Drainage plane walls with a drainage mat behind the cladding that is vented at the base.
- Direct-fixed walls with no deliberate cavity.

## Three years of data

Nearly 3 years of drying rate measurements have now been gathered from these walls. Each was dosed with a known quantity of water, on several occasions and in different seasons. In each wall water was released in:

- the back of the cladding, to simulate a leaking cladding
- the insulation side of the building wrap, simulating condensation on the wrap
- framing at a stud/dwang junction (see Figure 2 which shows the dosing point and pin moisture content measurement points).

As the walls dried, measurements were made of the humidity in the cavities and the timber moisture contents.

Figure 3 summarises the measured drying rates for different types of walls and different locations within the walls. There is some spread in the drying times for each wall type due to wall orientation and cladding differences. A shaded envelope has been drawn around the data points for each drying location to help explain the main messages in the data.

At this stage, the data relates to only one building in Wellington, but several observations can be made.

## Drying rates in walls

The most striking finding was the large difference between drying rates from deep inside the wall (in the framing) and from the back of the cladding. Water dries 100 times faster from the back of the cladding than from framing partly because water diffuses slowly in timber. This illustrates the importance of isolating the back of the cladding from the framing (clearly one of the key attributes of cavity designs). A previous research update in *Build* (June/July 2006, pages 54–55) reinforces this by showing how easily water transfers from the back of a direct-fixed cladding into the framing.

The next observation concerns drying from the back of the cladding. Non-absorbent claddings in the experimental walls retained very little water and this reduced the need for ventilation drying. It is quite common now to hear North American researchers emphasising this point and some manufacturers have responded by coating the backs of their claddings to reduce absorbency. If the cladding is absorbent, then drained and ventilated and open rainscreen walls recover quicker than those with direct-fixed claddings. On average there is a 3-to-1 advantage here for the ventilated cavity walls. It is worth noting, though, that weatherboard walls are an exception because they are naturally ventilated and have always been the fastest drying of the direct-fixed walls on the BRANZ building.

Another result was that the ventilated cavity walls deal with water trapped on the back of the cladding or on the building wrap more effectively than the non-water managed direct-fixed walls. However, the cavity designs have not helped to dry water from framing in these experiments, because the drying rate is still limited by moisture transport rates in timber. This emphasises the importance of preventing water from reaching the insulated cavity.

It should be noted that drying rates will be different in other parts of New Zealand and for many wall types not represented in the experimental building. The team plans to repeat drying rate measurements from framing in the next winter and check several other drying rates for reproducibility.

## Cavity design and dry timber key

Overall, the results emphasise the value of cavity designs in keeping timber framing dry. The experimental data can now be used to test computer models of heat, moisture and air transport in walls that can be used to broaden conclusions to different climates and wall types.

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Figure 2: Moisture content measurement at a stud/dwang junction in experimental walls.

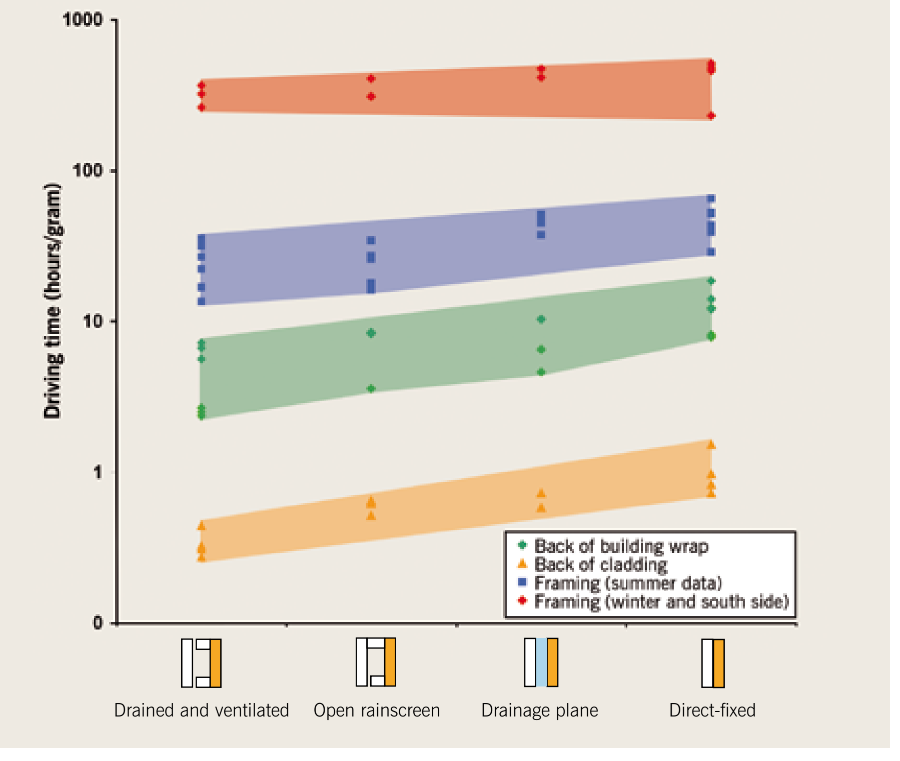


Figure 3: Drying times for water from three different places in experimental walls.