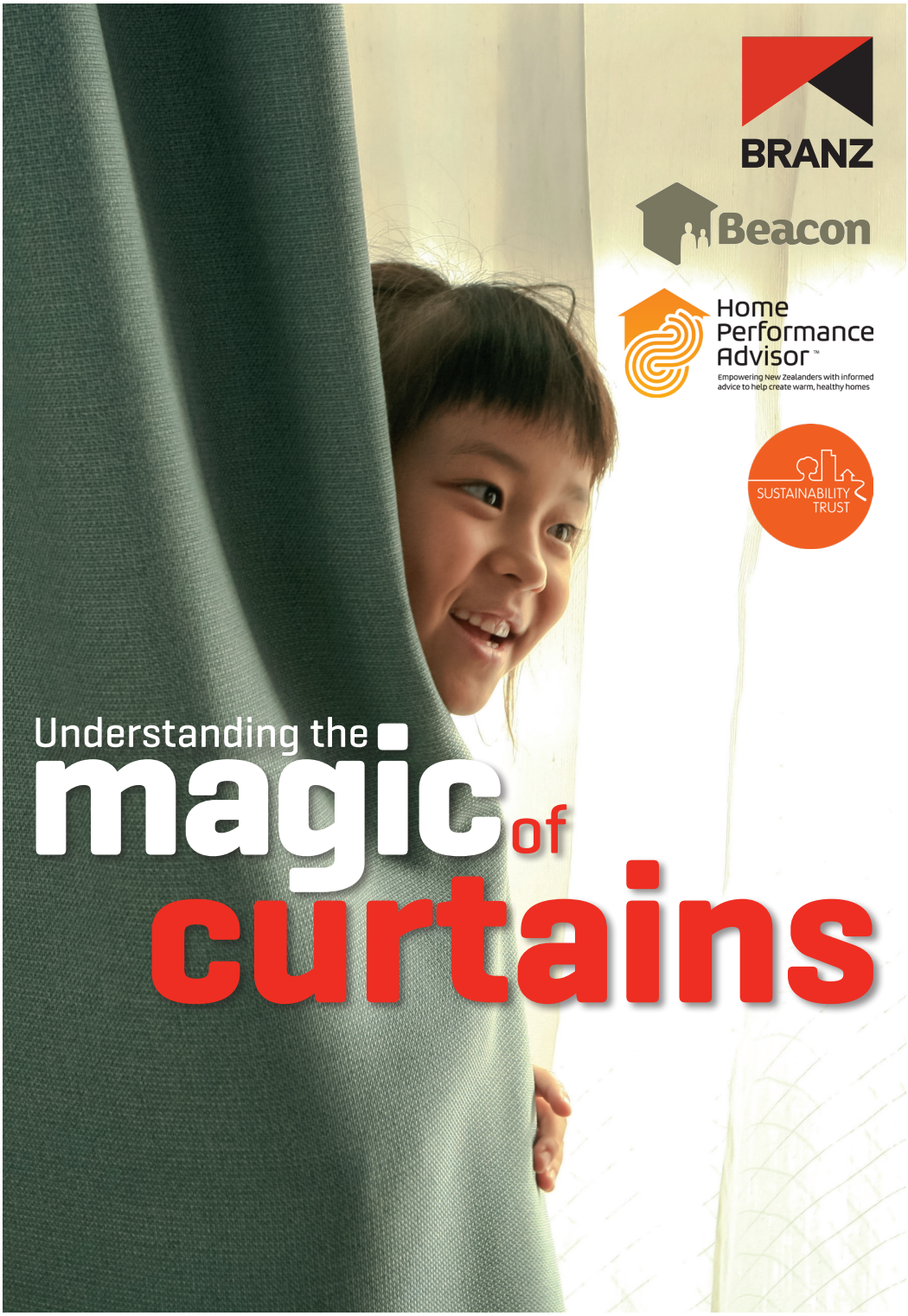

BRANZ
Beacon
Home
Performance
Advisor™
Empowering New Zealanders with informed advice to help create warm, healthy homes
SUSTAINABILITY TRUST
Understanding the
magic of
curtains

Introduction

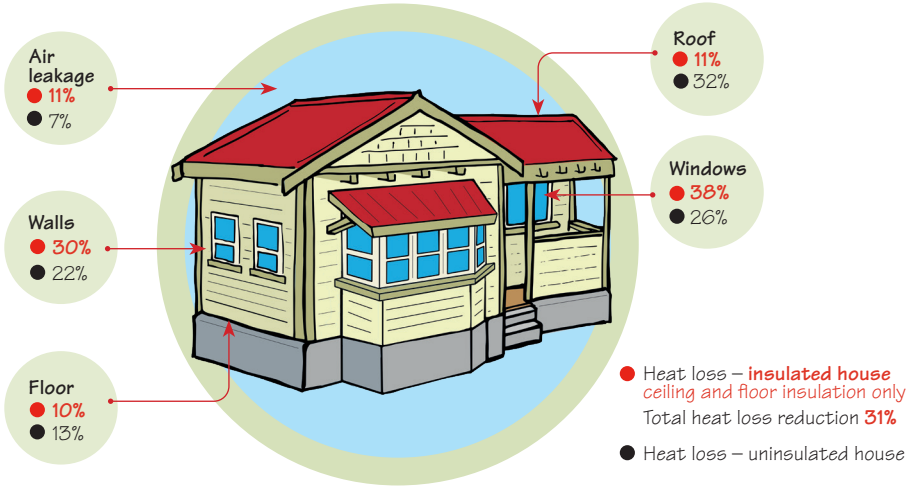
Beacon Pathway, the Home Performance Advisor Training Programme and BRANZ want to improve the understanding of the science of curtains in Aotearoa New Zealand. We partnered with Sustainability Trust, who work on the front line ensuring households have curtains in the Wellington region. Together, we developed new experiments to test the best curtain options for being comfortable at home, particularly when there are few other means to stay warm.

We found the best combination is curtains that are long and thickly lined and on a track that is tight with the wall.

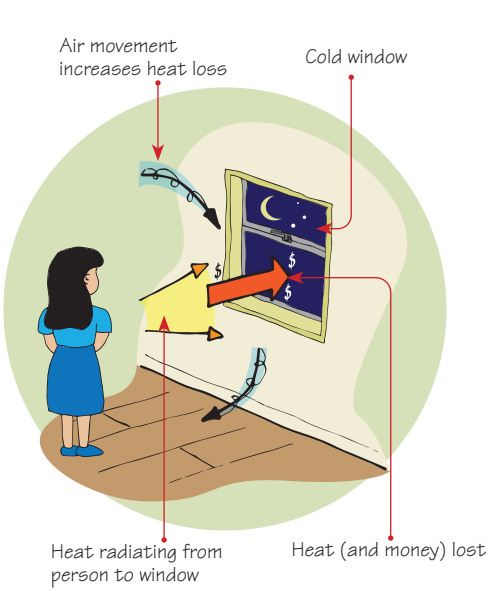
Keeping warm

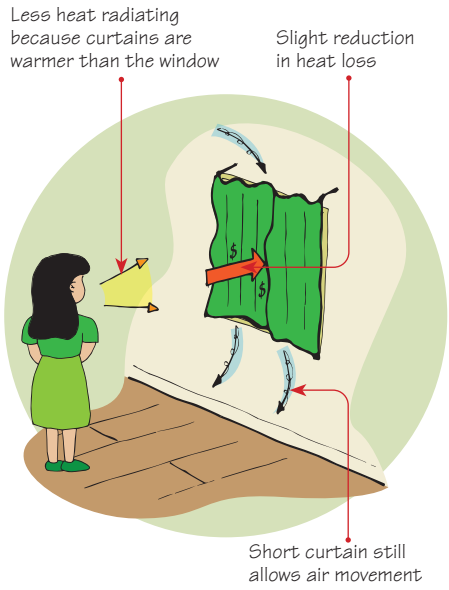
To understand the magic of curtains, you need to understand heat, houses, and what makes us comfortable:

- Heat travels from **hot to cold,** so if you have a warm room in winter, the heat is always trying to escape. We all know warm air rises, but it's important to remember that cold air drops!
- Heat moves in **three different ways**:
  - **Conduction** – moving from a warmer material to a cooler one. For example, when you're sitting on cold concrete, the heat from your warm body gradually warms up your spot. That's the same as the warmth in a heated lounge moving through the wall to the outside.
  - **Convection** – moving with air. For example, you are cooler standing in the wind because it moves the hot air away from your body. If you open the front door of a heated home, the warm air will move to the cooler area (outside).
  - **Radiation** – heat is transferred by infrared rays (the sun or a fire). For example, you stand in the sun to warm up on a cool day. In a house, the sun shining through a window warms up your furniture and carpet.
- **Still air is a good insulator** – that's why a puffer jacket is warmer than a raincoat. The air gaps between the feathers are trapping the heat from your body, slowing down its escape to the cold outside. A puffer jacket is slowing down heat loss by conduction (heat transfer from your body through the jacket to the outside) and convection (stopping air movement that would carry warm air away from your body). Most house insulation works in the same way.



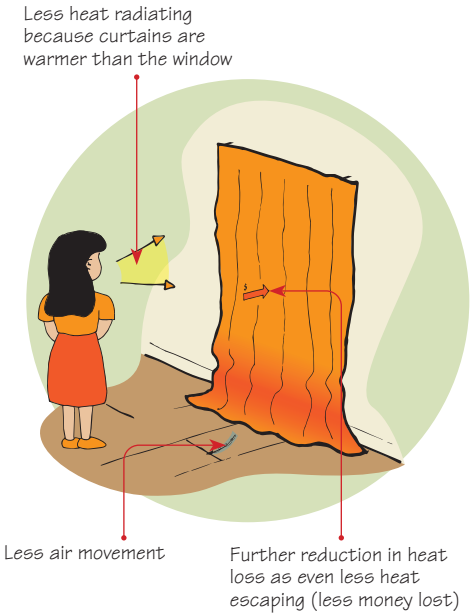
- Thanks to the healthy homes standards, rental homes will now have ceiling and underfloor insulation keeping more heat in. This means walls and windows will start to be the main places where heat is being lost. Walls can keep some heat in due to their materials and the relatively still air trapped between cladding, framing and linings. Wall insulation is great but also expensive and tricky to retofit and isn't in many New Zealand homes. **This leaves windows as the biggest gap for heat to escape.**
- Being warm is complicated. The World Health Organization (WHO) says to keep your rooms at 18°C or higher to be healthy. That's the air temperature of a room – but our feeling of warmth is not just due to air temperature. Our comfort is also affected by cold surfaces - we feel cold sitting next to a bare window in winter (your body is radiating heat, trying to warm up the window and the outside). We are also less comfortable when cool air moves over us (your body loses heat by convection), so draughts need to be addressed separately from curtains. We also want to keep the heat in so our heaters warm our living rooms and not the neighbourhood. We pay for the energy to heat our homes – if that heat is escaping outside, we'll be paying for more energy than we need to just to be comfortable. And that's a problem for many New Zealand families who can't afford to heat their homes.
- So to be comfortable in a room, we need our curtains to:
    - keep the heat in (helps us reach WHO air temperatures and not waste our heating budget)
    - reduce the amount of cold surfaces in a room (and bare windows can be very cold surfaces)
    - minimise air movement.





What did we do?

- We designed a research project looking at curtains or window coverings as a means of being comfortable at home.
- Using a test house on the BRANZ site, we started to look at what we thought would be the best curtain – one that is full length, with thick lining, and a tight track with minimal gap to the wall. The curtain can be closed carefully so there are no gaps in the middle or sides – we call this being well fitted.
- We then compared this curtain side by side with a variety of different curtain set-ups. There were three variables:
    - Curtain length: 'Long' means the bottom of the curtain puddling on the floor, so no gap at the bottom. 'Short' means the bottom of the curtain is just below the sill.
    - Curtain track fit: 'Tight' means there is minimal air gap at the top of the curtain where it is hanging. 'Gappy' means there are lots of gaps between the wall and the track/curtain.
    - Curtain lining: We had curtains with no lining, thin sheet lining and thicker lining (we used bumph), which were always the same length as the curtain.
- We used thermal cameras to compare the temperatures of different curtain set-ups and to see the differences between them.



What did we not do?

This experiment didn't measure how much heat is lost or how much energy can be saved with different curtain set-ups. The thermal imaging confirmed the principles of how heat loss works around curtains and which combinations reduced heat loss. However, actual heat loss will depend on many factors (the difference between outside and inside temperatures, amount of windows compared to walls in a room, air movement in a room, draughtiness of windows).

What did we find?

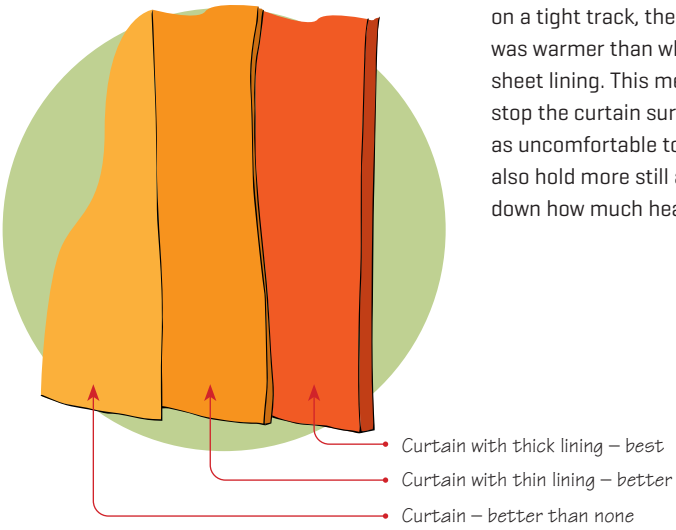
First, the cameras showed us that the bare window was always colder than any curtain, so any curtain is better than none.

The cameras showed us that, with short curtains, the cold air on the window dropped out of the bottom of the curtain, pulling warm air in at the top (by the track). If you think about this in your home, you will feel cold if you sit or sleep below a short curtain. As well as the cold air movement, this means that heated air from inside is being pulled behind the curtain and being lost outside (by conduction through the window).

The cameras showed that the surface of the short curtain wasn't as cold as the long curtain. When a curtain holds cold air near the window, it becomes a cold surface. The long curtain was better at holding cold air near the window. Behind the short curtain, heated air from the room is mixing with the cold air near the window.

The cameras showed us that the wall below a short curtain was a cold surface (we feel cold next to a cold surface). This means longer curtains provide another layer of protection for that bit of the wall. This would help in homes with uninsulated walls during cold evenings (as well as opening curtains in the day to let in the free sun to warm the room and the walls).

The cameras showed us the curtains on a tight track looked colder than those with gappy tracks. This is good because the tight tracks help the curtain hold the cold air near the window and don't let it move into the room.



When we added thicker linings to the long curtain on a tight track, the camera showed the curtain was warmer than when it was lined with a thin sheet lining. This means that thicker linings help stop the curtain surface cooling down so it's not as uncomfortable to sit near. A thick lining can also hold more still air behind the curtain and slow down how much heat is lost through the curtain.

What's the solution?

Our research has confirmed that long curtains are better than short curtains, tight tracks are better than gappy tracks and thick linings stop heat loss better than thinner or no linings.

Ideally, a household would replace their curtains and change the tracks. However, it is not always possible to change these features immediately. Here are some simple and cheaper solutions:

If you have short curtains, try:

- moving your furniture away from the windows
- finding a way to close the gap at the bottom of the curtain
- lengthening your curtains so there is no gap at the bottom
- unpicking the hems of your curtains so they puddle or drag on the floor.

If you have a large gap between the curtain track and the wall, try laying a rolled sheet or towels along the top of the track.

If you have unlined or thinly lined curtains, try:

- adding linings to existing curtains (if you rent your home, you can take the linings with you when you leave)
- hanging blankets or duvets as a second layer.

If you have no curtains, try:

- hanging blankets or duvets bought from a second-hand shop
- checking if you are eligible for curtains from a curtain bank.

If you are getting draughts (cold air movement) around your curtains, try everything above and:

- draught-stopping your windows
- closing curtains carefully at night
- using Velcro dots to hold the sides of curtains against the wall.

Final take-home message

The best way to be comfortable is to have a tight track with a well-fitted (no gaps), long, thickly lined curtain you can close on cold nights.

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Curtain Team

BRANZ:	Greg Overton, Vicki White, Ian Cox-Smith, Manfred Plagmann
Beacon Pathway:	Vicki Cowan, Andrea Blackmore
Home Performance Advisor:	Ian Mayes
Sustainabilty Trust:	David Pierce, Amanda Ashby