EXPERT REPORT ON

What You Absolutely Must Know About Owning a Plaster-Clad House

The crucial steps to diagnose, repair and manage weathertightness on plaster-clad houses – from New Zealand's leading expert

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Introduction

This report is intended for owners and potential owners of houses and apartments built between 1992 and 2004 - the period known as the 'leaky homes era'.

Although the media hype around leaky homes has subsided, there remain tens of thousands of homeowners adversely affected. This results in lower house resale values, high repair or massive re-cladding costs, and uncertainty around whether their homes are leaking and the next steps to take.

This report explores the background of the problem and how to determine whether a house is affected. It then outlines the various solutions available to homeowners, from low cost in-situ repairs and timber treatment, through to full re-cladding.

If you wish to talk with an expert about your house, you can call us on (09) 271 0522 or email at info@moisturedetection.co.nz.

As experts in evaluating weathertightness of houses, the key questions we always ask are:

1. When was the house built?
   This often points to the level and type of timber treatment used in the framing timber. This probably has the most significant impact on the risk of decay and damage. Treatment levels need to be confirmed by testing.

2. What cladding does the house have?
   Not all monolithic claddings have equal risk. Harditex and Solid Plaster (stucco) systems are the highest risk and well-ventilated EIFS (polystyrene systems) such as Hitex Diamond, are relatively low risk.

3. What does it look like?
   Many aspects and features of a house design will add to or take away from the risk of leaks and decay. Also, the larger, higher and more complex the house, the greater the chance of leaks and decay.

Important – for Potential House Buyers

If you downloaded this report because are interested in buying a monolithic plaster clad house, then this is an important time for you.

You may be about to buy the bargain of the century or a lemon that costs you emotionally and financially.

Bargain or Lemon? Find out before you buy.

Plaster clad houses sell for less than equivalent brick or weatherboard houses in the same area. This means you can buy a bigger house, in a better area, with the schools and amenities you want.

They are cheaper because overall, they are higher risk. Higher risk of leaks, decay and being hard to on-sell. However, many plaster-clad houses are sound, dry and will stay that way for many years with suitable monitoring and maintenance.

Every week, we talk with owners who bought without getting an appropriate level of pre-purchase inspection, now stuck with leaks and decay problems. Maybe they relied on the vendor's report or even their own thermal imaging, or visual inspection using standard moisture meters. **But these tools are not capable of 'seeing' what is going on inside the walls, in the framing timber itself.**

Non-destructive invasive testing is available to test the timber treatment, condition and moisture levels. If the vendor won't let you do this, then you are buying at high risk.

All Houses Leak!

All houses leak (or will leak at some time). This has been understood for decades.

For background information on why houses built in the leaky home era are more vulnerable to leaks and decay, please read the "Additional Information" section at the end of this book.

Houses move, cracks open up, sealants degrade, window mitres open up, washing machines overflow, showers leak, gutters block - there are multiple reasons why we have to expect even a well-built house to leak eventually. Like everything, houses need regular maintenance.

Although houses are required to have a minimum durability of fifty years, many of the building elements, such as claddings, roofs, paint, sealants etc. only have to last five or fifteen years. These are expected to fail and when they do, the framing timber will get wet. Whether it rots then relies on its treatment and ventilation and how quickly the owner discovers the leak.

Which Houses are Most at Risk?

When you think back to the publicity during the height of the 'leaky homes' scandal, the main problems seemed to be that the ***houses leaked and had monolithic cladding*****.** A lot of the blame was put on poor building techniques, flashing designs, and cladding materials.

It is now widely known that there are specific 'risk factors' which determine which houses are more likely to have problems.

Houses Built Between 1992 and 2003

The year of construction is an important risk factor for your home.

From 1992 through to 1998 most houses were built with undertreated H1 Framing Timber. From 1998 until 2003, untreated timber was allowed and extensively used. From 2004 – 2005, some houses continued to be built with untreated timber.

Although some architects were still specifying treated timber throughout this period, we have determined that untreated timber was often used in its place.

Houses built closer to 1992 are more likely to have better treated timber as some of the smaller, local sawmills kept producing at the pre-1992 boron loadings. They had not yet switched over to the new lower treatment level.

By late 2002, some houses were being built with the decay resistant H1 'Plus' timber that cladding manufacturers were promoting. Some [i]councils had also started to recognise that there was an issue and required H1 Plus timber and better weathertightness detailing, particularly on high-risk houses.

From early 2005, houses were not permitted to be built with untreated timber. The construction dates, rather than the date on the Code of Compliance Certificate (CCC), are the important dates to know, as a house built in 2002 may not have been issued with its CCC until 2005 or later.

Houses Clad with Monolithic Cladding

Houses in the 1992 - 2003 period were constructed using various materials including traditional weatherboards, bricks, and what are known as *monolithic plaster* systems.

The term *monolithic* is used to describe houses clad with sheets of material coated with a textured or plastered (stucco) finish to form a monolithic or continuous finish.

The most common types were.

- Polystyrene backing sheet with mesh and plaster finish, for example *Insulclad*,
- Fibre cement board rendered over with plaster such, for example *Harditex*
- Solid plaster, or stucco over a fibre cement board such as *Hardibacker*.

The cladding was generally directly fixed over building paper to the framing timber with no cavities. Some monolithic cladding designs, for example *Hitex Diamond*, did include drainage/ventilation grooves or channels, but most did not.

Unfortunately, most of these cladding systems were introduced and used any formal testing during their appraisal process at BRANZ. This was precisely at the same time that BRANZ was appraising lowering of timber treatment levels.

If either the cladding itself or poor weathertightness details leaked, the water couldn't drain out, the lack of cavities prevented air circulation and the timber was in danger.

If your house has direct fixed monolithic cladding, there is a high risk of some moisture and decay in the framing.

After 2004, monolithic cladding could only be used if it included a cavity.

A professional building inspector can advise on how your house is clad, what that means, and how the risks can be managed.

Regardless of whether your monolithic clad house actually leaks, potential purchasers and banks devalue your property due to this risk factor. The higher the perceived risk, the greater the value reduction.

Houses Without a Code of Compliance Certificate

A Code of Compliance Certificate (CCC) is a formal document, issued by the local authority to certify that the building work carried out, under a building consent, complies with that building consent (and the Building Code).

A homeowner can claim for financial loss against the council if their building becomes damaged by leaks within 10 years from the issue of CCC.

In the normal course of events, the CCC is issued once a house has been built and has a final inspection by the council. However, there was a new Building Act in 1991 and many builders and owners were not aware of the significance of getting the CCC on completion.

As the councils became more aware of the leaky home and untreated timber crisis, it was clear that they could ultimately be held liable for the financial cost of repairs. They responded by demanding additional work above that required by the original building consent, especially for 'high risk' houses. Many homes were caught in limbo – they had been designed, had consent approved and were constructed to one set of standards, then the councils demanded a higher standard before they would issue the CCC.

In many cases, it became too hard, a CCC was never issued and the building consent is still open. Owners find these houses increasingly hard to sell without a large price discount.

If your house (or one you are looking to buy) does not have a CCC, this could be because crucial weathertightness faults were not fixed. If these have been left, then leaks and damage to the timber could have resulted.

Late CCC equals higher risk: If the CCC was issued many years after the house was built, this could mean that the council had concerns about the materials and construction methods used. If these concerns related to weathertightness, the timber could have been allowed to get wet and begin to rot, before the leaks were sealed. A higher level of inspection is recommended for these houses.

Houses with High Building Risk Factors

The location of your house and its architectural features contribute to the risk of leakage.

During the leaky home era, councils adopted a less prescriptive approach to house durability and weathertightness design. Weathertightness did not have to be proven through professional independent testing and verification. Council building inspections were often contracted out to *independent certifiers* and standards fell well below those required to identify potential problems.

Typical features that add to the risk profile of a house include:

- Built in a high wind zone
- Built in a valley or shaded by trees
- Small or non-existent eaves
- Flat roofs
- Complex roofs with internal gutters
- Balconies
- Decks over living areas
- No or inadequate control joints between sheets of cladding
- Windows with no or inadequate flashings or under sill trays
- Pergolas and verandas fixed through cladding
- Flashings without stop ends
- Flashings relying on sealants
- Curved or arched windows, round windows etc
- Not enough clearance between ground and cladding
- Taylor or Klass fascia style guttering
- Low pitch tile roofs without 'ponding boards'
- Plastic sill flashings embedded into plaster

1. Base clearance
2. Vertical control joints/cracks
3. Horizontal control joints
4. Horizontal joints – corners
5. Cladding base
6. Intercladding junctions
7. Sheet joints
8. Material quality
9. Cladding top
10. Decorative bands
11. Corners
12. Window jambs
13. Window sills
14. Window sill/jamb junctions
15. Window head/jamb junctions
16. Window heads
17. Raked/curved window heads
18. Garage door heads
19. Garage door jambs
20. Garage door jamb bottom
21. Parapet/roof junctions
22. Parapet tops
23. Parapet top corners
24. Rainwater outlets
25. Downpipe spreaders
26. Roof edge gutter
27. Wall/roof junctions
28. Apron flashing bottom
29. Roof to wall clearances
30. Other roof flashings/skylights
31. Inter-roof claddings
32. Inter-roof/wall junctions
33. Deck/wall junctions
34. Deck perimeter/wall junctions
35. Deck perimeter
36. Open balustrade/wall junction
37. Clad balustrade/wall junction
38. Clad balustrade top
39. Handrail fixings
40. Deck drainage/overflows
41. Balustrade/deck junction
42. Timber deck/wall junction
43. Pipe penetrations
44. Pergola fixings
45. Meter boxes/grilles

Many of these features visually define what became known as a 'typical' leaky home. However just one feature, which is badly designed, badly constructed, or not maintained is sufficient to allow water to enter the structure of a monolithic, weatherboard, or brick clad house and put the framing at risk of rot.

How Will I Know if My House is Affected?

Sometimes leaks are obvious – musty smells, swollen skirting boards, cracks, staining, damp walls, decayed window reveals etc. However, leaks and decay can be hiding inside walls, causing damage for years before they become visible.

A visual only inspection may only identify the obvious leaks, leaving others undetected and endangering your house.

A higher level of inspection, known as invasive testing, is required to properly identify and confirm leaks and decay. Invasive testing looks at the actual timber for evidence of moisture or decay.

Timber Sampling

The only way of conclusively determining whether your house was built with treated timber, is to have representative samples from around your house tested.

Samples are required from different external walls because it is possible that timber of various grades and from various suppliers may have been used in different parts of the house.

Moisture Detection Company, or another expert can take samples of the framing after determining the best locations. Usually there is no, or minimal damage to claddings or interior linings if done carefully. The samples can be tested and compared against representative samples of known treated and untreated timber to assess whether treatment is present, what type and at what strength.

A more formal and significantly more expensive option is to send samples to laboratories for chemical analysis.

Additional samples, from areas which may be leaking, should also be taken and checked for existing decay. Moisture Detection Company carry out a VCR (Visual and Colour Grading) analysis of timber samples to categorise the decay condition.

Timber Treatment Testing

The results can indicate whether your house contains:

Untreated Kiln Dried Timber	- no protection
H1 (post 1992) 0.04% or 0.1% Boric Treated Timber	- low protection
H1.2 or H1 Plus Boric Treated Timber	- reasonable protection
C8 or pre 1992 H1 0.8% Boric Treated Timber	- high protection
H3.2 CCA Treated Timber	- high protection
C7 or Tanalith Treated Timber	- high protection
H3.1 LOSP TBTN Treated Timber	- reasonable protection

If your house contains untreated or undertreated external framing timber (or timber around wet areas, such as showers), your house is at higher risk of developing rot, if not now, then sometime in the future.

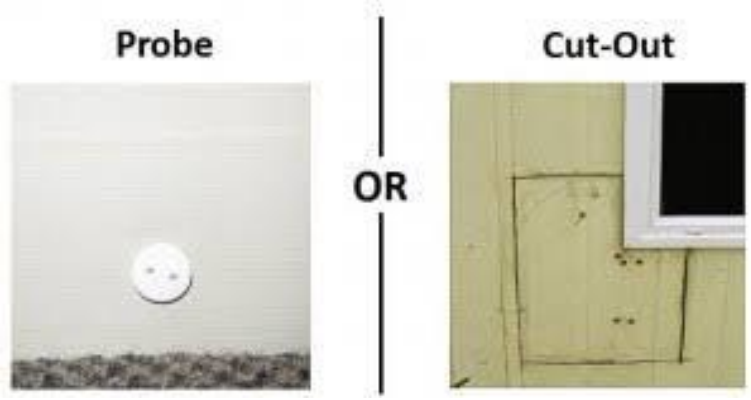
Timber Decay Analysis
If the decay testing shows a high incidence of decay around the house, or high-level decay at some locations, then further investigation and action is strongly recommended.

Building (Weathertightness) Inspection

A weathertightness building inspection entails a visual inspection of the risk features of your house (cladding, flashings, ground clearances etc.) as well as surface scanning for any actual damp areas.

Further destructive invasive testing (drill samplings, or cladding or gib cut-outs) may then be recommended to determine whether, and how far moisture or decay has spread into the framing.

A non-destructive alternative to cut-outs, are the Mdu Moisture Detection Probes, which are classed as invasive testing, because they are actually installed into the timber. They are discrete and designed to stay in the house for the life of the building.



A Moisture Probe Looks Like a Small White Button on the Skirting Board

The inspection must determine whether a cavity was used and whether the timber is adequately treated as this information is required for any serious risk assessment.

Moisture Detection

If you have a serious leak, or rot problem, you may already be able to smell mould or dampness, or see damaged gib, skirting, window reveals or paint. However, in most cases, the framing timber is slowly deteriorating within the walls with little external evidence - until it is already seriously decayed.

If rot is allowed to progress too far, a homeowner's options become more limited and expensive – sell the house at a very low value, replace all of the rotten wood and re-clad, or bulldoze and rebuild.

Most building inspectors will run hand-held scanners over the surfaces in your house to identify possible leaks. These detect changes in density close to the surface which may be associated with moisture in the gib or wood. While a useful tool, these scanners cannot 'see' inside the wall and do not measure moisture levels deep in the framing where the problem could be growing. They frequently miss picking up leaks and they cannot tell if framing is treated or decayed.

The results from the scanner can be confirmed by cutting out a small portion of gib or cladding to inspect the actual timber. Cut-outs on the cladding in particular, are hard to repair without leaving obvious signs that wet or damaged timber was suspected.

Thermal imaging is another promoted technique relying on detecting and associating changes in temperature in a wall with dampness. This technique is also flawed, especially on cold, shaded walls. This tool also cannot determine timber treatment or decay. In our experience, thermal imaging is a useful tool but misses many important defects.

Every house has a multitude of potential leak points, and the actual defects causing leaks are not always obvious. This means that most Inspection Reports are filled with comments about what 'might' be happening or what 'should be' inspected by another expert. The result is that homeowners are unsure about what to fix first and where to spend a limited repair budget. Home buyers are unsure about which things are real issues they need to be concerned about and which are just the inspector protecting themselves against potential claims by pointing out everything that ‘could’ be a problem.

Mdu - Moisture Detection Probes

In 2004, *Moisture Detection Company* designed and patented their unique Moisture Detection Probes as part of a complete building condition, moisture monitoring and decay management system. The probes measure and monitor the moisture levels directly in the framing out near the external cladding. This is where leaks and decay are most likely to show up.

Mdu Moisure Probe Installed into the Bottom Plate for Accurate Measurements

The goal was to detect leaks and understand their potential impact on the building, taking into account the timber treatment, and the existing decay condition.

Importantly, the probes stay in the house, where they can be re-read periodically to build up a history of the house performance and pick up any new leaks that develop in the future as the sealants, claddings, windows etc. age.

During installation, the moisture levels are measured accurately, and timber samples examined for decay. Representative samples are analysed to find out what treatment was used.

Moisture probes protect the house and its owners by detecting leaks and decay.

Probes are installed at any weathertightness detail that may leak, giving a complete picture of the house's condition. Typically, between 40 and 80 probes are installed.

This is the only way that homeowners can find out the condition of their house, in detail, without literally pulling it apart.

Mdu probes are also installed for potential buyers of houses, to understand the timber treatment, decay condition and weathertightness before they commit to the purchase.

When a house has Mdu Probes and a Timber Framing Condition Report, an inspector knows where to look for the defects that are causing problems in your home. Your maintenance budget can then be used to repair those actual defects in order of importance.

The 4-colour rating system

STATUS	Moisture Content (MC)		Visual Colour Rating (VCR)		Timber Resistance (TR)		Treatment (BT/CCAT/LOSPT)	
OK	Inside safe and acceptable level. Fungal activity unlikely	0 - 15%	No signs of discoloration in sample. Samples crisp and strong	A	High strength reading	>31.5	Boron, LOSP Tin or CCA detected in high level of colour eg Framesaver, RotStop, H3.1 and H3.2 (>1%BAE)	++
WATCH	Close to safe and acceptable level but if untreated framing surface of framing remains at risk to fungi	15% - 18%	Unknown discoloration in sample. Likely some early sapstain or invisible incipient decay	B	Upper medium strength reading	23.5 - 31.5	Boron, LOSP Tin or CCA detected in moderate level of colour approximately equivalent to current H1.2 standard (0.4%BAE)	+
WARNING	Moisture levels will allow germination and fungal growth especially in untreated framing	18% - 25%	Signs of discoloration in sample which normally is associated with early stages of decay fungi	C	Lower medium strength reading	18.5 - 23.5	Trace or weak colours of boron, LOSP Tin or CCA detected eg to old H1 (0.1%BAE)	+-
DANGER	Dangerous level of moisture even to moderately treated framing. Fungal activity high.	>25%	Significant deterioration in sample by color, shape and texture meaning likely loss of strength.	D	Low strength reading	<18.5	No Boron, LOSP Tin or CCA detected as no colour change or different colour change eg likely Untreated timber	-

Remark: VCR gradings: * = initial grading; no mark = expert grading; L = lab verified; MC readings: H = homeowner reading or source not recorded.

MDC - Moisture, Visual colour, Timber Resistance and Treatment Rating System

Are Only Monolithic or Plaster Clad Houses at Risk?

As has been explained previously, there are many risk factors affecting which houses are more or less likely to develop leaks or rot. Because monolithic houses were usually built without a cavity, they were most likely to show rot quickly and therefore became the focus of media attention.

However, weatherboard or even brick houses from this era can be affected because they are very likely to contain the same untreated or undertreated timber, and poor flashing details - the problem may just take longer to show up and be better concealed from view.

All houses built between 1992 and 2005 would benefit from having moisture probes installed and their timber treatment and moisture levels determined. This gives owners peace of mind and alerts them to potential problems before they develop into widespread expensive damage. The information gained is invaluable in deciding what needs to be done.

Are Houses Built Outside The 'Leaky Homes Era' At Risk?

The simple answer is 'yes', but the risk is less.

All buildings are at risk of damage if they leak and continue to leak. However, outside the leaky home time frame, the risk that they will leak, and suffer damage, will be lower.

If a house is built with well-treated timber and then leaks, the treatment will stop the wood from rotting - for a while. With long term or large leaks, the treatment leaches out and the wood can start to rot. However, the decay stops spreading once it reaches well protected dry wood. Therefore, the amount of timber affected is far smaller than if it was untreated.

We have seen many pre-1992 houses, including ones with stucco/plaster exterior cladding, with serious leaks but only moderate framing timber damage. Be aware that leaks also damage skirting boards, window trims, carpets, and internal linings as well as contributing to ill health of the occupants (rot is not the only risk).

Options for Plaster Clad Home Owners

What Will Happen if I Do Nothing?

At the very least, if you are fortunate, your house will not leak seriously enough to cause significant damage during the time you occupy it. However, when you come to sell, potential purchasers will attempt to discount the selling price to reflect the risk of buying potential problems.

Many potential house buyers simply walk away at the gate and will not even consider your house because of the stigma attached to this era and style of construction. If the pre-purchase inspection reveals high moisture readings, most banks will refuse to lend money to the buyer, leaving only cashed-up buyers or property developers in the position to buy. These are typically canny buyers, looking for a bargain at your expense.

This means that your biggest asset may be going down in value, while your neighbour's property, with different cladding, continues to skyrocket higher. In many cases, plaster houses, even quite sound ones, sell for less than the value of the land.

If there are leaks and rot which are left unchecked, then at some point the house will need to have the rotten timber removed and be fully re-clad, or demolished.

Leaky buildings are a known source of *Stachybotrys chartarum* mould which produces highly toxic mould spores, affecting the health of the occupants. The mould grows within the gib, wallpaper and insulation of damp walls.

Doing nothing or choosing to not find out, is a very dangerous and potentially expensive decision to make, especially when the cost and effort required to have trustworthy information about your house is so low.

Doing nothing or choosing to not find out, is a very dangerous and potentially expensive decision to make

Re-Cladding

What is Re-Cladding?

Re-cladding is a process, requiring building consent whereby the exterior cladding is completely removed, any damaged timber is replaced, some surface treatments applied, and new cladding installed with a cavity.

In order to obtain the consent and final council signoff, there is usually a lot of other work required, which can include replacing the windows, guttering, flashings, decks, and balconies, changing roof lines, even refurbishing bathrooms. This is to eliminate

as many 'risk factors' as possible from your house to minimise the chance of future leaks and future claims against council.

Typically, your house is virtually uninhabitable for several months (up to 18 months). The cost is not known until the existing cladding is removed, the extent of any damage determined, and the council's requirements agreed.

Re-clad costs normally start at $250,000 but expand upwards, many costing from $400,000 -$600,000.

The re-clad process is managed by a project manager charging a fee (often around 14% of the project). This goes on top of designer, architect, council and actual building costs. Recladding is big business in New Zealand and there is a lot of money being made. This is one reason why most building professionals associated with managing or undertaking re- clad projects recommend re-cladding to homeowners with leaky or potentially leaky buildings.

In many cases just two questions are asked; ***does your house have untreated timber,*** and ***is your house built without cavities****?* If the answer to these is "yes" then a re-clad is automatically recommended regardless of whether your house actually leaks. Many owners are paying huge amounts of money to fix problems that don't actually exist or can be managed in far cheaper ways.

Although sometimes a full re-clad is the only option, this may be avoided or delayed by knowing enough information about your home, and by taking an alternative approach based on what your house actually needs.

Does Re-Cladding Solve the Problem?

The answer is specific to each house and should be an economic decision.

> ***Will the re-cladded house and land be worth significantly more than the current value of the house and land, plus the cost of the re-clad, financing and alternative accommodation while the house is uninhabitable***

We say ‘significantly more’ because the final re-clad cost and end value of the house are unknown so there needs to be a safety margin to allow for this, and to make up for the disruption to your family’s lives.

Factors influencing this are:

1. Location: the base costs of re-cladding are similar for similar houses regardless of their location, however a house in a desirable area will typically have a greater uplift in final value. Re-cladding a house on low value land in a low value area is unlikely to

be economic. If the house is outside a major centre, this can reflect in higher re-cladding costs and less value increase.
2. Complexity and size: a larger, more complex house will cost more to re-clad.
3. Risk features: a house with many risk features such as internal gutters, decks over living areas and flat roofs will cost more to re-clad.
4. Timber treatment and current timber condition: a large cost of a re-clad is replacing damaged timber so a house with well-treated timber is likely to require less replacement than one with untreated timber.
5. Access: some houses are down narrow rights-of-way, difficult to access for major work.

- You should to get solid evidence based advice from a reputable agent or valuer as to the likely finished value of the property.

- You will want to talk with a re-cladding company to get an estimate of the likely costs – be aware that these estimates are usually low.

The fundamental problem with the 'leaky homes era' was not that the homes leaked, but rather that they were built out of timber that would rot when the inevitable leaks occurred and could not dry out.

A good, professionally managed, re-clad should leave you with a house with a cavity cladding system, some treated framing and with well-designed flashings, gutters, windows and decks. However, there are still two critical problems.

1. The house framing timber is still untreated. A brush on 'Framesaver' product is applied to all exposed timber during the re-clad. However, this is a surface treatment only, which may not penetrate to kill decay already in the framing. Framesaver is boron based and can leach out if new leaks develop. If rot is already in the wood or becomes established, Framesaver may not be enough to stop it from spreading.

2. You may have decided to re-clad because the stigma associated with plaster houses has affected its resale value. Unfortunately, re-cladding a plaster house only restores some of its value and the re-clad is recorded on the council *Property File*. Potential buyers and their inspectors will still know that the house is built with untreated timber, was probably a leaky building, and may discount the price accordingly.

If you do decide to re-clad your house, you still need to know if any leaks develop so they can be repaired *before* the damage cycle begins again. Moisture Detection Probes usually picks up leaks long before you see any physical signs, allowing you to have repairs done quickly, and hopefully before damage is done.

Is There an Easier Way to Fix My House?

Many plaster-clad houses can be maintained, and their value increased without a full re-clad.

The first step is to properly identify the extent and location of your problems.

The only way to do this without high cost and damage to your house is to accurately test the condition and moisture content of your timber using the *Moisture Detection Probe System*. Many good building inspectors will actually refer you to Moisture Detection Company to have probes installed.

The next step depends on you, and the condition of your house.

In some cases, the house has been well built and maintained, and there are no serious problems to report. The recommendation is usually to continue regular monitoring with positive results building up a history of dry readings to aid an eventual sale.

Most houses have at least some areas where moisture is high, or the wood shows signs of decay. This is what owners fear the most - potentially huge, costly and disruptive re-cladding and timber replacement projects.

A targeted remediation and treatment process usually avoids the need for this.

Targeted Remediation Planning – A Mature Response to Leaks

The reasons your house is leaking and potentially rotting are a combination of water ingress wetting under-treated timber, inadequate or non-existing ventilation cavities, and poor details/flashings/sealants.

> ***The fundamental problem is that untreated timber is never going to be durable enough for the leaks that were always going to happen.***

It is not practical to replace all of the untreated or undertreated timber in your house with properly treated framing, however you can use a ***targeted remediation*** **and maintenance plan** that increases the weathertightness AND timber treatment levels in your home, without wasting money on unnecessary work.

The advantages of this approach are.

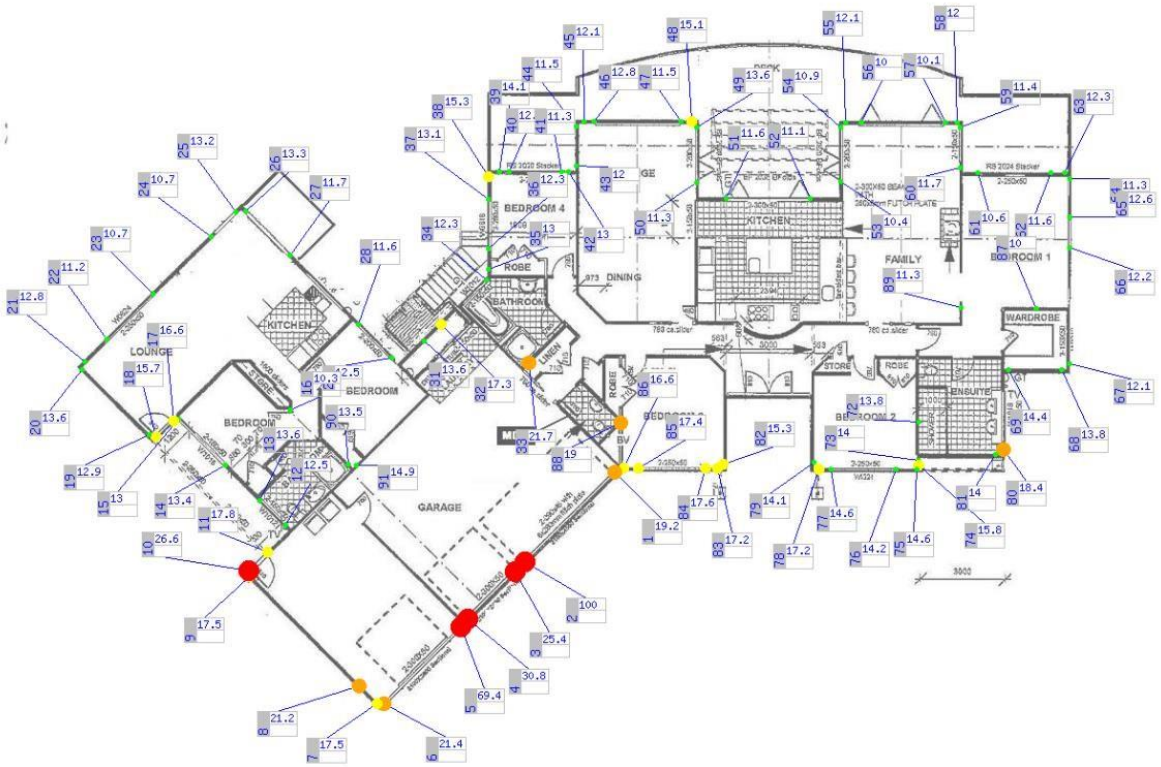
- Vastly cheaper than a full re-clad
- Minimal or no disruption to the house - you don't need to move out

- Target the most serious issues first then move to the lesser problem areas
- Repair costs can be planned and spread out to make them affordable
- Building consents are not usually required
- You only spend money on actual leaks and treating the most vulnerable timber i.e. where framing is at risk
- You only replace framing if it is seriously decayed or structurally important.

Steps to a Drier, Safer More Valuable House

Step 1: Mdu Moisture Probe System

- Install multiple discrete moisture measuring probes through the skirting boards at or below possible leak points throughout the house
- Analysis of the wood treatment (or lack of wood treatment), from these samples
- Analysis of the current condition of the timber decay levels
- Measure moisture levels of the timber framing throughout the house (probes)
- Identify areas (high moisture or decaying timber) you should be concerned about
- Pinpoint potential faults or leak points that are likely contributing to those concerns



Typical Mdu Probe House Moisture Plan – Showing Areas of Elevated Moisture

Similar plans are produced to show the levels of decay and timber treatment discovered.

Step 2. RotStop Treatment of affected or vulnerable timber

Based on the report, the owners can decide which parts of the house they want to protect from existing or future leaks and decay.

- Injected as a foam through small, easily patched holes in the exterior cladding or through the gib linings
- Kills and stops decay and mould fungi
- Treats untreated timber to protect against decay and insects
- Rotstop is a proven, researched and tested treatment that can be applied to the entire house, potential future problem areas, or just the areas that are currently leaking or decayed
- Rotstop actually follows the path of any water leaks through the timber to search out and destroy fungus and mould spores.
- Wherever timber is under-treated or untreated, and shows signs of decay or elevated moisture, the recommended initial treatment is Rotstop.

Step 3. Targeted Repairs of Timber or Building Details

The actual leaks should always be targeted for repair, however ideally, other risk factors such as high ground lines, lack of eaves, pergolas, decks, flat roofs etc. should also be considered as part of a longer term plan.

- Repair or install flashings or other details that could be contributing to the leaks - these can be done for you, or you can organise this yourself
- Some local timber replacement if necessary.
- Cavity ventilation systems can be installed to ventilate the lower cavity around the house and dry out the bottom plates.

Step 4. Monitoring and Maintenance

Finding and repairing leaks can be an on-going process as there may be several defects contributing to a high moisture reading. Additionally, as building age, more defects will develop. Regular readings of the moisture probes are an important part of weathertightness maintenance.

- Moisture probes are read regularly and the effectiveness of any weathertightness repairs are assessed and discussed.

- Review and update your maintenance plans according to the results and goals

RotStop – Post-Treatment for Untreated Houses

What Is RotStop and How Does It Work?

RotStop is a unique, non-toxic to humans, treatment that is absorbed into the timber to provide protection against decay, insects and mould. This is injected through small holes in the cladding, which are repaired on completion.

The RotStop application process is designed to produce boron levels in the timber well above the current H1.2 standard. The excess free boron remains within the wood

where any future water leaks will carry it further into the structure - in effect increasing the treatment.

Penetration of the RotStop during application is verified by the installed Moisture Detection Probes.

RotStop treatment is often recommended as the first step following an MDU probe installation which detects leaks or damaged timber. It will stop the dampness from causing decay, or if this has already started, it kills the fungus and **puts the decay on hold**.

The timber in the leak area is now protected and the leak can be repaired.

RotStop cannot repair or strengthen wood that has already decayed but can stop the decay from progressing further. It will also kill *Stachybotrys chartarum* and other harmful mould spores.

RotStop has been laboratory tested to confirm that bracing, insulation materials, metal straps, wiring etc. are not adversely affected.

Wherever there is a leak, Rotstop will stop the timber from rotting further while you plan repairs to fit your budget. RotStop protects wet framing from rotting as it dries out after leak repairs.

This means that Rotstop is often a reasonable alternative to a full re-clad. No building consent is required. There is minimal disruption, and the cost is a tiny fraction of a re-clad project.

Where is RotStop applied?

RotStop can be applied to any framing whether untreated, undertreated, or treated (where boron has leached out due to leaks or floods). RotStop is usually targeted at the most vulnerable areas, normally around the base of the house (bottom plate), or each floor level bottom plate, around certain known risk features, and to wet framing under known leaks.

Wherever there is evidence of decay, with elevated moisture levels, these are the specific danger points that must have treatment protection and are the highest priority. Timber that has decayed in the past is also normally treated because it will contain live fungus spores that immediately become active at elevated moisture levels during future leaks or times of high humidity.

From here, the owners can decide how much more framing they wish to protect for peace of mind, and a treatment schedule that suits them.

A high overall level of protection is achieved when RotStop is applied to

- The ground level bottom plate (the timber frame running around the bottom of your house)
- The bottom plate of any upper levels of the house

- Under and around windows, ranch sliders, decks or other features which could become leak points.

All injection points are logged onto your house records, together with the amount of treatment applied.

A Rotstop certificate sits alongside your regular Moisture Detection Company Moisture Reports to demonstrate to inspectors and buyers that your house is safe to buy.

How do I Increase my House Resale Value?

If you want to sell a monolithic clad house from the leaky home era, you will not receive the best sales price unless you take action.

Unfortunately, due to the stigma attached to monolithic clad buildings, your house will never be worth as much as if it were built with the correct materials and designs. This is just a fact.

However, there are definite steps you can take *now* to increase your house value, by decreasing the risk of buying your house to potential buyers, making it worth more than neighbouring plaster-clad houses. These steps must be completed and reports ready before it comes time to sell.

Monolithic clad houses are worth *less* because the public fear that they will have problems, which may become expensive repairs. Buyers are concerned about whether they will be able to sell when the time comes. We have seen houses sell for just 80% of the land value as the buyer takes into account the cost of demolishing the house before they can rebuild it, *and taking advantage of unprepared sellers.*

Your house may be in the exact right location, be the right size, the right layout and look wonderful but there will be few buyers interested, without substantial discounts.

You *can* protect and increase the value of your asset by;

- demonstrating with the Moisture Probes that your property does not leak and has a history of not leaking,
- has a certificate of timber treatment – either original treated wood or post-treated with Rotstop,
- eliminating, as far as practicable, the risk factors that alarm buyers and inspectors,
- having a moisture monitoring system and maintenance plan so buyers have confidence that the house can be kept dry and rot free,

The Moisture Probe reading history, Rotstop Certification and Maintenance Plan provide potential buyers with a reason to buy your house at a fair price, because the risk is reduced and managed. We have found Banks will consider this when assessing lending risk.

The Pre-Purchase Inspection Nightmare

The Sellers Nightmare

So, you finally have an offer on your plaster clad house. It's not as high as you hoped but not as bad as you feared, so you can relax and look forward to moving on.

The buyer included a pre-purchase inspection clause, so they can obtain finance or confirm their pre-approved finance. Only then can the contract go unconditional.

Then your real estate agent informs you that the inspection report was not good. The inspector found a couple of high moisture readings. The report claims your home **might** have several leaks which you never had any idea existed, that there **may** be some rotten timber, and some of your flashings **may** not be sealing properly because they don't meet current standards. The report says that 'invasive weathertightness inspections' are required to find out if the suspicions are real problems.

The bank won't lend enough for the buyers to complete the sale, and everyone is going cold on the deal unless you slash your price. What do you do? You may have already made an offer on another house, however that depended on selling this house for a fair price. Do you can the whole idea and stay put after investing your money in marketing and have set your hearts on moving?

This is a very real scenario which sellers of monolithic clad houses experience. Your real estate agent probably warned you when they listed the property. The surface scanning moisture meters that Building Inspectors use cannot 'see' or measure moisture inside your walls. So, they have to act cautiously as they could be held liable if they miss anything significant in their report. So even if they can't see rot, they will report that it **may** be there and that straight away puts your house sale at risk. If surface scanning or visual inspection suggests any hint of a problem, they recommend 'invasive inspection', which normally means someone cutting open your walls to look at the framing. And the last thing you want or will approve is having your walls chopped open while you are trying to sell.

You can prevent this happening by *Pre-Inspection Proofing* your home with Moisture Detection Systems and RotStop. The best time to start doing this is right now, preparing so you have the longest history possible showing that your house is safe, dry and rot free.

To properly prepare a monolithic house for sale takes time. If you wait until the last moment, there is unlikely to be enough time to find any problems, resolve them and build up a verified history.

Time is required to find and rectify any issues and for wet wood and RotStop to dry out before you go to market. Your home is your biggest investment and you need to plan ahead to protect this and maximise your sale price.

If you want to sell your plaster clad house for a fair price, the time to start planning for the sale is now.

If you are caught in the pre-purchase inspection nightmare now, and want to move the sale ahead, but don't want your house cut open, Mdu probes are the non-destructive, invasive inspection tool to use.

Pre-Inspection Proofing Process

Pre-Inspection Proofing is a logical, structured process that takes away the reasons for not buying so your house appeals to more buyers.

1. House inspection to determine potential problems that may be negatively reported in a pre- inspection report – flashings, gutters, defective sealants, high risk features etc.
2. Install MDU Moisture Detection Probes throughout the house
3. Report on timber decay condition and moisture levels, and recommended remedial work (if any)
4. Rotstop treatment to stop existing decay and protect vulnerable timber - this can be just localised treatment or more extensive as required or requested.
5. Targeted repairs to stop any leaks detected, e.g. installing or modifying flashings, sealing penetrations, isolated timber replacement,
6. Building modifications, if practical to eliminate risk features such as high ground lines, and Taylor fascia style gutters.
7. Re-test moisture levels to prove the timber is drying and leaks are repaired
8. Issue Moisture and RotStop certification (for the areas treated)
9. All Test, and Maintenance Reports available on-line in summary form for buyers

MDU probes and reports have been used since 2004 to show building inspectors exactly what is happening behind the walls of houses so they can confidently report the real condition - without the *might/may/could* statements that scare buyers and devalue your house.

The Buyer's Nightmare

You have found the house that you really like and made your offer. The location is good, and the house looks in great condition. It has plaster cladding, so the price is a little less than other ones in the area. It's a good chance to be somewhere you couldn't otherwise afford.

Then the pre-purchase inspection report comes back. You expected a few negative comments but this reports just leaves more questions in your mind than it gives answers. Lots of comments about what might be happening inside the walls, defects

that could be leaking, possible decay – things that the inspector can't actually see or measure but has to warn you about anyway.

Then you read the recommendation to get 'invasive weathertightness inspections' to check the condition of the framing. All pre-purchase inspections on monolithic clad houses should recommend this.

Your bank won't lend without this, the vendors don't want their house cut open, you don't want to buy a leaking lemon or take on someone else's problems. So, you have to let the deal slip by. It may have been OK, but it's too late.

Or, you have a big deposit, so the bank lends you the balance and you move in. In winter, you start to notice some musty smells and some moisture damage. You then get some invasive testing done and find decay in the walls, untreated timber and huge costly headache.

If you buy a plaster clad house without appropriate invasive investigation, you are at high risk of significant loss.

If the house you are interested in doesn't have Mdu probes installed, you can request permission to have some put in. Contact Moisture Detection Company for approved inspectors for invasive inspection using moisture probes.

What is the Next Step?

Good decisions can only be made if you have good information.

The only logical step is for you to obtain the necessary information about your house, to work out the options available, so you can make informed decisions affecting your biggest investment and your future.

If you contact a re-cladding company or an expert with an interest in re-clads, then they are going to recommend a re-clad.

Moisture Detection Company accurately measures the timber condition, moisture contents and treatment levels throughout your home without damage. This is the critical information you **must** possess before making commitments about how much money is spent and where.

Armed with complete information you can consider all options, including those far cheaper and less disruptive than full re-cladding or selling for less than land value.

Please contact Moisture Detection Company for a no obligation assessment of your home.

Additional Information

Background: Why Did Houses Built in the Early 1990's and 2000's Leak and Rot?

To answer this question, you first need to look back at NZ in the 1950's, when houses were built properly and rarely rotted. Then roll forward as building, and material standards were systematically lowered, culminating in the leaky home crisis that exploded in the early 2000's.

Knowing what happened in the past is an important part of understanding your home today and how you can manage issues that you are facing.

Principles of House Construction

Over sixty years ago the standards of the day required that houses be built with three vital principles, which were known as the *Belt and Braces*. This meant that if one element failed then the other two would ensure the house would not deteriorate before normal maintenance could be carried out.

The three *Belt and Braces* principles were:

Timber Treatment

Boron treatment was approved for external framing timber, at a level where it controlled all wood destroying pests, including borer, all types of rot, native NZ termites and some foreign imported termites.

Ventilation

Boron treated framing required air circulation (ventilation) so it could dry out if it got wet for any reason. This meant that a cavity was required between the framing and the cladding.

Flashings

To keep water out of the house, suitable durable flashings such as under-sill flashings for windows, and wide eaves on the roof, were required to deflect rain away to the outside.

Houses built using these principles have stood the test of time and exhibited exceptional durability. Even when significant leaks occurred, owners would get fair warning to undertake maintenance before decay affected the buildings structurally. Rot, when it did occur, was confined to small areas.

After this brief history lesson, let's move forward in time…

Lowering of Building Standards and Material Quality

As new building materials, concepts and techniques were introduced from the 1970's onwards, the *Belt and Braces* principles were slowly eroded, and their importance forgotten.

By the time 1998 rolled around, [ii]NZ Standards, the Building Industry Association, and [iii]BRANZ had systematically downgraded the 'Belts and Braces' and were allowing houses to be built with untreated framing, with no ventilation, and poorly designed or non-existent flashings and weatherproofing.

Councils accepted these changes at 'face value' without historical review. They issued building consents, inspected the houses, and gave Code of Compliance Certificates. Owners believed they had compliant, well-constructed buildings, but they did not.

Here is a brief timeline showing the key dates in changes to allowable Timber Treatment:

1952	[iv]1.2% BAE (Boric Acid Equivalent) was approved as the required level of protection against all timber destroying pests. 1.2% gave a high safety factor to account for variable production methods.
1972	[v]C8 Framing Timber (0.8% BAE) was allowed because better pressure treatment processes ensured that all of the timber was properly impregnated with boron.
1992	[vi]H1 Framing Timber was approved for use. Treatment levels were 0.1% BAE at the core for 'wet frame' and 0.04% BAE for dry frame, OR just treated with permethrins (the same ingredient as fly spray). Some wet frame treated timber in reality had a reasonable level of boron at the surface. Both treatments were insufficient to protect against decay, termites and some species of borer. 0.04% BAE treated timber used methanol as a solvent and actually increased decay rates.
1998	[vii]Untreated Kiln Dried Timber (UTKD) was allowed for framing - zero protection against decay, borer, or termites if it became damp
2002	In response to the developing leaky home crisis, H1 Plus Framing Timber was introduced for external walls but was not compulsory - 0.4% BAE or LOSP TBTN- was sufficient to control some decay and insects
2005	A return to compulsory use of treated timber for framing. [viii]H1.2 Framing Timber mandated 0.4%BAE - sufficient to prevent some decay, borer and some native termites

This meant that from 1992 into 2004, the great majority of houses were framed with timber that was untreated or undertreated.

The timelines showing the downgrading, then re-establishment of the requirements for ventilation and effective flashings follow a similar pattern.

Removal of the Belt and Braces Principles

In 1952 the NZ government's *Boron Enquiry* heard extensive research and determined on the evidence presented by DSIR and Forest Research, the boric treatment levels needed to protect radiata pine from all known timber destroying pests. External framing timber was then treated to a suitable level until 1992 and was branded as C8 (1975 – 1987), or H1 *Boric Treated* timber (after 1988).

From 1992, sawmills were allowed to produce H1 Boric Treated Timber with boric levels less than 10% of that required to prevent decay. But it was still branded as *Boric Treated,* so most builders, architects and owners were not aware of the change or implications.

From 1998, Untreated Kiln Dried timber was permitted in the NZ building standards and approved by BRANZ. Phrases such as "*Chemically Free Treated Timber*" were catchy marketing terms used to describe timber which had not been treated at all - just kiln dried, and with zero protection against rot or borer if it became damp.

Research from the [ix]Forest Research Institute in 1999 demonstrated that even H1 timber could begin to rot within six weeks of exposure to high moisture levels, such as could be experienced on typical New Zealand building sites. However, tens of thousands of houses continued to be built from untreated kiln-dried timber known to rot when this happens.

This took away the *first of the Belts and Braces* protections - that timber needed to be treated to protect against all wood destroying pests.

Can you see where this goes from here?

Research from [x]BRANZ dating from 1983 concluded that "under no circumstances should wet timber be enclosed", i.e. without ventilation, because it could take years to dry fully. In spite of this, BRANZ approved the use of claddings fixed directly to the framing with no cavity. Most framing timber gets wet to some extent during construction and virtually all houses experience minor leaks at some time in their lives.

This was the *end of the second Belts and Braces element* (requiring a cavity and ventilation). Now framing stayed wet and without adequate boron protection, it decayed.

The desire to build cheaper and more aesthetically pleasing houses with monolithic stucco exteriors, Mediterranean style flat roofs, internal gutters, decks, balconies, and complex architectural features challenged *the third Belt and Braces element* – deflection of water away from the house.

However, instead of BRANZ requiring manufacturers and architects to prove that their cladding systems and flashing designs were water-tight, they were appraised as fit for purpose and allowed to be used with no testing. When BRANZ finally did start testing claddings in 2002 - they all leaked.

This gives some understanding of how the perfect storm of leaky homes came about. Serious questions remain as to who was exactly responsible and what motivated the series of decisions that led to this disaster, however;

- Timber companies who saw the opportunity to gain competitive advantage by offering cheaper, faster to produce products lobbied for the changes.
- Developers could promise much faster build times because they didn't have to wait for the timber treatment to dry.
- Builders preferred working with dry timber that wouldn't shrink or distort on site.
- Architects had a field day designing wonderful examples of art that ended up as leaking nightmares. They could achieve any design and use virtually any material because NZ Standards, BIA, BRANZ and local councils opened the door to let them.

Many reputable people and manufacturers warned the authorities of the dangers of the changes, but they were ignored. For a period of time, the Weathertight Homes Resolution Service process put some of the remediation costs back onto the councils, but this is no longer available. Now the costs lie with the tens of thousands of homeowners affected.

The Return to the Belts and Braces

Following publishing of the 'Hunn Report' on leaky homes in 2002, and the pressure of the escalating scandal, the building standards were eventually strengthened.

By 2005 Building codes had reverted to requiring the minimum standard for all framing timber to be H1.2 boric treated and ventilated with a cavity. Although at 0.4%BAE this is just half of the treatment level required in 1972 to destroy all wood destroying pests.

The framing timber being used today is still vulnerable to attack by native termites, and decay if there are ongoing leaks.

The BIA introduced the **4 D's (Durability, Drying, Deflection and Drainage)** principles for designing and constructing weathertight and durable buildings, which are the original 'Belt and Braces' principles - just reworded.

In conclusion, we can say that everything we knew about building safe, durable houses in the 1950's was lost from 1992 - 2004, and only put back into legislation and building standards once the catastrophe became too obvious to ignore.

What is the End Result?

The end result, is a generation of houses, supposedly built to a 50-year durability standard that are prematurely failing. In some cases, houses and apartments were rotting even before they were completed (for example, the Sacramento apartment complex).

Although the blaze of publicity has died down, thousands of home and apartment owners [and commercial building owners] are still disastrously affected by:

- Uncertainty over whether, or how badly their house is leaking or rotting
- Ongoing repair and rot replacement costs
- Loss of value of their monolithic plaster clad home, or difficulty in selling
- Health issues due to toxic moulds and dampness
- Enormous re-cladding costs with a challenging building consent process
- On-going problems still trying to get a Code of Compliance Certificate from the local council
- Uncertainty about how to safely purchase a house built in that time period, and how to fund it, as the banks are hesitant to lend on houses that could require significant repair costs

Typical rot seen in the bottom plate of a house built with untreated timber and no cavity

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[i] Auckland City Council Practice Notes 13, 13a and 13b

[ii] NZS 3602:1995
[iii] BRANZ Appraisal 279A UTKD
[iv] 1952 Government Commission of Enquiry
[v] NZS 3602:1975
[vi] MP36040, cited in NZS 3602 and adopted into BIA B2/SA1
[vii] NZS 3602:1995
[viii] NZS 3640:2003, NZS 3602:2003, E2/AS2
[ix] Forest Research Institute Research Aug – Oct 1999
[x] M Cunningham 1983 BRANZ Researcher