Issue No. 143 ***November 2011***

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For any enquiries regarding this news sheet, please contact Simon Tonkin **on (03) 211 1777**

RE-USING GREYWATER

Re-using the water you use in your laundry and bathroom can help to save this precious resource.

With the right technology, water used to wash yourself and your clothes can be re-used on the garden or for flushing toilets.

By re-using greywater instead of sending it down the drain, you can save water, reduce wastewater charges and cut down on demand for water supplies in your area.

Greywater irrigates this Kapiti coast garden

However, it's important that any system you use for collecting and re-using greywater is properly installed and maintained. Greywater also needs to be kept away from human contact as there are possible detrimental effects on health (see "Is greywater safe to re-use" below).

While you can have a greywater re-use system that can comply with the Building Code, you'll need to check with your local council before installing a system to collect and re-use greywater.

WHAT IS GREYWATER?

All household wastewater from kitchen sinks, dishwashers, laundry tubs, washing machines, showers, baths and basins is called greywater. A building consent is required to collect and re-use greywater from baths, showers and washing machines on your garden or for toilet flushing.

Greywater cannot be used for cooking, bathing, brushing teeth, swimming or drinking.

The wastewater from your toilet or bidet is known as blackwater. You can't re-use it. It has to go into the mains sewage system or, if you have no connection to a mains sewage system, into an on-site sewage system. Kitchen wastewater is also unsuitable for re-use.

IS GREYWATER SAFE TO RE-USE?

Yes, if a system is properly installed and maintained. Expert advice is recommended. It is possible that greywater can contain faecal matter and microbes which are harmful to human health. Possible detrimental health effects can come about if drinking water becomes contaminated with greywater or there is direct contact with collected greywater that has become septic.

If you do want to have a greywater recycling system at home:

- It needs to be properly installed and maintained.
- The greywater needs to be kept away from direct human contact if you're using it in the garden.
- It should be discharged under the soil (not on top) and it should not be discharged in areas where food plants grow.
- Untreated greywater should be used within 24 hours. Your system should be set up so that any greywater not used in that time goes to the sewer.

It's vital that no-one can unwittingly drink from a greywater storage tank. Put locks on taps and put up signage.

HOW DO YOU COLLECT AND RE-USE GREYWATER?

There is a range of options for collecting and using greywater, depending on the source of the greywater and where you intend to use it.

USING GREYWATER ON YOUR GARDEN

In general, a garden greywater system will divert water from your washing machine, shower, bath or basin so that solids such as lint and fats are filtered out. Care needs to be taken when cleaning and maintaining systems (e.g. avoiding contact with solids that can be composted or disposed of). After filtering, the water then flows to a storage tank or directly through an irrigation system to your garden.

With some simple systems, the greywater flows directly to a storage tank with a filter inside. These systems require a high level of maintenance requirement (e.g. emptying the filter every time the washing machine runs).

Whatever type of system you use:

- The greywater should be discharged below ground, not directly on to the surface of the soil to avoid the risk of people being exposed to bacteria in the greywater. There's also a risk of the greywater pooling on the ground.
- It's worth having a switch to allow you to bypass the greywater system and have your greywater go straight into the sewer. This is handy if you're putting something down the drain that you wouldn't want in the garden.

Flushing the toilet:
If you want to re-use your greywater, you'll need a plumber to install a greywater recycling system that connects to your toilet. It may be difficult to fit one of these systems to an existing home with a concrete floor. Your system will need to comply with local building consent requirements. Refer to the references for details.

LOOKING AFTER A GREYWATER SYSTEM

If you install a greywater system:

- Make sure faecal matter - for example, from children's baths or from washing nappies - is diverted to the sewer or on-site sewage system.
- Use appropriate soaps and detergents - avoid washing powders that whiten or have enzymes, and avoid detergents or cleaners containing boron.
- Don't use too much greywater on your garden - if water ponds, harmful microbes can multiply, creating a potential health hazard.
- You may want to divert the first flush of water from your washing machine into the sewer to reduce the amount of chemicals you are putting on your garden.
- Take advise about planting - some plants do not thrive in alkaline conditions and greywater tends to be alkaline. You may need to change plants or avoid watering such plants with greywater.

Testing by Environmental Science and Research (ESR) on greywater systems in New Zealand found the presence of bacteria which can harm your health, even in treated greywater. Water from kitchen sinks was found to be unsafe for re-use because of the risk of contamination from organic matter such as bacteria from meat. Therefore it is recommended that kitchen greywater be discharged to a sewer or on-site sewage system. ESR findings also suggest that bathroom and laundry wastewater can contain levels of bacteria similar to that of kitchen wastewater. So it's important for your health to maintain the system to the manufacturer's recommended guidelines.

WHAT ARE THE LEGAL ISSUES?

Before you install a greywater system, contact your local and/or regional council for advice. You will require a building consent for any plumbing work and possibly a resource consent for any discharges of greywater.

Some local authorities restrict the re-use of greywater, particularly for garden irrigation in some urban locations. Under the Resource Management, Health and Building Acts, you'll be responsible for any greywater that runs on to neighbouring properties or into waterways.

MORE INFORMATION

From Smarter Homes

- Reducing water flow
- Collecting and using rainwater
- Managing stormwater
- Outdoor water use
- Onsite sewage systems

From other sites

- The Kapiti Coast District Council has a guide about the safety of re-using greywater. It includes information on a do-it-yourself system to re-use washing machine water. You can download it here Greywater and your health (PDF, 123KB).

Technical References

- Building Regulations and Building Code clauses:
  - G13 Foul Water, G13/VM4, On-site disposal AS/NZS 1547:2000
  - G12 Water supplies, G12/VM1, Greywater plumbing to toilet, AS/NZ 3500.1: 2003, Section 9

REDUCING WATER FLOW

By reducing the water flow from your taps, you'll save on hot water and reduce condensation.

Do you get splashed when you turn a tap on full? In many New Zealand homes, water flows much faster from taps and showerheads than it needs to.

There are simple, inexpensive ways to reduce the flow of water from your taps and shower.

On this page

WHAT IS WATER FLOW?

Water flow is the rate - in litres per second - at which water comes out of your taps or showerhead. It shouldn't be confused with water pressure, which is the amount of force (from gravity or pumping) pushing water through the pipes. Water pressure is measured in kilopascals or kPa.

The water pressure in your home determines what type of hot water system you can have, but your tap ware or showerheads determine the flow.

HOW MUCH WATER DO YOU NEED?

According to Australian water efficiency standards, your taps and showerheads needn't deliver more than nine litres of water per minute.

A test by the Consumers' Institute seems to confirm this. The institute tested the flow rate of a low-flow shower installed over a bath. At six litres a minute, the showerhead delivered a great shower - and the low flow minimised splashing.

As at April 2006, flow rates of commonly available showerheads on the New Zealand market ranged from 5 to 24 litres per minute.

BENEFITS OF REDUCING WATER FLOW

By reducing the flow of water from your taps and showerheads:

- You'll get less condensation - so your home will be drier.
- You'll use less water - so your water heating bill will be lower, and if you're on metered water your water bill will be lower too.
- You'll have fewer splashes to mop up.

You'll also be helping to save water, which benefits your community and your environment.

GET THE KIDS INVOLVED

Measure the flow on your taps. Kids love doing this, so get them involved.

To check flow rates from your taps and showerheads:

- Turn the tap or shower mixer on full and run the water into a bucket for 15 seconds.
- Measure how much water you have in your bucket, then multiply this figure by four to get your flow rate per minute.
- A flow rate of more than nine litres per minute means you are probably using more water than you need. For taps you probably need even less.

HOW DO YOU REDUCE THE FLOW?

Apart from just not turning the tap on fully, there are three things you can do:

- Fit flow restrictors to existing taps and shower mixers. These cost from $20 (2006 price). Check your brand of tap or shower mixer and ask your plumbing retailer for advice on which size. Aim for a flow of six to nine litres per minute. Depending on the design of your basin or shower mixer you may need a plumber to install these.
- Have your plumber fit a pressure-limiting valve to reduce flow to the whole plumbing system.
- Replace tap and shower fittings with low-flow fittings. Tell your plumbing retailer you want to save water and they will advise which models to choose from.

Get advice from your plumber or plumbing retailer about which options are best for your household. The best option may depend on what type of hot water system you have and what pressure your hot water is delivered at.

MORE INFORMATION

From Smarter Homes

- Easy ways to save water
- Re-using greywater
- Collecting and using rainwater
- Managing stormwater
- Outdoor water use

From Consumer Build

- Your local council can provide information about water restrictions or any schemes they have to help you save water. ConsumerBuild's Council finder web page has contact details for New Zealand local authorities.

EASY WAYS TO SAVE WATER

It's easy to conserve water, and you'll benefit through lower costs and a drier, more comfortable home.

You can buy water-saving appliances or install low-flow fittings, but the easiest way to save water is to think about how you use it.

By repairing leaks or turning off the tap when you are brushing your teeth you can save thousands of litres of water a year. If you pay for your water through water metering, that will also save you money.

On this page

TURN OFF THE TAP

The easiest way to save water is simply to turn off the tap when you don't need it.

If you run a tap while you brush your teeth, for example, you are sending many litres of water down the plughole. Instead, turn the tap off until you need water to rinse. Remind the kids to keep the tap off while they brush, and you'll save more water and have a drier bathroom too.

When you do have the tap running, turn it on part-way. You'll get plenty of water for washing your hands or brushing your teeth - and you won't get splashed.

FIX LEAKS

Leaks waste far more water than you'd think.

If you have a tap that drips at 50ml per minute (an egg cup full), you'll be losing 72 litres of water a day. Over the course of a year, that's more than 26,000 litres - enough to fill a family-sized swimming pool. If it is leaking from the hot tap, that unused water could cost more than $200 a year to heat.

A leaky hose can waste even more water - up to 60,000 litres in a year. Soggy ground around a leaking garden tap or hose can cause dampness and condensation in your home.

Fix leaking taps and pipes promptly. You'll save on water and energy charges, keep your home drier, and - in the case of leaking pipes - prevent serious damage to your home.

Whenever you call a plumber, have your tap and plumbing fittings checked for leaks and wear, so that prompt action can be taken.

USE THE PLUG

If you rinse a lot of muddy clothes under a running tap, you could be sending as much as 100 litres of water down the drain. That's enough to do a whole load of washing. Instead, use a bucket or part-fill the tub instead of running water.

The same applies in the kitchen. If you're rinsing dishes or food in the kitchen, put in the plug and part-fill the sink instead of running water throughout.

FILL A JUG

Keep a water jug in the fridge in summer so you don't have to run the tap for ages to get your water cold enough for a drink. It will also help save water when filling pots for cooking or the kettle. If your water is chlorinated, it also reduces the chlorine flavour.

You can also give kids their own water bottle. They'll love the ownership and freedom it gives them. It's also more hygienic than sharing bottles.

SCRAPE DISHES OR USE THE DISHWASHER'S ECO RINSE

Rinsing plates in the sink can waste many litres of water and is often unnecessary. Generally, it is enough just to scrape plates before putting them in the dishwasher.

Modern dishwashers can cope with grease and even some food scraps without rinsing first. Also, they often have water-efficient rinse cycles. These cycles may use just a few litres of water to rinse messy dishes when you're not ready to wash a whole load.

TAKE SHOWERS

A typical bath uses 180 litres of water. A typical shower uses anything from 20 to 100 litres, depending on how long you stay in. To save water and save on hot water bills too:

- Take showers instead of baths.
- Keep your showers short - a bath may be more efficient than a long shower.
- Turn the shower on only when you're ready to get in (and persuade teenagers to do this too).
- When you use the bath, think about how full it needs to be.

For teenagers, put a clock or a timer in the bathroom and reward them if they keep showers to the agreed time.

REDUCE YOUR TOILET'S WATER USE

Toilets use from three litres (for recent dual flush models) to 12 litres each flush. Many households use one-third of their water to flush the toilet.

You can adjust your toilet so it uses less water. Put a displacement device, such as a "gizmo" or a brick, in a single-flush cistern. Or you can fill a couple of plastic bottles with water and put these in your cistern. You could save thousands of litres of water a year.

In older toilets (pre-2004) a full flush uses 11 litres. Check inside your cistern to find how much water you're using with each flush.

Reducing the amount of water you flush is a particularly good investment if you have a septic tank, or are on metered water or rainwater tank supply.

Check with your plumbing retailer for the best option for your cistern.

FIX TOILET CISTERN LEAKS

Check for cistern leaks and fix them - small drips of water can quickly add up to thousands of litres wasted.

You may not know if you have a leak. To check, put a few drops of food colouring in the cistern. If colouring ends up in the toilet bowl without flushing, you have a leak.

Note that in older toilets any overflow from the cistern goes to a drain outside, so the only water finding its way to the toilet bowl would be from a leak. In newer toilets, overflow from a poorly adjusted cistern goes into the toilet bowl. This can make it harder to decide whether you have a leak or if you need an adjustment to the overflow. Call a plumber if in doubt.

If there is a leak, it may be a simple matter of replacing the "underwater valve seating washer" (the piece of rubber that keeps water in the cistern). These are available from plumbing retailers. Check the inlet washer at the same time. Replacing either of these washers will cost only a few dollars.

CHOOSE THE RIGHT APPLIANCES

Choose appliances that are the right size for your household, so it's practical to run them only when they're full. And choose models that use energy and water efficiently. For more detailed information, see choosing the right appliances.

DON'T RUN APPLIANCES HALF-EMPTY

Fully load your dishwasher and washing machine before running them. Typically, the "half-load" setting on dishwashers tends to use much more than half the water and energy of a full load. Choose eco-settings where practical to save water and energy.

For more detailed information, see Energy and water-saving tips for home appliances.

REDUCE WATER FLOW

Water flow is the rate water comes out of your taps and showerheads. You don't need your taps or showerhead to deliver more than nine litres of water a minute, yet some use three times that much.

By switching to water efficient ("low-flow") taps and showerheads, or installing water restrictors, you can save significant amounts of water.

For more detailed information, see reducing water flow.

MORE INFORMATION

From Smarter Homes

- Choosing The Right Appliance
- Re-Using Greywater
- Collecting And Using Rainwater
- Water Heating
- Reducing Water Flow

From other sites

- You can download NZ Water and Wastes Association booklets The story of Water (PDF, 5.4MB) and Savings in your House (PDF, 5.5MB), from the association's website.

Building work on solid fuel heaters

This article provides guidance for owners and installers of solid fuel heaters (and to building consent authorities (BCAs)) as to when installation work requires a building consent or is exempt under Schedule 1 of the Building Act 2004 (the Building Act).

This guidance is also a reminder to building owners, and installers considering working on solid fuel heaters about the need to ensure any building work complies with the Building Code and that it is an offence to undertake building work that is not exempt without a building consent. A person committing such can offence may be liable to a significant fine.

Legislative requirements

Building work must not be carried out without a building consent unless it falls within one of the exemptions listed in Schedule 1 of the Building Act.

Under clause (a) of Schedule 1, there are exemptions for certain repair, maintenance, and replacement work to any component or assembly incorporated or associated with a building. As discussed in the Department's guidance document on exempt building work, this might include repairs to solid fuel heaters. The exemption applies to repairs or maintenance using comparable materials, or to replacements with a comparable component in the same position in the building. The exemption does not apply where, for example, the work involves complete or substantial replacement of any component or assembly contributing to the building's structural behaviour or fire-safety properties.

An important aspect to consider when installing solid fuel heater appliances is their compliance with the National Environmental Standards. These standards are provided for under the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 (SR 2004/39) which limit the emissions from solid fuel heaters. Some Councils' regional plans may also impose further requirements for the installation of woodburners.

A list of certified woodburners is available from the Ministry of Environment website.

Examples of building work on solid fuel heaters:

Work that may be exempt under Schedule 1	Work that is not exempt and requires a building consent
■ Replacing a building element such as a stainless steel flue or outer liner that has met the durability criteria under Building Code Clause B2 – Durability. ■ Repairing a solid fuel heater such as replacing fire bricks, grates, seals,	■ Fitting a new solid fuel heater. ■ Fitting a new solid fuel heater with a wetback carried out in accordance with the Plumbers, Gasfitters, and Drainlayers Act 2006.

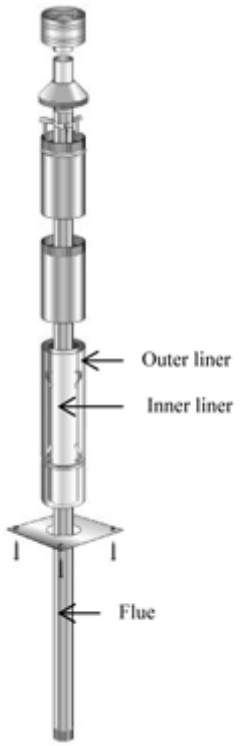
glass or any item that can be easily removed, and includes welding repairs to any part of the heater.

- Fitting a second hand solid fuel heater.
- Fitting a second hand solid fuel heater with a wetback.
- Replacing an existing solid fuel heater with a new or second hand solid fuel heater of the same make/model.
- Replacing a building element such as a stainless steel flue or outer liner that has failed the durability criteria under Building Code Clause B2 – Durability.
- Installing a new wetback to an existing solid fuel heater (including a tempering device).
- Replacing an existing solid fuel heater that includes a wetback with a new solid fuel heater and wetback.
- Relocating or repositioning an existing solid fuel heater with or without a wetback within a dwelling.

Note: Work undertaken on wetbacks installed in solid fuel heaters must be carried out or supervised by a registered plumber in accordance with the Plumbers, Gasfitters, and Drainlayers Act 2006.

Building Code requirements

Any building work carried out on a solid fuel heater must comply with the Building Code regardless of whether it needs a building consent.



The relevant requirements of the applicable Building Code clauses when installing solid fuel heaters are as follows:

B1 Structure: Requires the provision of seismic restraints; that the flue not cut through existing roof framing; flue stability; appropriate chimney construction (including requirements relating to foundations and provision of lateral bracing); and appropriate hearth slabs (supported on timber or concrete floors).

B2 Durability: Requires five years durability for free standing solid fuel heater appliances, or 15 years durability for inbuilt appliances and flues.

C1-4 Fire safety: Requires the use of certain clearances, heat shielding, ceiling and chimney liners, ceiling plates, and floor protectors, etc.

E2 External moisture: Specifies certain roof or wall penetration and flashing details.

Note: If the building work is in an existing dwelling and requires a building consent, then an up-grade to the means of escape from fire may also be required, such as installing smoke detectors.

Durability

Building Code Clause B2 - Durability requires a durability of five years for building elements for which access, replacement and detection of failure is easy. However, building elements must be durable for 15 years where they are moderately difficult to access or replace, or where detection of failure would only occur during normal maintenance.

Accordingly, most freestanding solid fuel heater appliances must have a durability of five years, while most inbuilt appliances and flues should have a durability of 15 years.

When issuing building consents for building work involving second-hand appliances, some BCAs may grant the consent subject to a waiver of Clause B2 of the Building Code. If a waiver is granted, it should be shown on the building consent documentation [1]. Ongoing maintenance is the responsibility of the owner. The durability levels given in the Building Code are minimum levels, and good maintenance is likely to give a longer life.

After five years or 15 years (whichever is applicable under clause B2), the heater will have satisfied durability requirements, but this does not necessarily mean that its safe working life has expired.

Note: The durability of a building element must not be confused with the intended life of the building. Under section 113 of the Building Act, a specified intended life applies to the whole building, not just to parts of a building, and should not be applied to solid fuel-burning appliances.

[1] Notification of the waiver must be provided by the BCA to the Department of Building and Housing.

STANDARDS NEW ZEALAND
PAEREWA AOTEAROA

ADVISORY NOTE FOR NZS 3604:2011 AND SNZ HB 3604:2011

On 1 August 2011, the Department of Building and Housing announced changes to the B1 Structure and E2 External Moisture Building Code documents. This announcement was made in the Building Controls Update Bulletin No. 116. The changes to the Structure documents include the referencing of NZS 3604:2011 *Timber-framed buildings*, which was published in February 2011.

These changes took effect immediately with a transition period through to 31 January 2012. During the transition period, both NZS 3604:1999 and NZS 3604:2011 will be Acceptable Solutions. From 1 February 2012, only NZS 3604:2011 will apply.

The Department also announced the following modifications to its referencing of NZS 3604:2011.

- **Modifications for the Canterbury earthquake region**
  On 19 May 2011, the Department made changes to Acceptable Solution B1/AS1, which applies to the Canterbury earthquake region. These changes took effect immediately. The definition of 'good ground' was changed to exclude ground subject to liquefaction and/or lateral spread, and stronger foundations were required for that region. These modifications to the referencing of NZS 3604:1999 have been carried forward to the referencing of NZS 3604:2011.

  The changes for Canterbury were made to allow homeowners in the region to quickly progress with their repairs or rebuilding. Details on the changes for Canterbury can be found in the Department's information sheet.

- **Modifications for all New Zealand for concrete slab floors and foundations**
  On 1 August 2011 the Department extended the requirement for stronger foundations to the rest of New Zealand. The Department modified its referencing of NZS 3604:2011 to exclude unreinforced slabs. All concrete floor slabs on 'good ground' are required to have reinforcing steel mesh and all perimeter foundations are required to be tied to the concrete slab with reinforcing steel.

  This modification has been made to provide the rest of New Zealand with the same readily administered, effective, and robust Acceptable Solution requirements for foundations as those already made in the Canterbury earthquake region.

To read the Building Controls Update Bulletin No. 116 and the Department's questions and answers on the changes, please go to the Department's website – www.dbh.govt.nz/bc-update-116.

It is important to review the modifications to the referencing of NZS 3604:2011 when using the Standard as the basis of compliance with the New Zealand Building Code.

If you have any questions about the Department's modifications, please contact the Department on 0800 242 243 or email info@dbh.govt.nz.

This Advisory Note was issued by Standards New Zealand on 6 October 2011.

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SNZ HB 3604 HANDBOOK TO NZS 3604:2011 – AVAILABLE NOW

Issue 32 – October 2011

Standards New Zealand has just published SNZ HB 3604:2011 *Timber-framed buildings: Selected extracts from NZS 3604:2011.*

SNZ HB 3604 provides users with a collection of figures and tables extracted from NZS 3604:2011 that are commonly used on-site. The Handbook directs users to the appropriate section of the Standard for full information.

During the development of the Standard, NZS 3604:2011, the need for a durable product containing selected extracts from the Standard to use as a reference guide on-site was identified. Standards New Zealand undertook four consultation meetings with different user groups on the range of content they required and tested formats for the Handbook in mid-2010.

The SNZ HB 3604 committee began work on the Handbook once the NZS 3604 Standard content had been finalised. The committee included nominated representatives from Architectural Designers New Zealand Inc., Building Officials' Institute of New Zealand, Certified Builders' Association of New Zealand Inc., New Zealand Institute of Architects, and Registered Master Builders' Federation. The feedback from the consultation meetings was used by the committee.

SNZ HB 3604:2011 has been designed as an on-site reference guide for timber-framed buildings not requiring specific engineering design, up to a maximum of three storeys in height.

The Handbook is laid out in four sections based on the construction sequence for a timber-framed building.

- **Section 1:** Outlines the limits for buildings covered by NZS 3604, identifies activities which shall be carried out before building starts, sets out criteria such as tolerances and moisture content that apply to all subsequent sections, and explains the basis for determining bracing requirements and the durability of materials.
- **Section 2:** Covers the framing and bracing requirements below floor level including piles, concrete and concrete masonry foundation walls, bearers, jack framing, floor joists and flooring, and the relationship of those members to other parts of the building. It also includes concrete floor slabs.
- **Section 3:** Covers wall framing for loadbearing walls and non-loadbearing walls, the construction and bracing of, and the forming of openings, within those walls.
- **Section 4:** Covers the framing requirements and the construction of bracing for roofs and ceilings.

To ensure that it aligns with NZS 3604, the collection of figures and tables are numbered identically and colour coding of the figures and tables replicates that of the Standard.

Must not be used as a substitute for the Standard

The development committee advises the Handbook must not be used as a substitute for the full Standard, NZS 3604:2011

ISSUE 32 – OCT 11

BUILDING CONTROLS UPDATE 120 – DEPARTMENT OF BUILDING AND HOUSING

Issue 32 – October 2011

The Department of Building and Housing (the Department) released a Practice Advisory on 30 September 2011 to alert practising structural engineers assessing existing multi-storey buildings throughout New Zealand about issues relating to safety of stairs.

The Lyttelton earthquake (aftershock) of 22 February 2011 caused a number of stair failures in buildings in the Christchurch CBD. Although it is recognised that this earthquake made extraordinary demands on existing designs, the failure of stairs is of serious concern. The Department considers it imperative that the circumstances of these failures are fully understood and the implications for similar buildings around New Zealand examined and acted upon.

The Practice Advisory is directed towards having owners of buildings to which members of the public have access, including office buildings, particularly those with scissor stair configuration, seek professional advice on whether any necessary retrofit work is necessary. It highlights the need for stairs designed to slide under seismic action to have adequate clearances and seating.

The report commissioned by the Department on the collapse of the stairs in the Forsyth Barr Building illustrates an example of the issues and concerns. This is one of three consultant reports on the Department's investigation into the structural performance of Christchurch CBD buildings in the 22 February 2011 aftershock. All reports, including the Expert Panel Stage 1 Report, are available on the Technical investigation section (www.dbh.govt.nz/canterbury-earthquake-technical-investigation) of the Department's website.

Read the Practice Advisory (www.dbh.govt.nz/practice-advisory-13).

Department of Building and Housing
Te Tari Kaupapa Whare

Practice Advisory 13

Egress Stairs:
Earthquake checks needed for some

This Practice Advisory is issued in response to concerns about stair collapses in Christchurch CBD in the 22 February 2011 Aftershock

Background

The Lyttelton earthquake (aftershock) of 22 February 2011 caused a number of stair failures in buildings in the Christchurch CBD. Although it is recognised that this earthquake made extraordinary demands on existing designs, the failure of stairs is of serious concern. The Department considers it imperative that the circumstances of these failures are fully understood and the implications for similar buildings around New Zealand examined and acted upon.

The report commissioned by the Department on the collapse stairs in the Forsyth Barr Building [1] illustrates an example of the issues and concerns. A report prepared for the Royal Commission [2] provides further comment on the issues and some considerations that may assist structural engineers to decide on retrofit actions. Design considerations for stairs are offered in the SESOC draft Practice Note [3].

Purpose and Scope of Advisory

This Practice Advisory is to:

- alert practising structural engineers assessing existing multi-storey buildings throughout New Zealand to issues relating to safety of stairs

It applies to all existing multi-storey buildings throughout New Zealand:

- to which members of the public have access, including office buildings, particularly those with scissor stair configuration, and
- have stairs designed to slide under seismic action, particularly those with the gap-and-ledge stair detail.

Key concerns

- If the relative lateral displacements between adjacent floors of a building (the "inter-storey drifts") are sufficiently large, a stair may be pulled off the ledge that supports the sliding end of the stair.
- The seating dimensions allowed in existing designs may not be sufficient to account for movements now expected.
- The maximum inter-storey drift in estimates of building displacement may not adequately account for variability and uncertainty.
- Details that have limited scope to allow closing movement may cause damage to the stair flights. This damage may shorten the flights and make them more likely to fall off their supports.
- Seismic gap details that have been partially or fully filled or are susceptible to being filled because of construction or maintenance errors may restrict or prevent closing movement.
- Heavy finishes, fixtures and fittings in stairwells may come loose during an earthquake and fall and block the stairway or injure people using it.

Main points

1. *Stairs designed to slide*: Check if sliding is the designed intention or not:

- This Practice Advisory applies to stairs that are detailed to slide on the end supports in order to accommodate the relative horizontal earthquake displacements between floors (known as "inter-storey drifts").
- Stairs that are "built in" to the supports/landings at both ends are not covered by this Practice Advisory.

2. *Overall allowance for movement*: Needs to be checked:

- There are a number of loading Standards and material Standards that have prescribed the calculation of inter-storey drifts for NZ buildings (as far back as 1956). Typically, these design displacements are not consistent across the Standards. Therefore it is imperative that relative displacement between floors is calculated to the current Loadings Standard, NZS 1170.5.
- Clearances and seatings for stairs should be capable of sustaining at least twice the Ultimate Limit State (ULS) inter-storey displacements (drift) as calculated in accordance with NZS 1170.5.

3. *Stair movement that closes the gap between the end of the stair and the support*: Check support detail.

- Calculate the inter-storey drifts as per Item 2 above.
- Check if the movement causes the sliding end of the stair to impact against the support (wall, beam or landing) - see Figure 1.
- If the lateral movement of the stair closes the gap, causing impact on the support/landing:
  - Look to increase the gap.
  - Check implications of bracing action as the stair struts between floors, if gap should close:
    - on the stair flight
    - on the supports at each end of the stair
    - on the building, as the stairs can significantly stiffen the building through the bracing action between floors, via unintended load paths. This results in the building attracting seismic forces that may be much larger than originally considered in the design of the building.
- Check gap left for closing movement of the stairs:
  - Check for objects in gap, such as debris or floor levelling compounds that may have occurred during earlier repairs/new fit-outs. Remove these obstructions.
  - Modify detail to prevent further objects in the gap impeding movement. For example, cover plates over the gaps.

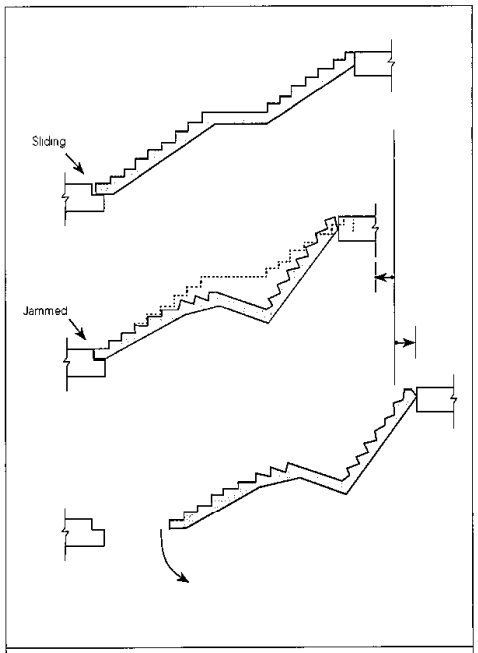


Figure 1 – Inter-storey drift along the stair compresses the stair shortening it.

When earthquake reverses, the stair can now fall off the supporting ledge. [2].

4. *Progressive collapse: one stair falling on to the stairs below and collapsing them all*: mitigate:

- Using the inter-storey drifts from Item 2 above, construction tolerances, residual width of seating, spalling of the concrete ends of the stairs or the edges of the supporting ledge and other factors, determine what should be the width of the seating (contact area) between the sliding end of the stair and the support. If the available width of support is inadequate, install catch-frames or similar safety devices or engineer extensions of the ledge to ensure adequate width of support for the end of the stair.
- Stairs can swing sideways relative to its length. This can either damage the lining to the stairwells causing blockage of the egress path or, more significantly, can overload the connection at the other end of the stair, where the stair is fixed in to the support. This overload can result in failure of the bars or connection details there, resulting in collapse of that stair. The ability of the connections at the fixed ends must be checked and if there are issues, these need to be mitigated by design, i.e. by using NZS1170.5 Section 8, Requirements for Parts and Components.

5. *Wall finishes, fixtures and fittings within the stairwells*: Make these safe:

- Secure or remove any wall finishes that can not sustain the calculated inter-storey drift and could dislodge in earthquake shaking or building movement (particularly under inter-storey drifts).
- Restrain or remove any fixings and fixtures in the stairwells. Restrain in accordance with NZS 4219.

Actions to be taken

The Department advises the following actions from the various parties:

- *Structural engineers*: When undertaking detailed assessments of buildings, strongly recommend to your client that checking of the stairs is included in your brief.
  - Recommend that any necessary retrofit measures be carried out as soon as possible. These should bring the stair earthquake safety performance to as nearly as is reasonably practicable to that of a stair in a new building of similar structural characteristics (see "when designing new buildings").

- *Territorial authorities*: When advising owners of the need to renew their annual Building Warrant of Fitness Territorial Authorities are advised to bring this practice advisory to the attention of owners.
- *Building Consent Authorities*: When building consent applications are made for any work on a multi-storey building with sliding stair details, Building Consent Authorities are advised to bring this practice advisory to the attention of owners.
- *Building owners with concerns*: Owners should contact a chartered professional engineer with suitable qualifications and experience to review the stair design and make recommendations for retrofit work.

References

1. Beca Carter Hollings and Ferner Ltd (2011), Investigation into the Collapse of the Forsyth Barr Building Stairs on 22 February 2011. Report prepared for the Department of Building and Housing, September 2011
2. Bull, D (2011), Stair and Access Ramps between Floors in Multi-storey Buildings. Technical paper prepared for the Canterbury Earthquakes Royal Commission, August 2011
3. SESOC Practice Note: Design of conventional structural systems following the Canterbury Earthquakes, September 2011

When designing new buildings

Do

- Do use details which allow stair flights to slide on landings without restrictions
- Do take into account variability and uncertainty in estimates of building displacement to provide resilience. Clearances and seatings for stairs should be capable of sustaining at least twice the Ultimate Limit State (ULS) inter-storey displacements as calculated in accordance with NZS 1170.5, after allowances for construction tolerances.
- Do take account of disproportionate collapse, i.e. progressive collapse resulting from a stair flight failure

Don't

- Don't use details that restrict closing movement that may cause damage to the stair flights. This damage may shorten the flights and make them more likely to fall off their supports. The freedom of movement may be further restricted by debris or other material in the movement space.
- Don't use seismic gap details, particularly gap-and- ledge stair detail, which are susceptible to being filled by construction or maintenance error and thereby restricting closing movement.
- Don't allow stair wells to have heavy finishes, fixtures or fittings that could come loose during earthquake movement. They may fall and block the stairway or injure people evacuating the building.

ASK FOR THE CARD

PLUMBERS, GASFITTERS AND DRAINLAYERS BOARD

Public awareness campaign - Ask for the Card

The PGD Board has launched an important public awareness campaign - **Ask for the Card -** which aims to raise awareness among consumers about the importance of hiring authorised tradespeople.

Sanitary plumbing, gasfitting and drainlaying are regulated trades in New Zealand and it's illegal for anyone to do this work unless they are authorised by the PGD Board to do so.

The PGD Board's role as a regulator of these trades is to promote and safeguard the health and safety of people and prevent damage to their property by ensuring that those persons carrying out regulated work are competent to do so.

All authorised tradespeople must carry their authorisation card issued by the PGD Board. The authorisation card provides consumers with confidence that they are hiring a competent tradesperson authorised by the PGD Board to undertake the work.

The key message for consumers is to 'Ask for the Card' - check to see if a tradesperson is authorised to carry out the work by asking to see their card.

Hiring someone who isn't authorised to do that work poses a significant health and safety risk to consumers and may also compromise their insurance cover.

A leaflet with more information about the PGD Board's authorisation card and a campaign poster has been produced. In the interests of building quality, the Building Officials Institute recommends its members promote the awareness of this campaign by displaying the poster and as appropriate ensuring the importance of hiring authorised Plumbers, Gasfitters and Drainlayers is conveyed to all considering work in these areas.

Simply visit http://www.pgdb.co.nz/About_us/Our_publications to read more on the campaign and access promotional material.

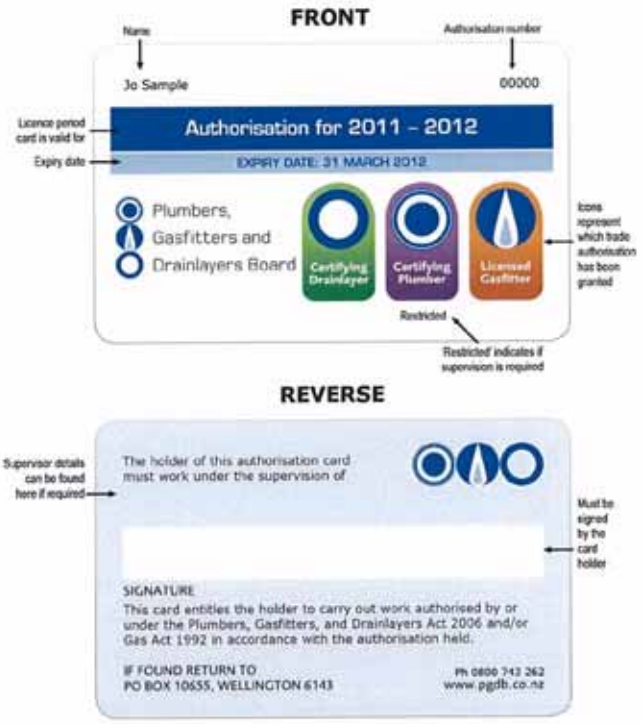
For any questions, or to check if a tradesperson is authorised, visit http://www.pgdb.co.nz/Public or phone 0800 743 262.

ASK FOR THE CARD

ABOUT TO HIRE A PLUMBER, GASFITTER OR DRAINLAYER?

First check to see if they are authorised to undertake the work by asking to see their card. All authorised tradespeople must carry their authorisation card issued by the Board. The card also details what a person's supervision requirements are, if any (on the reverse).

You can also check to see if a tradespeson is authorised by visiting **www.pgdb.co.nz** or phone the Board on **0800 743 262**.



'DON'T RISK your family's health and safety or your insurance by hiring unauthorised tradespeople to undertake work'

Plumbers,
Gasfitters and
Drainlayers Board

ASK FOR THE CARD

HIRING A PLUMBER, GASFITTER OR DRAINLAYER?

DON'T RISK your family's health and safety or your insurance by hiring unauthorised tradespeople

Check to see if they are authorised to undertake plumbing, gasfitting or drainlaying work by asking to see their card.

All authorised tradespeople must carry their authorisation card issued by the Plumbers, Gasfitters and Drainlayers Board.

Sanitary plumbing, gasfitting and drainlaying are regulated industries in New Zealand and it's illegal for anyone to do this work unless they are authorised by the Board to do so.

For any questions, or to check if a tradesperson is authorised, visit **www.pgdb.co.nz** or phone **0800 743 262**.

Plumbers,
Gasfitters and
Drainlayers Board

Issue 01 - October 2011

There have been several changes to the documents supporting Building Code Clauses B1 Structure and E2 External Moisture. If you are a designer or builder of timber, steel framed or concrete houses and small buildings, these changes affect you.

Structure B1

Changes to the documents supporting B1 Structure

If you use Acceptable Solution B1/AS1 and NZS 3604 to construct houses and small buildings you should use the 2011 version of NZS 3604; that's the version B1/AS1 references now.

But there are important modifications to NZS 3604:2011 in B1/AS1:

You can't use unreinforced concrete slabs-on-ground anywhere. All concrete slabs-on-ground must be reinforced with Grade 500E steel mesh which is tied to perimeter foundation reinforcement. This was introduced for the Canterbury earthquake region in May 2011 and has been extended nationwide. Read guidance on reinforced concrete slabs-on-ground.

In the Canterbury earthquake region the definition of 'good ground' excludes ground with potential for liquefaction or lateral spread.

You can buy NZS 3604:2011 from the Standards New Zealand website.

If you use Verification Method B1/VM1 there are two new referenced documents:

A Standard for restraining equipment in earthquakes – NZS 4219:2009. Visit the Standards NZ website to buy this standard.
A Standard for the design of light-steel framed houses, published by the National Association of Steel-framed Housing (NASH). Visit the NASH website to buy the standard.

External Moisture E2

Changes to the documents supporting E2 External Moisture

Acceptable Solution E2/AS1, which deals with the weathertightness of cladding, has been updated to work better with the 2011 version of NZS 3604. The extended wind range of 55m/s allows more buildings to be designed to E2/AS1.

Verification Method E2/VM1, is a way to test how claddings with drainage cavities perform on timber-framed buildings to show that they comply with the Building Code clause E2. E2/VM1 has been updated to work with the revised E2/AS1.

There is a new Acceptable Solution for weathertightness of concrete and concrete masonry construction. This is E2/AS3 which references the Code of Practice for Weathertight Concrete and Concrete Masonry Construction published by the Cement and Concrete Association of New Zealand (CCANZ). Read the CCANZ document.

When do B1 and E2 changes take effect?

They are already in effect.

There is a transition period until the end of January 2012 when you can use either the previous documents or the new ones. From 1 February 2012 onwards you must follow the revised documents to be sure your buildings will comply with the Building Code.

QUIZ ON ARTICLES IN THIS NEWS SHEET

1. All household waste water from kitchen sinks, dishwashers, laundry tubs, washing machines, showers and baths is called _____.
   a. White water
   b. Black water
   c. Grey water

2. The waste water from a toilet is called _____.
   a. White water
   b. Black water
   c. Grey water

3. Grey water is safe to be used as drinking water.
   a. True
   b. False

4. Grey water should only be discharged directly on the surface of the soil.
   a. True
   b. False

5. Untreated grey water should be used within what timeframe?
   a. 2 hours
   b. 12 hours
   c. 24 hours

6. A leaky tap that drips 50ml per day (an egg cup full) will be how much wasted water after one day?

   a. 10 litres
   b. 20 litres
   c. 70 litres

7. A typical bath uses how many litres of water?
   a. 20
   b. 100
   c. 180

8. A typical shower used how many litres of water?
   a. 20-100
   b. 100-150
   c. 150-200

9. A toilet uses how many litres per flush?
   a. 1 to 5
   b. 3 to 12
   c. 4 to 16

10. Schedule 1 of the Building Act 2004 contains certain building work that can be undertaken without a building consent.
   a. True
   b. False

11. A flue attached to solid fuel burner that has burnt out after one year does not require a building consent to replace it.
   a. True
   b. False

12. A building consent is required to fit a new solid fuel burner.
   a. True
   b. False

13. A building consent is not required when an existing solid fuel burner is replaced with a solid fuel burner.
   a. True
   b. False

14. Code Watch is a new sector education alert issued by:
   a. The local Council
   b. Department of Internal Affairs
   c. Department of Building and Housing

15. Practice Advisory 13 has been written due to some stair failures in the Christchurch CBD.
   a. True
   b. False

16. Practice Advisory 13 deals with stairs that are “built-in” to the supports landings at both ends of the stair.
   a. True
   b. False

17. The Practice Advisory 13 recommends that walls in stair wells do not have heavy finishes, fixtures or fittings that could come loose during an earthquake.
   a. True
   b. False

18. Practice Advisory 13 applies to all existing multi-story buildings in New Zealand.
   a. True
   b. False

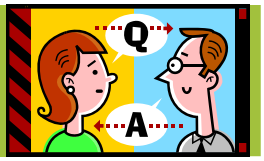
19. Stairs should be designed to slide under seismic action.

    a. True
    b. False

20. Practice Advisory 13 has been issued in accordance with Section _____ of the Building Act 2004.

    a. 100
    b. 125
    c. 175

ANSWERS TO QUIZ



1. c
2. b
3. b
4. b
5. c
6. c
7. c
8. a
9. b
10. a
11. b
12. a
13. b
14. c
15. a
16. b
17. a
18. a
19. a
20. c