

ISSUE 666 **BULLETIN**



RESTORING A HOME AFTER FLOOD DAMAGE

December 2021

- Once building access is safe and services such as electricity are turned off or made safe, flood debris should be cleared away quickly so drying can start as soon as possible.
- Finishing work must not begin until the building is fully dry. Beginning work too soon may result in longer-term damage such as mould growth and timber decay.
- This bulletin updates and replaces Bulletin 455 *Restoring a house after flood damage*. It does not cover making residential properties resilient to flooding.

1 INTRODUCTION

1.0.1 After a home is flooded, the building may need remedial work to help it dry out and to repair any damage.

1.0.2 The building owner should contact their insurance company as early as possible and follow the insurer's instructions. Work on the building should not begin until the owner has confirmed that the insurance assessor has visited and/or the insurance company has authorised the work to go ahead.

1.0.3 Presented with an expensive repair plan, the owner may choose not to proceed, particularly if they have no insurance or are underinsured and cannot afford the repairs. The risks of doing nothing include:

- the building may be damp and unhealthy to live in
- the building condition may deteriorate and become unsafe or uneconomical to repair
- the building may eventually be declared dangerous or unsanitary by the local territorial authority, which can then require work or demolition at the owner's cost
- the condition of the home may affect its future saleability.

1.0.4 An owner may decide to demolish or to sell the building 'as is'.

1.0.5 Whether they own or rent their home, people often have a large emotional investment in it, and being flooded is a traumatic experience. Bear this in mind during work on the building.

1.0.6 This bulletin updates and replaces Bulletin 455 *Restoring a house after flood damage*. It does not cover making residential properties resilient to flooding.

2 REQUIREMENTS

2.0.1 Remediation work sometimes involves reconstruction. This is considered building work under the Building Act and must comply with the Building Code [section 17 of the Act].

2.0.2 The requirements of the Building Code and the need for building consent must be considered for each particular type of repair.

2.0.3 Where work involves general repairs and replacing existing materials with comparable materials, it may not need building consent. For example, replacement of damaged wall linings with comparable materials may be exempt from needing building consent unless the lining being replaced contributes to the building's structural behaviour or fire-safety properties or is being substantially or completely replaced [see Building Act Schedule 1 *Building work for which building consent not required*]. Check with the local authority to find out if building consent is needed.

2.0.4 Building consent is generally needed if:

- structural elements are being replaced
- repairs are being made to fire separations in non-detached dwellings.

2.0.5 Other parts of the building that are not remediated must continue to comply with the Building Code to at least the same extent as before the flooding. Apart from considerations for escape from fire in multi-unit residential buildings, there is no requirement to upgrade parts of a building not being repaired.

2.0.6 If the work involves an upgrade or alteration, check whether it needs building consent. Extensions or additions will require consent and will need to comply with the current Building Code, including thermal performance requirements.

2.0.7 If the house structure is substantially damaged, a structural engineer must be consulted to decide whether it can be repaired. If not, salvageable items should be removed and arrangements made for demolition.

2.0.8 Demolition may or may not require building consent. Schedule 1 of the Building Act allows exemptions for the full demolition of detached buildings not more than 3 storeys high. Partial demolition will generally require building consent but may be exempt if the removal does not affect the primary structure of the building, any specified system or any fire separation. If in doubt, check with the local authority.

3 IMMEDIATELY AFTER A FLOOD

3.0.1 Civil defence emergency management personnel will advise householders when they can return home. This procedure gives a chance to recover important items, but it does not necessarily mean that the dwelling is safe or can be occupied.

3.0.2 If a building is not safe to enter for structural and/or health reasons, emergency authorities will usually place a red 'Entry prohibited' placard near the entrance [Figure 1]. The building must not be entered until this is removed or changed. A yellow 'Restricted access' placard allows access to some parts of the building or short-term entry only. A white 'Can be used' placard allows access but does not mean the building is safe to work or live in. Further safety checks may be required. Before beginning work, check with the local authority or civil defence emergency management that return to the property is allowed.

3.0.3 Before starting the clean-up, check that the property presents no immediate danger:

- Floodwaters have receded enough to make the building safe to enter and no further flooding is expected.
- Land damage such as undermining and subsidence will not pose a risk for people on site.
- The building is structurally safe – a structural engineer, suitably qualified building consultant or experienced builder who is also a licensed building practitioner (LBP) should confirm this.
- A registered electrician has either checked and confirmed that the power supply and installation is safe or has cut off the power supply [appliances must be checked individually]. They may hook up temporary electrical services if it is safe.
- The gas supply has been checked by a registered gasfitter and either tagged as safe or disconnected.

ENTRY PROHIBITED

(THIS IS NOT A DEMOLITION ORDER)

There has been a quick visual inspection of this building:

- This building is at risk from an external hazard
- This building has been seriously damaged

Description of hazard observed: _____

Extent of barricades required: _____

Diagram attached showing restricted areas

Access is not permitted without written authorisation from the Civil Defence Emergency Management Controller or other Responsible Person.

Building Name and Address: _____

This building has been subject to a rapid assessment:

- Exterior Only
- Exterior and Interior

Assessor ID: _____
 Date: _____ Time: _____

This placard has been placed on behalf of the CDEM Controller or other Responsible Person under the authority of s133BT of the Building Act 2004 or the Civil Defence Emergency Management Act 2002 (cross out as applicable).

For further information:

- <https://www.building.govt.nz/managing-buildings/managing-buildings-in-an-emergency/>
- For enquires about this building: _____

DO NOT REMOVE THIS NOTICE

RESTRICTED ACCESS

- TO PART(S) OF THE BUILDING ONLY
- SHORT TERM ENTRY ONLY
- Access to be supervised by a person authorised by the issuing authority

There has been a quick visual inspection of this building:

- This building has been damaged and its structural safety is questionable
- Enter only at own risk
- Future events may cause more damage that may change this assessment

Description of hazard observed: _____

Restricted areas are: _____

Restrictions on use:

- Removal of essential documents/valuables only
- Removal of property
- Other: _____

Diagram attached showing restricted areas

Building Name and Address: _____

This building has been subject to a rapid assessment:

- Exterior Only
- Exterior and Interior

Assessor ID: _____
 Date: _____ Time: _____

This placard has been placed on behalf of the CDEM Controller or other Responsible Person under the authority of s133BT of the Building Act 2004 or the Civil Defence Emergency Management Act 2002 (cross out as applicable).

For further information:

- <https://www.building.govt.nz/managing-buildings/managing-buildings-in-an-emergency/>
- For enquires about this building: _____

DO NOT REMOVE THIS NOTICE

CAN BE USED

NO RESTRICTIONS ON ACCESS

There has been a quick visual inspection of this building:

- No obvious structural problems were observed, but;
- This does not mean that the building is completely safe
- This does not mean that the building is not damaged
- Future events may cause more damage that may change this assessment

The following items have generally not been inspected:

- Utilities (electrical, gas, water, sanitary facilities, etc)
- Secondary elements (ceilings, windows, fittings, etc)

Building owners and tenants have an important role in regard to the future safety of occupants and the public:

- The owner should organise for someone to look at the building more thoroughly
- Tell the issuing authority if you find anything that could be dangerous

Building Name and Address: _____

This building has been subject to a rapid assessment:

- Exterior Only
- Exterior and Interior

Assessor ID: _____
 Date: _____ Time: _____

This placard has been placed on behalf of the CDEM Controller or other Responsible Person under the authority of s133BT of the Building Act 2004 or the Civil Defence Emergency Management Act 2002 (cross out as applicable).

For further information:

- <https://www.building.govt.nz/managing-buildings/managing-buildings-in-an-emergency/>
- For enquires about this building: _____

DO NOT REMOVE THIS NOTICE

Figure 1. Placards that may be placed on dwellings following severe flooding. © The Crown.

- The sewerage system is safe and presents no health danger to workers cleaning. Flooded septic tanks should be checked by a certifying plumber and/or registered drainlayer and pumped out as soon as possible if necessary and the disposal field cleared of any silt.

3.0.4 When entry to the dwelling is permitted, maintaining security may be difficult. The occupants should remove any remaining valuables.

3.0.5 Before any clean-up or repair work begins, take photographs and/or videos of all the damage and store them safely. Where you can see the maximum height that floodwaters came up to, mark that point in each room with a permanent marker.

3.0.6 With buildings on suspended timber floors, try to determine whether the house has moved on its foundations. If this seems likely, consult a registered engineer. Door frames out of shape and new cracks in walls may be evidence of this.

4 HEALTH AND SAFETY

4.0.1 Floodwater is often contaminated. Do these things to keep safe during clean-up:

- Wear long trousers, a top with long sleeves, gloves and sturdy shoes and have a mask handy.
- Prioritise safe disposal of accumulations of sewage and dead animals in the vicinity of the building and manage any other health hazards.
- Only drink purified water until the regular supply is confirmed as safe to drink and you have run taps until the water is clear.
- Discard all food exposed to the flood unless stored in sealed airtight containers. Wash all food containers carefully before opening. Do not eat vegetables from the garden if the garden was under floodwater. Disinfect and wash crockery, glassware and cutlery thoroughly before use. Dispose of thawed food in freezers where the power has been off for 2 days or more.
- If the water in a water storage tank was affected by floodwater, dispose of the water, clean out and disinfect the tank.
- Keep small children, pets and anyone with asthma or allergies away during clean-up.
- Use liberal amounts of disinfectant when cleaning, and wash hands thoroughly before eating and drinking.
- Disinfect cuts and skin injuries immediately and cover with a waterproof dressing.
- If you need light, use a battery-powered torch or lamp and not a light with a naked flame.

5 CLEANING UP INSIDE

5.0.1 Remove wet belongings, furniture, bedding, wet curtains and floor coverings. Once items are thoroughly cleaned and dried, arrange to store these elsewhere. Some items that cannot be satisfactorily cleaned and dried (such as innersprung mattresses) will need to be disposed of.

5.0.2 Appliances and systems that have been covered by floodwater should be checked and may need to be

removed. These include space heating and water heating systems and so on. Some may be cleaned, dried and checked/tested before being reinstalled/used while others must be disposed of.

5.0.3 Leave nothing inside the house that can trap moisture and slow the drying process.

5.0.4 Locate and clear pockets of trapped water and debris:

- Remove skirtings, cupboard kick panels and front panels to showers and baths.
- Remove wall linings sufficiently to allow cleaning of the wall cavity and the removal of wet insulation materials.
- Drill holes in or remove ceiling linings when water is trapped above.
- Ensure the power supply is disconnected and then remove electrical switch plates and fittings.

5.0.5 Remove any water, mud and silt that may be trapped:

- underneath the bath and shower tray
- in and beneath cupboards
- under stairs
- in wall cavities and between internal linings and claddings
- in a fireplace, chimney or woodburner
- above the ceiling
- in electrical switchboards and wall sockets (ensure power is disconnected)
- in sanitary fittings such as toilets, bidets, cisterns and pipes.

5.0.6 Remove all visible mud and debris. If sufficient clean water is available, use a hose with a reasonable nozzle pressure, starting from the top or upper limit of the flooding and working down. Insert the hose into concealed spaces to flush out dirt as work proceeds.

5.0.7 After hosing down, wipe or wash surfaces with disinfectant to reduce the risk of flood-carried infections and contaminants.

5.0.8 It is usually easier to clean wall framing cavities from the inside due to the presence of wall underlay on the outer face of the framing and the need to remove wet insulating materials. However, if the floodwater carried silt, this may be trapped between the wall cladding and the underlay. If this is the case, remove the outside cladding sufficiently to allow the silt to be removed. Silt left behind will affect wall underlay performance.

5.0.9 Hard linings such as wood panelling or wallboard can be scrubbed with a stiff bristle brush, water and detergent to remove dirt from cracks, corners and crevices. The surfaces should be well rinsed with clean cold water.

5.0.10 Gypsum plasterboard has a low tolerance to water and will almost always have to be replaced if it has been immersed.

5.0.11 Where plasterboard is used as bracing, it must be removed and complete sheets replaced, following specified fastening schedules to ensure the bracing

capacity is restored to the original. Removing these bracing elements means temporary bracing is required, particularly when the building requires an extended period for drying. Always consult a registered engineer, building consultant or experienced licensed builder. Building consent will be required.

5.0.12 If the plasterboard is not a bracing element and depending on the wall finishes being reinstated, it may be possible to remove a strip to 300 mm higher than the flood damaged zone. Where plasterboard sheets are cut, include nogging or flat-wise timber to provide some support at the edges for stopping. However, a better result will be achieved if full sheets are removed and then replaced after the framing has dried.

5.0.13 If it is not clear whether the plasterboard is used for bracing, replace with a braced lining with appropriate fixings and brackets.

5.0.14 Items made from composite wood materials such as medium-density fibreboard (MDF) or non-flooring grade particleboard have low tolerances to water immersion and may need to be replaced if fibres have swollen. This may affect skirtings, architraves, scotias, window jamb linings and joinery units.

5.0.15 Flooring board made from composite wood materials may also need to be replaced, as flooding damage could cause structural weakness. If checking the floor strength, it must first be completely dry. If in doubt, consult an appropriate expert.

5.0.16 Timber framing, whether treated or not, should be checked by a registered building surveyor before it is re-enclosed. It should be cleaned where required, treatment applied as advised and then be allowed to dry [see 9.0.3].

5.0.17 If there is significant mould growth, affected linings should be removed and disposed of in sealed bags. Any affected timber framing should be washed thoroughly, rinsed, treated and dried. If mould has been removed from the sides of a stud, it is likely to also be present on the back face of the stud, and this should be managed accordingly.

6 CLEANING UP SUBFLOOR SPACES AND BASEMENTS

6.0.1 For homes with subfloor spaces under suspended ground floors, clean out the space to prevent excess moisture remaining, to speed up the drying out of the structural timber above and to reduce the risk of future rot.

6.0.2 Options to remove water under the floor are:

- pumping out
- digging drainage channels to the outside
- digging a pit to drain the water into, then pumping or bailing the water out.

6.0.3 The water removed from under the building should be disposed of as far away as is practicable without impacting other properties. Where the subfloor is lower than the surrounding ground, it may take some time for water to stop accumulating.

6.0.4 Once the subfloor water has been drained, remove any dirt and debris left behind by floodwater. Leaving the silt slows the drying process, but solid debris including silt could be left if it is inaccessible and:

- there are no foul odours present
- the foundation vents are not blocked and there is at least 400 mm between the lowest timber and the ground
- the debris contains no organic matter.

6.0.5 Remove wet insulation. Underfloor insulation should be reinstated or replaced after the subfloor is dry to the level required by the current Building Code or the material manufacturer. If metallic foil subfloor insulation is present, disconnect the electricity supply, remove the foil and replace with a Code-compliant product [foil cannot legally be installed or repaired].

6.0.6 Hose down the underside of the suspended floor to remove dirt from nooks and crannies, particularly around the perimeter. Dirt left behind can hold moisture, slow the drying and may cause rotting.

6.0.7 Check services such as drains, pipes, wiring and conduits for damage and repair if necessary. Silt can be deposited into drains through gully traps. Flush these with clean water.

6.0.8 The best way to dry the subfloor space is to maximise airflow:

- Clear any debris blocking ventilation openings.
- Knock out the grilles to underfloor vents.
- Cut back plants that are obstructing vents.
- Remove items stored under the dwelling.
- Leave subfloor access doors open.
- Remove part of the foundation enclosure such as base boards or sheet linings. If these materials are part of the subfloor bracing system, install temporary diagonal bracing and ensure the bracing is restored to the equivalent of the original. If in doubt, consult a registered engineer or experienced licensed builder.
- Form new ventilation openings in concrete foundations, ensuring there is no structural compromise.
- Set up fans to circulate air if space allows and they can be set up safely. Hire centres often have larger industrial fans.

6.0.9 Concrete foundations can hold water and will need time to dry.

6.0.10 If a basement is flooded, pump the water out over several days. Emergency management authorities advise that, if water is removed from a basement too quickly, water-saturated soil outside the basement could put strong pressure on basement walls, with the risk of collapse.

7 CLEANING UP OUTSIDE

7.0.1 Remove and dispose of driftwood, rubbish and decaying vegetation.

7.0.2 Protect the outside of the building to prevent further rainwater entering while the interior is drying.

7.0.3 Clean external walls with water and detergent as soon as possible, as dirt on the surface will keep it damp.

Use a stiff nylon or bristle brush for brick or blockwork and a soft brush or cloth for timber. Do not waterblast, as this is too aggressive and can do damage.

7.0.4 Wedging out or removing the bottom two or three weatherboards will allow draining and flushing out of the bottom of the wall cavity where it continues past the inside floor level. This will also give much better ventilation to the wall and assist in drying. Sheet claddings that span from top to bottom may have to be removed completely.

7.0.5 With masonry veneer cladding, silt may be cleaned out by inserting a hose through the perpend drain points. Where there is more significant silting, remove bricks or blocks in the bottom course to make access ports to flush out the silt.

7.0.6 All monolithic claddings (stucco, exterior insulation and finish systems [EIFS], flush-stopped fibre-cement sheet) should be inspected by a registered architect, registered building surveyor or building surveyor experienced with this type of building. Some of these materials are quite absorbent. Fibre-cement sheet, for example, must be allowed to dry thoroughly.

8 DRYING OUT THE HOME

8.0.1 Once wet materials have been removed and the dwelling is thoroughly cleaned, drying out can begin. Drying out, particularly in winter, can take several months.

8.0.2 Ideally, a building should dry as quickly as possible to reduce risks such as mould growth. Removing linings will speed the drying of concealed places, and linings can be replaced when the building is dry. Relining should not be carried out until the moisture content in the timber wall framing has dropped to acceptable levels (see 9.0.3), and the framing must show no signs of rot. Where time is critical, it may be more practical to replace timber that is wet than wait for it to dry.

8.0.3 On dry days, keep all windows and doors open to maximise ventilation. On wet days, leave windows ajar so there is still some ventilation. Leaving cupboard doors and drawers open will speed the drying of storage areas.

8.0.4 Heaters (and fans and dehumidifiers) can be used, but too much heat may cause wood to warp and split. An inside air temperature of approximately 20°C (or at least 8°C above the outside air temperature) will increase the drying rate without creating additional problems. Ventilation as well as heating allows warm moist air to escape (although doors and windows should be closed if using dehumidifiers). Do not light a fire in a brick fireplace unless it has dried fully – steam created from the moisture can cause damage as it expands, and wet bricks and mortar can explode.

8.0.5 To speed drying of floors:

- remove polyurethane coating or sealer
- lift water-resistant floor coverings such as vinyl sheet, vinyl tiles and ceramic tiles
- ensure good ventilation inside the home and under suspended floors.

8.0.6 Hardwood floorboards need to be dried slowly to prevent cracking and buckling. Do not attempt to straighten warped or buckled timber floors until the whole building has dried completely and the timber moisture content is 20% or less.

9 REPAIRS

9.0.1 The building must be sufficiently dry before repair work is carried out.

9.0.2 Undertaking repairs to the structure and finishes before the building is dry enough can result in:

- mould developing
- future degradation of structural materials if they are enclosed before drying
- poor adhesion (blistering) of finishes
- materials continuing to move as they finish drying, resulting in cosmetic cracking to plaster and paintwork
- lifting and bubbling of vinyl floor coverings
- health problems for occupants.

9.0.3 Timber in homes normally has an in-service moisture content of 12–20%. Timber standing in water will absorb it, and it may take months for the moisture content to return to what it was. The moisture content in timber framing must drop to below 20% before the wall linings are replaced (plasterboard manufacturers may require 18% or less). Before any wall linings are replaced, there should be a prelining inspection by the territorial authority. The timber must also be dry before timber weatherboards or exterior joinery are painted. Use a moisture meter to check. These can be hired.

9.0.4 For concrete floors, a flooring hygrometer is the most reliable for testing dryness. The concrete must be sufficiently dry to give a relative humidity reading of 75% or less before installing fixed floor coverings.

9.0.5 Damaged wall underlay in external walls may need replacing. Removing the outside cladding to replace underlay is best practice.

9.0.6 Replace insulation under the floor and in the walls. When reinstating insulation, take the opportunity to upgrade to current Code requirements or, ideally, better than Code.

9.0.7 BRANZ recommends upgrading to current bracing requirements wherever possible [see NZS 3604:2011 *Timber-framed buildings* for timber-framed buildings less than 3 storeys or consult an engineer]. If there is doubt over what bracing was used at the time of construction, refer to the consent plans held by the local authority. If the construction dates from before 1978, a bracing schedule should be recalculated by an architect or engineer using NZS 3604:2011 and bracing installed.

9.0.8 Where appropriate, take the opportunity to add tie-down straps between the studs and bottom plates and check the number of foundation holding-down plates, straps and bolts and add to them if necessary.

9.0.9 Ventilation holes in foundation walls should be made vermin proof if they have been damaged or

removed to assist drying. Any base boards removed for drying should be replaced when drying is complete.

9.0.10 Replace doors and frames (including cupboard doors) that are damaged by swelling, warping and/or blistering or peeling surfaces.

9.0.11 Check particleboard floors for swelling at the joints by using a long straight edge. If swelling is more than 4 mm, the floor should be sanded flat. If it exceeds 6–8 mm, replace the floor.

9.0.12 Once the dwelling is cleaned and the building fabric dried, items that can be reinstalled after cleaning, repair or replacement include:

- appliances
- hot water cylinders and gas water heaters
- heaters
- central vacuum and heating systems
- electrical fittings
- carpet that does not have rubber backing or rubber underlay (rubber underlay will restrict the final drying).

9.0.13 No decorating should be carried out until moisture levels have dropped to the acceptable levels for relining.

9.0.14 Occasionally, a dwelling can be lived in while repair work is carried out, when:

- there is not a health risk
- the initial clean-up of water, mud and debris is completed
- the power supply is safely restored and electrical appliances have been checked
- potable water supplies and sewerage systems have been checked, repaired if necessary, tested and declared safe for use
- the local authority has lifted any notices on the dwelling.



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ISSN 1178-4725 (Print) 2537-7310 (Online)

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