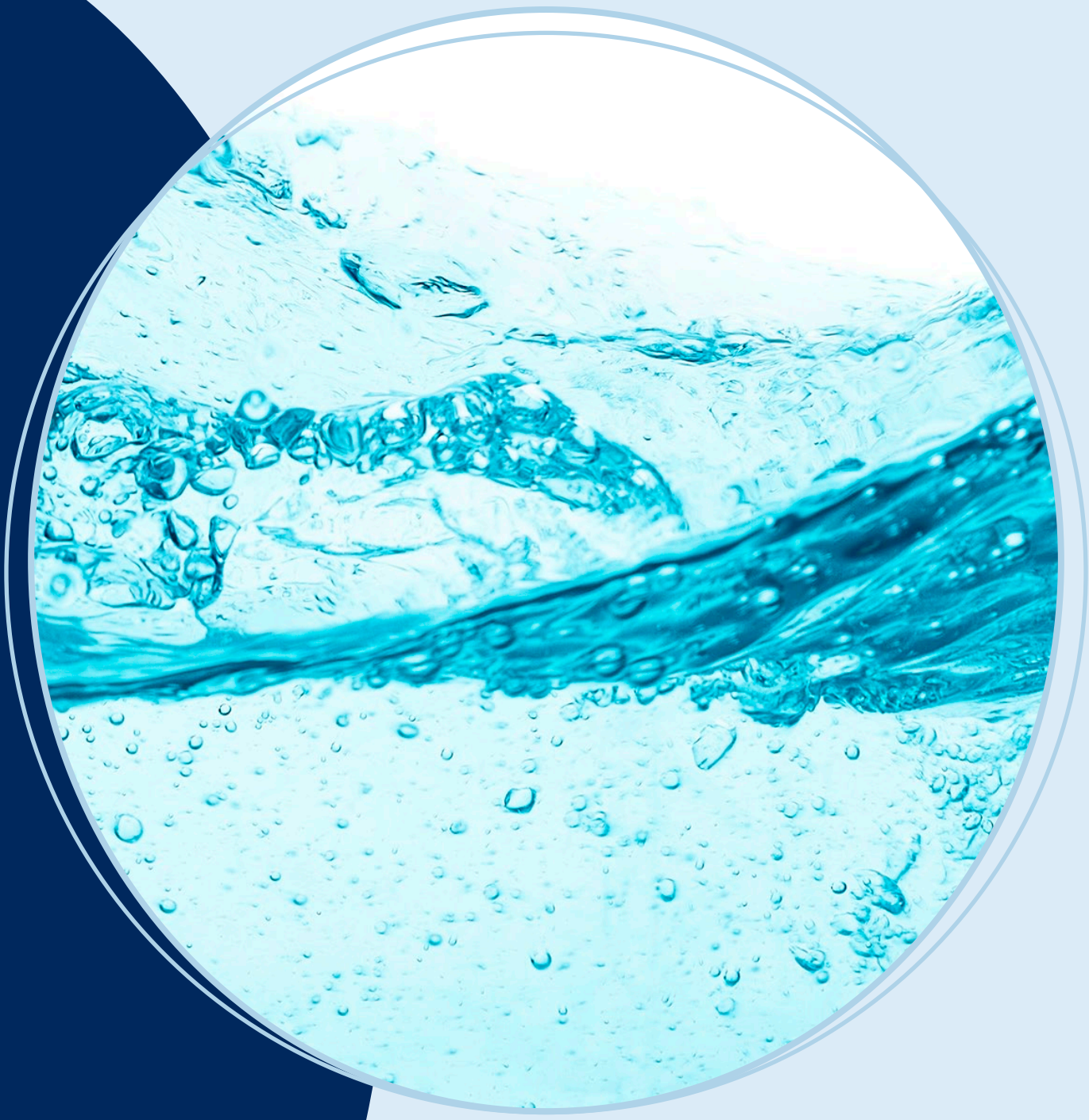


Continuing Professional Development 2025

CPD 2025

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Introduction

Tēnā koutou katoa,

Welcome to the Plumbers, Gasfitters, and Drainlayers Board 2025 continuing professional development (CPD) course.

Completing the CPD course contributes to a safe and competent workforce, and we appreciate your commitment to furthering your knowledge and skillset. By prioritising ongoing learning and staying up to date with industry best practices, you play a crucial role in protecting the public from potential risks and hazards.

This year's course content was developed through a combination of feedback received in previous years from practitioners and industry and developed by subject matter experts.

Your feedback is essential to help shape future courses and ensure the content is as current and relevant as possible. We ask that you provide feedback through the survey you will be sent after the course.

Finally, we expect that the format and delivery of CPD will evolve in the coming years. We will seek your feedback on any proposals for how CPD is delivered in the future before any decisions are made.

Thank you for all that you do to ensure the highest standards of safety and quality in your work.



Ngā mihi
Aleyna Hall
Chief Executive

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01

Topic 01:
Ensuring the future of the trade: Updates to apprenticeship training

This topic provides insights gained from the review of the Plumbing, Gasfitting, and Drainlaying apprenticeship training, and what the new training model will mean for apprentices in the future.

Written by:

Mike Grumball
GM Assurance

Introduction

The Plumbing, Gasfitting, and Drainlaying industry has been working with Waihanga Ara Rau (the Construction and Infrastructure Workforce Development Council) since 2022 to review the Plumbing, Gasfitting, and Drainlaying apprenticeship training following concerns that:

- It was taking apprentices too long to get through their training.
- There were delays in getting onto block courses.
- There was more of a focus on assessment, rather than teaching and learning.
- There had been an increase in the number of apprentices entering the industry, but the training capacity did not change.

The review included speaking to employers, apprentices, and training providers to undertake the most comprehensive review of PGD training in the past 30 years.

The changes to apprenticeship training began to be introduced in January 2025. As part of this topic, we will focus on the key changes to the teaching, learning, and assessment of PGD apprentices.

What are the main outcomes?

The new training programmes will ensure that there is flexibility for an apprentice to move through their training at their own pace and through training that suits them. This is based on a few key principles:

1. An apprentice can only be signed into a programme that relates to the day-to-day jobs they are undertaking in the workplace. This means for example that if you are only doing plumbing at work, then you will only be able to undertake the plumbing programme; you will not be able to do gasfitting.
2. There will be a defined level of performance introduced to ensure that the apprentice is competent at the tasks they are undertaking, especially for the practical tasks undertaken in the workplace.
3. The programmes focus on the core tasks that most plumbers, gasfitters, or drainlayers will undertake across the motu. Specialist subjects will be available ‘on top of’ the apprenticeship.
4. Workplace assessment will allow apprentices to be assessed in the workplace if they are undertaking tasks on a regular basis. This means they will not need to go to a provider to be assessed for those tasks.
5. Block course training will have more of a focus on teaching and learning, rather than assessment. This means that the apprentice can reinforce their knowledge through being able to practise practical tasks on a block course.

Let us look at some of these points in more detail, but first: What is an apprenticeship?

What is an apprenticeship?

- An apprenticeship is a formal work-based training programme
- There are three parties to an apprenticeship – the apprentice, the employer, and the training provider.
- The apprentice must be employed, have a training agreement, and have an individual training plan.
- The employer must ensure the apprentice is taught on the job, and that their work covers the breadth and depth of the skills and experience needed to complete their apprenticeship.
- The training provider ensures the apprentice has a training plan and is monitored and mentored throughout the apprenticeship.
- There must be clear communication between all parties.

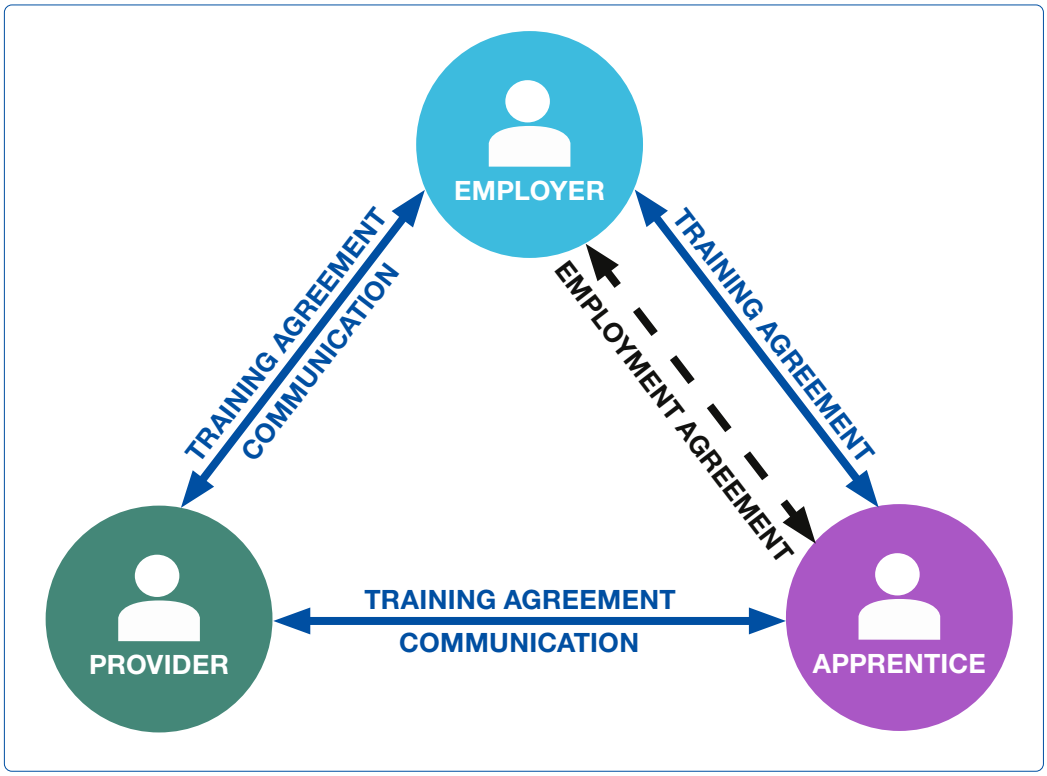


Figure 1. ***Training communication model***

The TEC (Tertiary Education Commission) 'Code of Good Practice for New Zealand Apprenticeships' goes into more detail about the responsibilities of each party in an apprenticeship. It is 'how' an apprenticeship should work using the three principles of commitment, collaboration, and communication.

See *Code of Good Practice for New Zealand Apprenticeships* *https://www.tec.govt.nz/teo/working-with-teos/kis/new-zealand-apprenticeships/code-of-good-practice-for-new-zealand-apprenticeships*

Level of performance

A new level of performance has been introduced to ensure apprentices are fully competent in critical practical tasks. This is why an apprentice must be practising the trade in the workplace.

To meet the level of performance an apprentice must achieve a required level of competency, by completing tasks:

- to current and relevant legislation, standards, and codes of practice (including safety).
- in an environmentally sustainable manner.
- within an acceptable timeframe.
- in the workplace.
- in different and unfamiliar contexts.

The level of performance can only be met if an apprentice has the opportunity to learn and practice those tasks that are important to the industry **before** they are assessed as being competent. This takes time and involves exposure to those tasks in the workplace. It is also why it is important that an apprentice is only signed into a programme that relates to the day-to-day jobs they are undertaking in the workplace.

Workplace Assessment

Workplace Assessment, as the name suggests, is assessment that is undertaken in the workplace through a collection of naturally occurring evidence demonstrating a person's competence in a particular task.

Naturally occurring evidence is evidence that is collected from the workplace, over a period of time, from undertaking normal activities. This could be from installing hot water cylinders to fitting out a bathroom. An apprentice will be using plans, taking lots of photos, and filling out time sheets. All of these things are naturally occurring evidence.

All of the evidence needs to be authentic, valid, current, and sufficient. The jobs will be observed, and the evidence authenticated by a verifier. An assessor will make the final judgement of competence based on the review of all of the evidence presented.

A verifier is someone who supports the assessment process by:

- verifying that the evidence provided by the apprentice is valid, authentic, and repeatable.
- confirming that the apprentice's practice is in accordance with relevant legislation, codes, standards, and workplace practices.
- observing the apprentice completing practical tasks in the workplace.

Who can be a verifier?

A verifier could be an employer or the person supervising the apprentice undertaking the task. A verifier can only verify evidence that aligns to their qualification, e.g. a plumber can't verify a drainlayer unless they also hold the drainlaying qualification. They would need to either:

- hold a current PGD Board licence as a plumber or drainlayer.
- hold a current PGD Board license as a certifying gasfitter

An assessor conducts the actual assessment by reviewing all evidence presented by the apprentice. The assessor may also perform the role of the verifier.

Who can be an assessor?

An assessor can only assess against standards that are aligned to their qualification, eg a certifying drainlayer can't assess against gasfitting standards. An assessor will need to:

- hold a current PGD Board licence as a certifying plumber, gasfitter, or drainlayer.
- hold standard 4098 - Use standards to assess candidate performance.
- maintain currency through continuous professional development.

Being assessed in the workplace will mean that an apprentice will need to be undertaking relevant tasks over a period of time, but they will not need to go to a block course to be signed off on practical tasks they are doing every day. It will also be easier for the apprentice to meet the expected level of performance and be deemed competent in that task.

Being competent means having the skills, knowledge, and experience to do something at the right level of performance consistently over time.

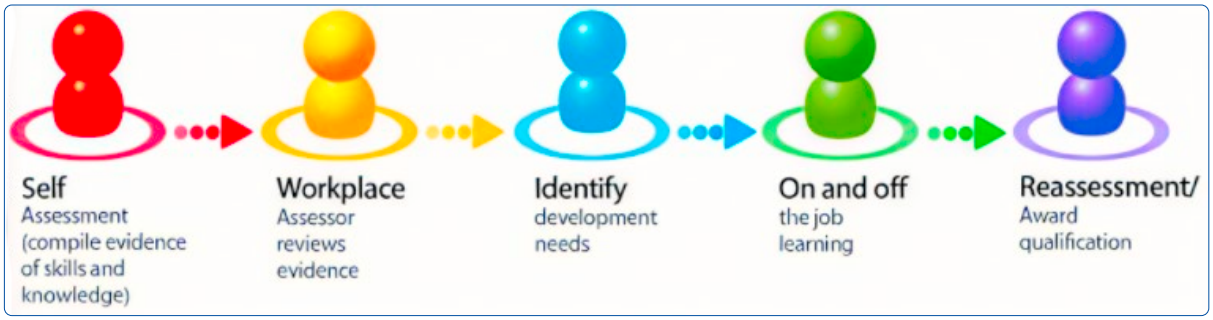


Figure 2. ***Assessment process***

Block course training

Block course training should start to look different in the new programmes being offered from January 2025. There will be more of a focus on teaching and learning, rather than just assessment. This means that apprentices will have the opportunity to reinforce their knowledge through practising practical tasks on a block course, rather than just focus on assessment.

Each provider will determine the length and regularity of block courses depending on the trade (plumbing, gasfitting, or drainlaying), but block courses will be specific to one trade (plumbing, gasfitting, or drainlaying) going forward rather than combining trades. In time apprentices may be able to choose when and if they need to go on a block course.

The assessment of theory knowledge may be undertaken at the block course, or through the online learning platform following a block course.

Although it is preferred that apprentices complete their practical assessment through workplace assessment, there will be occasions where this is not feasible, either because appropriate jobs in the workplace are not available at that time, or because that task is not undertaken in that workplace.

Where a practical assessment is being undertaken through a block course, the apprentice being assessed needs to demonstrate the same level of performance and competency as would be required for an assessment undertaken in the workplace. The apprentice should also have had the opportunity to practise the relevant skills prior to an assessment being undertaken. This may mean that the assessment is done at a separate block course.

Practical assessment at a block course needs to consider the following:

- Any evidence from the workplace. An apprentice may have already gathered evidence of an assessment task from the workplace and, where valid, this must be used as part of the assessment.
- The assessment task being undertaken through the block course must replicate, as closely as possible, how that task would be undertaken in the workplace. It must include all elements of the assessment task.
- The number of times the assessment is undertaken must be the same. This may mean that the apprentice needs to complete the task two or three times on different equipment.
- The evidence gathered as part of the assessment process should reflect similar evidence to the evidence that would have been gathered in the workplace.

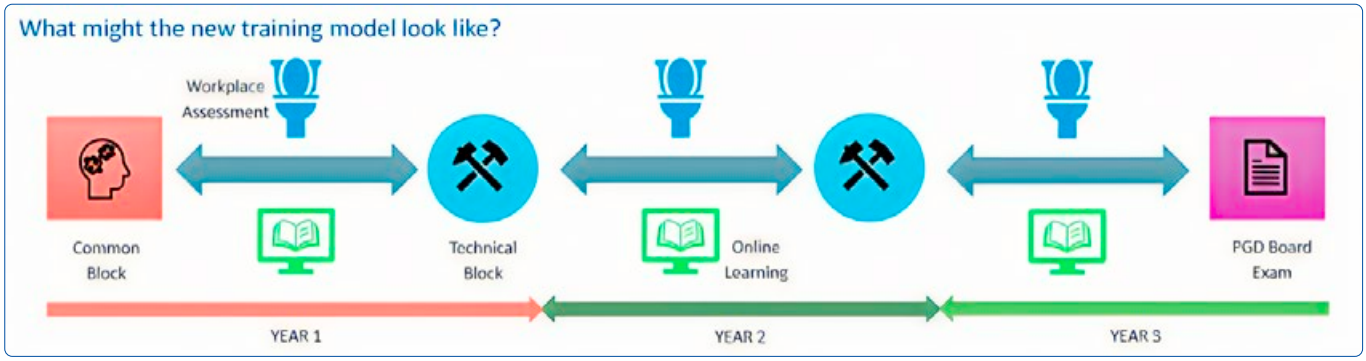


Figure 3. ***Training model diagram***

FAQs

Some other important questions that you might have about the new model.

Q: When can an apprentice sign into the new model?

A: The new programmes will be available from early 2025 for new apprentices, but apprentices should continue to sign up now. Some apprentices who are in the early stages of the older programmes may transition to the new programmes, but the training provider will discuss this with the apprentice and their employer.

Q: My apprentice does not seem to have completed enough block courses for the current programmes. Who should I contact?

A: If you have concern around the number of block courses for your apprentice, please contact your training provider:

- Te Pūkenga/EarnLearn – *blockcourses@earnlearntepukenga.ac.nz*
- ICE – *office@icexl.co.nz*

Q: Will an apprentice still need to do the registration exams at the end of their apprenticeship?

A: Yes, they will. The exam is part of the apprenticeship. The qualification cannot be awarded without the apprentice passing the relevant registration exam.

Summary

The way new apprentices are trained is going to change from January 2025 to ensure we have more highly skilled and competent plumbers, gasfitters, and drainlayers. The training will become more flexible over time; the apprentice and their employer will be able to choose the training pathway that best suits them.

Training providers will be sharing more details around the structure of the new training and will be having more in-depth discussions with new apprentices and their employers at the beginning of the sign-up process.

The opportunity to be assessed in the workplace will become a reality with the new training programme, so if you are interested in becoming a verifier or an assessor then please have a conversation with the provider during the sign-up process.

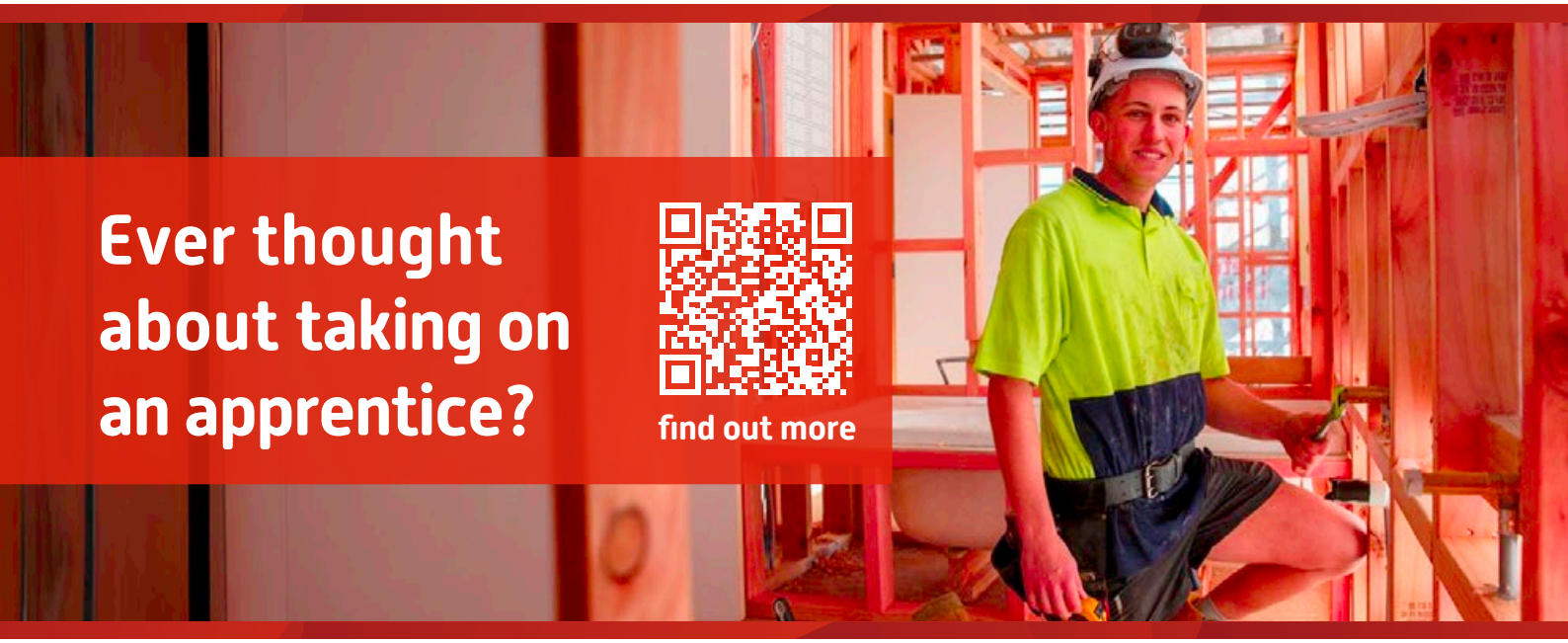
The reasons for an employer to take on an apprentice have not changed. The industry needs to continue to train apprentices to ensure there are enough competent plumbers, gasfitters, and drainlayers for the future. The industry needs more employers to give new apprentices an opportunity to get into the industry.

Protecting the public, your business, your trade

By equipping the next generation of plumbers, gasfitters, and drainlayers with exceptional training and hands-on experience, we are protecting the future of the industry. The changes to the curriculum are designed to safeguard the plumbing industry's reliability and foster its growth for years to come.

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02

Topic 02:
Effective on-site wastewater treatment

This topic explains practices in careful design, correct installation, and regular maintenance of on-site wastewater systems ensuring long-term system performance and safety.

Written by:

Sandy Ormiston
On-site Wastewater Specialist
Ormiston Associates Limited

Background

An on-site wastewater system collects, treats and discharges wastewater sourced from an individual home or commercial facility on the same property as it is generated (TP58 2004). TP58 is an on-site wastewater system design guideline published by Auckland Council and is specific to the Auckland Region, although other councils within New Zealand also refer to the document. Designers should confirm if the Australia/ New Zealand Standard AS/NZS1547:2012 or TP58 is accepted. An on-site wastewater system is required where connection to a municipal sewer is not available. Figure 1 is an example of an on-site wastewater system comprising:

- water source (roof water collection/bore/reticulated)
- wastewater source (dwelling or school, café, etc.)
- primary treatment stage (septic tank and effluent outlet filter)
- a possible secondary treatment stage (aerated wastewater treatment plant or textile system)
- a treated effluent tank to store effluent prior to discharge to land disposal
- A land disposal system.

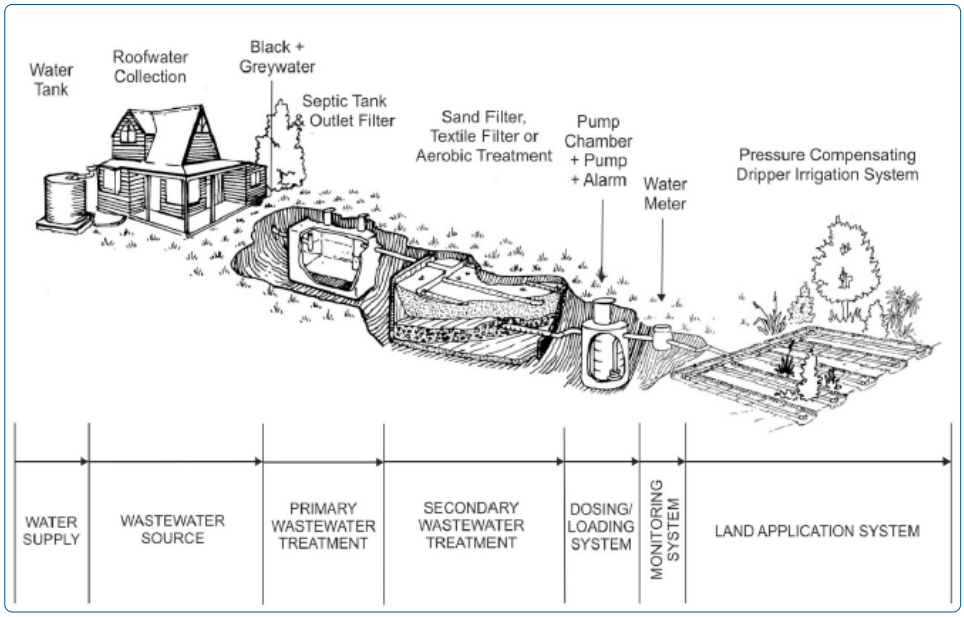


Figure 1. ***Illustration of an on-site wastewater system. (Source TP58 2004, Auckland Regional Council Design Manual.)***

On-site wastewater treatment and land disposal systems provide wastewater management for approximately 21% of New Zealand's population.

Careful design, installation and ongoing regular maintenance is critical to minimise the possibility of system failure, treatment system overflow and consequent risk to public health and the environment.

Australia/New Zealand Standard 1546:2012 "*On-site domestic wastewater management*" provides design guidance for sizing, construction, risk management and maintenance for single-dwelling on-site wastewater systems.

Introduction

In this topic we discuss:

- what is on-site wastewater treatment
- composition of domestic wastewater
- risk to public health and the environment from wastewater discharge direct to the environment
- primary wastewater treatment
- secondary/advanced wastewater treatment
- tertiary wastewater treatment (nutrient reduction)
- installation requirements
- system maintenance
- risk management.

The successful and longterm performance of an on-site wastewater system is dependent upon conservative design, but critically dependent upon correct installation and ongoing post-construction maintenance.

Wastewater is defined as *untreated* and **effluent** is defined as *treated wastewater* discharged from any part of a treatment system.

Wastewater and what's in it

Domestic wastewater comprises:

- **blackwater** sourced from toilets (urine and faeces)
- **greywater** sourced from showers, laundry and taps.

Black and greywater both pose public health and environmental risks.

The two wastewater streams are typically combined for treatment and land disposal and described as 'All Waste'. An on-site wastewater treatment and land disposal system is designed for the daily hydraulic load (in litres per day) and treated and discharged to the environment (soil) to reduce:

- **pathogens** (viruses, bacteria, protozoa)
- **organic content** (BOD_5 – 5-day Biochemical Oxygen Demand in mgO/L). Typical domestic wastewater is 370mgO/l.
- **Total Suspended Solids** (TSS in mg/l) – what remains when water has evaporated. Typical domestic wastewater is 340mg/l.
- **nutrients** – Total Nitrogen TN mgN/l. Typical domestic wastewater is 30–85mg/l.
- **nutrients** – Phosphorus measured as Total Phosphorus TP. Typical domestic wastewater is 9–12mg/l.

Pathogens pose a public health risk where there is a risk either of direct human contact, or from ingestion of contaminated water or shellfish.

BOD_5 is a measure of the amount of oxygen required to oxidise the organic content of the wastewater. Discharge to water of untreated wastewater results in depletion of oxygen from the water and suffocation of life within the water.

TSS can clog the land disposal system, resulting in effluent breakout to the surface.

Nutrients (Nitrogen): Nitrate poses a risk to drinking water and can contribute to eutrophication and depletion of oxygen in surface water by promoting vegetation growth. Eutrophication refers to a process where nutrients (nitrates and phosphorus) accumulate in a water body, resulting in increased growth of microorganisms that may deplete the oxygen in the water.

Phosphate can also contribute to eutrophication and depletion of oxygen in surface water by promoting vegetation growth.

Daily wastewater flow assessment

AS/NZS1547:2012 (Table J1) and TP58 (Table 6.1) provide guidance for determining the design occupancy of a dwelling based on the number of designated and potential bedrooms. Potential bedrooms include studies, games rooms, music rooms and gyms.

AS/NZS1547:2012 (Tables H3 and H4) and TP58 (Table 6.2) provide per capita flow allowances based on water supply (roofwater collection or reticulated), and the installation of high water use fixtures or water-conserving fixtures.

Criteria	Totals
Number of bedrooms	3 designated bedrooms & 2 potential bedrooms (3 bedrooms + study + music room)
Design number of bedrooms	5 bedrooms
Total design occupancy level	8 people
Water source	Roofwater collection and tank storage
Dwelling use	Holiday home
Per capita flow allowance	
(Standard Fixtures Table H3)	180 l/p/d
Daily Wastewater Production	**8p x 180 l/p/d = 1,440 l/d**

*Table 1. **Example of daily wastewater production & compliance***

It is important to note that there is no reduction in the design flow for an intermittently occupied holiday home, as in the future it could change to become permanently occupied. It is also important to note that wastewater sourced from dwellings is different to that from schools and public toilets, as domestic wastewater is diluted by greywater. Wastewater from sources other than dwellings require specific design to account for the higher strength of the wastewater (BOD_5 load and nitrogen) which standard domestic wastewater treatment plants are not designed to treat.

Primary wastewater treatment

The first stage of an on-site wastewater treatment system comprises a septic tank which provides primary treatment by separating scum and light material by flotation and settlement of heavier solids. The process is anaerobic, occurring in the absence of oxygen, and consequently the treatment process is slow.

The septic tank capacity comprises:

- air space
- surface scum layer
- a clear zone
- basal sludge/solids layer (Figure 2).

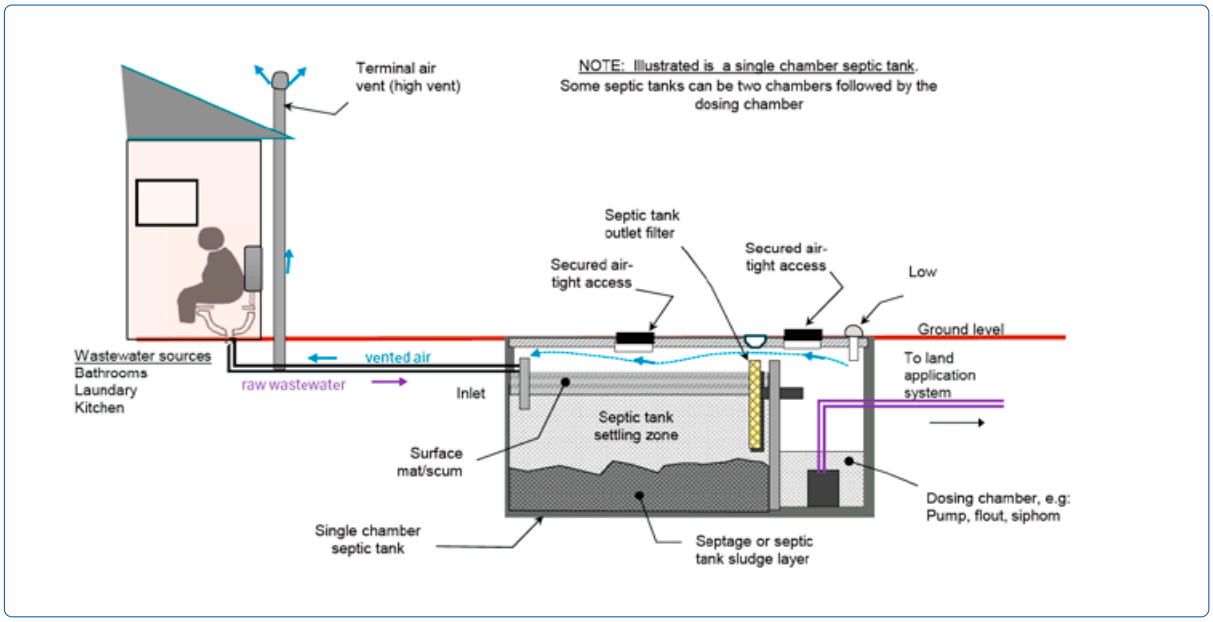


Figure 2. ***Typical Septic Tank. (Source: Andrew Dakers EcoEng)***

Septic tank volume requirement is typically determined by providing 24–48 hours hydraulic retention time and allowing for 80 litres of sludge accumulation per person per year and a 5-year pump out interval. Typically the septic tank volume is based on 1⁄3 scum + 1/3 clear zone + 1/3 sludge. As the volume of surface scum and basal sludge increases, the clear zone between the two decreases. This increases the velocity of through flow resulting in movement of settled solids, poor settlement conditions, and discharge of solids to land disposal.

Septic tank pump-out timing is typically based on measuring the combined depth of sludge and scum, and when this comprises 50% of the storage volume solids pump-out is required. Care is required with pump-out where there is an elevated water table, as there is a risk of the tank becoming buoyant and floating.

Modern septic tanks include an effluent outlet filter which significantly improves septic tank performance by modulating surge flows and filtering solids down to about 3mm diameter solids, which are retained in the septic tank. Modulating surge flows assists in retaining bacteria in the tank for improved treatment.

There are numerous types of effluent outlet filter:

- screen/mesh
- slotted
- plate
- multi-tube.

Effluent outlet filters require regular cleaning by removal from the septic tank and washing down back into the septic tank.

The treated effluent pump chamber includes pump on/off float switches, high water level alarm, and minimum 24 hours' emergency storage.

Critical components for operation of **an on-site wastewater system** include:

- gully traps to be proud of ground level to prevent surface stormwater water inflow
- no roof downpipes are to discharge to sewer pipes and the septic tank
- all drains to the septic tank must be watertight
- septic tank inlet and outlet connections to be flexible
- the septic tank must be watertight
- all lids, risers, inlet and outlet connections must be watertight
- all lids to be proud of ground level
- all lids to be screwed or bolted down to prevent public access and drowning risk
- modern septic tanks include an effluent outlet filter at the discharge to modulate the outflow and filter solids
- the inlet to a septic tank with gravity discharge is to be higher than the outlet to prevent backup
- the inlet is to discharge into the clear zone so as to minimise disturbance of the surface scum layer and minimise short circuiting
- the outlet is to be positioned in the clear zone to minimise risk of solids/scum discharge – unless an effluent outlet filter is fitted
- terminal vent is to be vented above the roofline.

It is critical that groundwater and surface water cannot enter the septic tank, as the additional water overloads the septic tank – resulting in partial treatment, overflow risks and overloading of the following treatment stages and the land disposal system. The result is ineffective treatment, flowthrough of solids to the land disposal system and breakout from the land disposal system, posing a public health risk from direct contact and environmental risk from discharge to surface water.

Flexible inlet and outlet connections minimise the risk of breakage of sewer pipes caused by settlement of backfill placed in the tank excavation and around the septic tank (Plates 1, 2 & 3).



Plate 1.



Plate 2.



Plate 3.

Examples of good and bad downpipe connections (Plate 1), poor septic tank lids (Plate 2), and modern riser and lid (Plate 3).

Primary treatment

Primary Treated Effluent discharged from a septic tank with an effluent outlet filter is defined as effluent having:

- BOD_5 120–190mg/l
- TSS 30–85mg/l
- TN 30–65mg/l

Secondary treatment

Modern on-site wastewater systems can comprise multiple treatment stages with second stage aerobic treatment following primary septic tank treatment significantly reducing the concentration of contaminants.

Secondary Treatment (Aerated Treatment Plant) is defined as effluent having:

- BOD_5 < 20mgO/l
- TSS < 30mg/l

Advanced secondary treatment

Advanced Secondary Treatment (Recirculating Textile Filter) is defined as effluent having:

- BOD_5 < 15mgO/l
- TSS < 15mg/l

Tertiary treatment

Tertiary Treated Effluent (Disinfection)

Where there is a high risk of environmental impact to surface water and groundwater, secondary or advanced secondary treated effluent can be disinfected by ultraviolet light or chlorine to reduce the pathogen concentration typically to less than 200 CFU/100mls (Coliform Forming Units).

There is a range of domestic on-site secondary treatment systems on the market comprising:

- Aerated suspended and fixed growth treatment processes – typically termed aeration systems (SAF, SAFF systems) and sequencing batch reactors (single chambered SAF) – which process effluent by aeration and provide an environment for aerobic bacteria to be kept in suspension by aerators or attached to submerged media (Plate 4). The SAF tank includes a primary septic tank chamber, aeration chamber, clarifier chamber and treated effluent chamber.
- Recirculating textile and sand filter systems, typically termed packed bed reactors (rtPBR systems). The systems do not submerge the aerobic bacteria, but provide solid surfaces (textile or sand grains) for the bacteria to attach to. Septic tank effluent is pumped onto the textile/sand surface which aerosol bacteria consume, thus providing treatment (Plate 5).

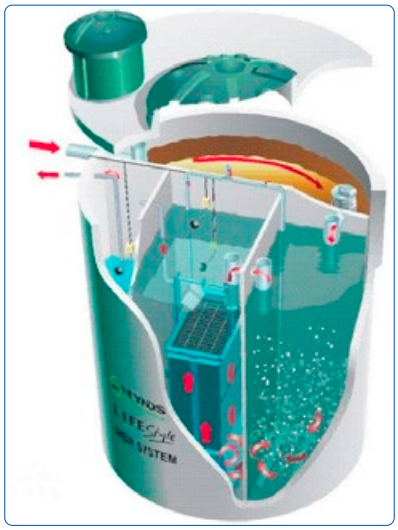


Plate 4.



Plate 5.

Examples of SAFF (Plate 4) and Textile (Plate 5) secondary treatment systems.

Secondary, advanced secondary and disinfection treatment systems must only be installed by installers specifically trained for that particular brand.

All wastewater treatment and land disposal systems require regular maintenance at least 12-monthly, but more regularly where risks from a system malfunction are high.

Septic tank installation risks

Where the septic tank's excavation intersects the groundwater table there is a high risk of tank flotation. Additionally, if the septic tank, installed below ground level, is not water-filled, it can float following rainfall. Flotation risk can be minimised by:

1. Providing drainage from the excavation to maintain groundwater below tank base level. This is not always practically achievable.
2. Filling the tank with water immediately at the time of installation.
3. Specific engineering design of the tank to include a basal flange extending beyond the tank footprint and using excavation backfill to resist uplift.

Do not smash a hole in the tank floor. This allows both groundwater ingress and untreated effluent exfiltration directly to groundwater.

Maintenance health and safety

Maintaining septic tanks risks contact with wastewater containing infectious pathogens (viruses, protozoa and bacteria).

- All maintenance personnel should be protected against polio, tetanus, hepatitis A and B through inoculation.
- Always wear rubber gloves.
- Do not eat, drink or smoke with dirty hands or in the vicinity of the septic tank.
- Thoroughly clean your hands with water and soap or hand cleanser.
- To overcome the risk of falling into an open tank, ensure a secure foot and hand hold.
- Sewage produces toxic gases which can cause suffocation when you enter a tank. If tank entry is necessary, full confined space entry procedures must be taken – including gas detection, use of a trained standby person, and a prepared emergency evacuation plan.

Consents

All on-site systems require **building consent** from the territorial authority before any construction starts. On-site systems located on smaller sites or sites with large houses may also require a **discharge consent** from the regional council or unitary authority in addition to a building consent. Always check consents have been granted prior to system installation.

Summary

An on-site wastewater system is designed to treat and discharge wastewater produced on the property within the property boundaries in such a manner that public health and the surrounding environment are protected.

The successful longterm operation of any on-site wastewater system is dependent on:

- design
- installation
- ongoing regular maintenance
- acceptance of responsibility (buy-in) by the homeowner.

The correct installation of any on-site system is therefore critical if the system is to effectively protect public health and the environment.

Protecting the public, your business, your trade



On-site wastewater systems manage and treat wastewater within property boundaries, ensuring public health and environmental protection. Serving 21% of New Zealand's population, these systems rely on careful design, correct installation, and regular maintenance. Following standards like AS/NZS1547:2012 and guidance like TP58 helps reduce risks such as pathogens and contamination. Homeowner involvement is crucial, as proper system care prevents failure and protects both public health and the environment. Effective installation and maintenance are key to long-term system performance and safety.

03

Topic 03:
Best practices for on-site wastewater disposal

Effective on-site wastewater disposal prevents contamination and requires professional design, installation, and maintenance to minimize risks.

Written by:

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Background

An on-site wastewater system collects, treats and discharges treated effluent sourced from an individual home or commercial facility on the same property as it is generated (TP58 2004). An on-site wastewater system is required where connection to a municipal sewer is not available (Figure 1).

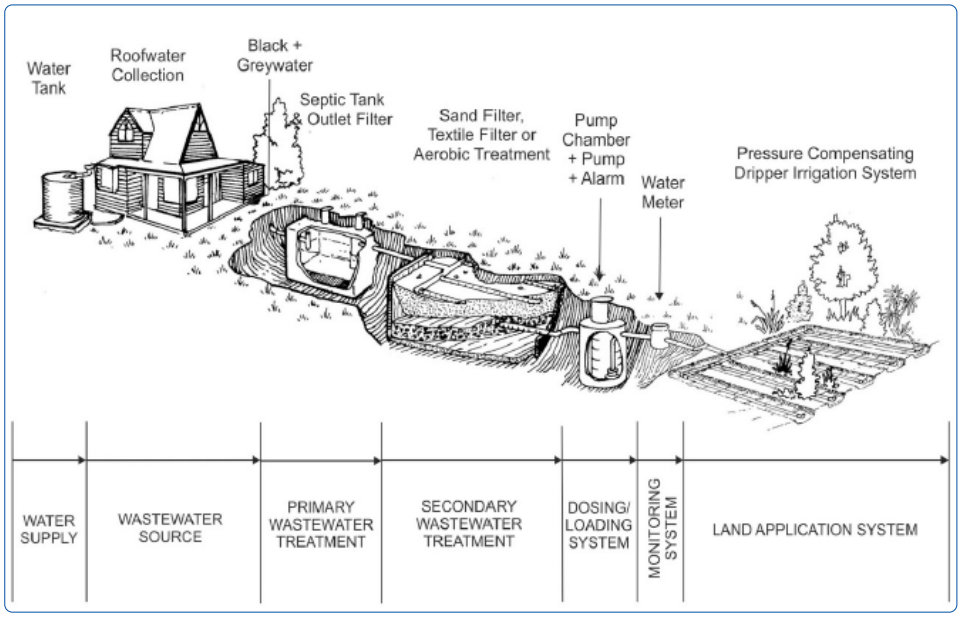


Figure 1. ***Illustration of an onsite wastewater system. (Source TP58 2004, Auckland Regional Council Design Manual)***

On-site wastewater treatment and land disposal systems provide wastewater management for approximately 21% of New Zealand's population.

Careful design, installation and ongoing regular maintenance are critical to minimise the risk of system failure, effluent breakout to the ground surface, and risk to public health and the environment.

Australia/New Zealand Standard 1546:2012 "*On-site domestic wastewater management*" provides design guidance for sizing, construction, risk management and maintenance for single dwelling on-site wastewater systems.

Introduction

In this topic we discuss:

- what is on-site wastewater (treated effluent) land disposal
- risk to public health and the environment from wastewater discharge
- land disposal methods
- loading methods to land disposal system
- pump head and flow rate
- distribution methods within trench or bed
- installation requirements
- system maintenance
- risk management
- health and safety.

The successful and long term performance of an on-site wastewater system is dependent upon conservative design, but critically dependent upon correct installation and ongoing maintenance post-construction.

Wastewater is defined as *untreated* and **effluent** is defined as *treated wastewater* discharged from any part of a treatment system.

Wastewater and what's in it

Domestic wastewater comprises:

- blackwater sourced from toilets (urine and faeces)
- greywater sourced from showers, laundry and taps.

Black and greywater both pose public health and environmental risks.

The two wastewater streams are typically combined for treatment and land disposal and described as 'All Waste'. An on-site wastewater treatment and land disposal system is designed for the daily hydraulic load (in litres per day) and treated and discharged to the environment (soil) to reduce:

- **pathogens** (viruses, bacteria, protozoa)
- **organic content** (BOD_5 – 5-Day Biochemical Oxygen Demand in mgO/l). Typical domestic wastewater is 370mgO/l.
- **Total Suspended Solids** (TSS in mg/l) – what remains when water has evaporated. Typical domestic wastewater is 340mg/l.
- **nutrients** – Total Nitrogen TN mgN/l. Typical domestic wastewater is 30–85mg/l.
- **nutrients** – Phosphorus measured as Total Phosphorus TP. Typical domestic wastewater is 9–12mg/l.

Pathogens pose a public health risk where there is a threat either of direct human contact, or from ingestion of contaminated water or shellfish.

BOD_5 is a measure of the amount of oxygen required to oxidise the organic content of the wastewater. Discharge to water of untreated wastewater results in depletion of oxygen from the water and suffocation of life within the water.

TSS can clog the land disposal system, resulting in effluent breakout to the surface.

Nutrients (Nitrogen): Nitrate poses a risk to drinking water and can contribute to eutrophication and depletion of oxygen in surface water by promoting vegetation growth.

Phosphate can also contribute to eutrophication and depletion of oxygen in surface water by promoting vegetation growth.

Treated effluent standard

Typical treated effluent standards produced by the different levels of treatment are summarised below.

Primary treated effluent (Septic Tank) is defined as effluent approximating:

- BOD_5 120–190mg/l
- TSS 30–85mg/l
- TN 30–65mg/l

Secondary treated effluent (Aerated Treatment Plant) is defined as effluent approximating:

- BOD_5 < 20mgO/l
- TSS < 30mg/l

Advanced secondary treatment (Recirculating Textile Filter) is defined as effluent approximating:

- BOD_5 < 15mgO/l
- TSS < 15mg/l

Tertiary treated effluent (disinfection and/or nutrient reduction)

Where there is a high risk of environmental impact to surface water, groundwater and public health, secondary or advanced secondary treated effluent can be disinfected by ultraviolet light (common in New Zealand) or chlorine (uncommon in New Zealand) to reduce the pathogen concentration typically to less than 200 CFU/100mls (Coliform Forming Units).

Nutrient reduction, for the reduction of total nitrogen and/or phosphate, can be a complex process requiring additional treatment circuits and may require dosing of alkalinity (calcium carbonate) and carbon for nitrate reduction and alum for phosphate reduction.

Treated effluent land disposal

Treated effluent sourced from an on-site wastewater treatment system is discharged to a land disposal system for final inground treatment by:

- soil microorganism predation (one organism kills and consumes another),
- physical filtering and chemical reactions between the soil,
- air and solid particles within the soil profile.

Soil texture (grain size; gravel, sand, silt, clay) and soil stricture (natural fractures within soil) control the rate at which effluent can move through the soil.

The choice of a land disposal method is based on:

- soil texture within the land disposal area
- land slope angle
- vegetation cover
- groundwater separation
- the treated effluent standard (primary, secondary, advanced secondary, tertiary).

The land disposal system design is based on:

- soil texture (sand, silt, clay)
- the peak design daily wastewater flow in litres per day
- the treated effluent standard (Primary, Secondary, Advanced Secondary, Tertiary).

Typical Land Disposal Methods are:

1. Standard soakage trenches (trench base must be excavated level along the contour).
2. Aerobic seepage beds/Evapotranspiration seepage beds (base must be excavated level along the contour). See Plates 1 and 2.
3. Mounds.
4. Pressure Compensating Dripper Irrigation (PCDI).

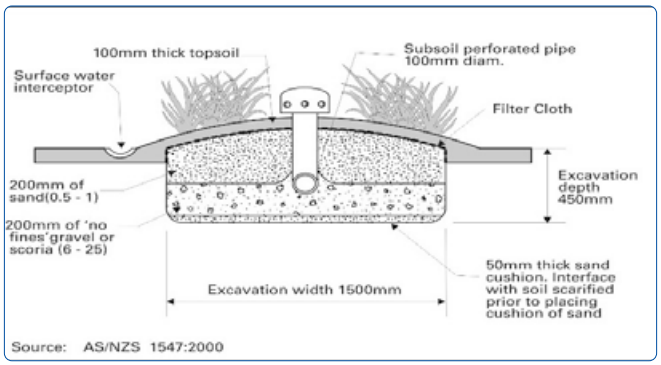


Plate 1. Aerobic Seepage Bed cross section.



Plate 2. Bed/trench base excavated level along the contour prior to covering over.

Primary treated effluent can be discharged to trenches and beds, but not to pressure compensating dripper irrigation (PCDI) line.

Secondary or better treated effluent can be discharged to PCDI lines (similar to garden irrigation pipe) along with trenches, beds and mounds. PCDI is the most versatile disposal method and can be surface located in gardens or bushed areas or buried within topsoil. PCDI lines include pressure compensation and should be installed along the contour. But pressure compensation means lines do not need to be exactly level, which significantly simplifies installation (Plate 3).



Plate 3. ***Pressure compensator and emitter within dripline (PCDI).***

AS/NZS1547:2012 Table 5.2 below details the loading rate, which is the depth of water applied per square metre per day based on the land disposal method (trench, bed, mound, PCDI), soil texture and soil structure (Table 1).

TABLE 5.2
SOIL CATEGORIES AND RECOMMENDED DESIGN IRRIGATION/LOADING RATES (DIR/DLR) FOR LAND-APPLICATION SYSTEMS

Soil Category	Soil texture	Structure	Indicative permeability (Ksat) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	>3.0	(see Note 1 of Table L1 for DLR values			(see Note 4 of Table L1)	5 (see Note 2 of Table M1	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	>3.0						4	24
			1.4–3.0	15	25	50				
3	Loams	High/moderate structured	1.5–3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5–1.5	10	15	30				16
4	Clay loams	High/moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
		Weakly structured	0.12–0.5	6	10	20	8			8
		Massive	0.06–0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12–0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see note 4 of Table M1)	8
		Moderately structured	0.06–0.12	(see Notes 2 and 3 of Table L1)	5	10	5 (see Notes 2, 3, and 5 of Table L1			(see Note to Table N1)
		Weakly structured or massive	<0.06			8				
6	Medium to heavy clays	Strongly structured	0.06–0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	<0.06							
		Weakly Structured or massive	<0.06							

Table 1. ***Design hydraulic loading rates for soil texture, soil structure and land disposal system. Source: AS/NZS1547:2012***

Loading methods

The long-term performance of any on-site land disposal system depends on soil texture, loading rate and disposal method – but also how the treated effluent is discharged to the land disposal system. This is commonly referred to as the loading method. The objective is to achieve even distribution (loading) across the entire infiltration surface for optimum inground treatment and avoid spot loading.

Loading methods include the following.

- **Uncontrolled loading**
  - Gravity/trickle discharge.
    This method is cheap, but results in poor distribution of effluent across the basal area of the trench or bed and can result in creeping failure (progressive failure) of the infiltration surface in response to high loading over a limited infiltration area and poor inground treatment of applied effluent.
- **On-demand loading**
  - Dose loading of a set volume for each dose.
  - Dose by siphon/flout, or
  - Dose by pump operated by float switch.
    Dosing a set volume by pumping, siphon or flout provides for better distribution over the entire basal area of a trench or bed. The drawback with on-demand dosing is that the discharge is concentrated around morning and evening when wastewater production peaks, with no or limited discharge over most of the day and night.
- **Controlled loading**
  - Timer-controlled pump.
    Timer-controlled dosing provides the best result, as effluent is stored and discharged as a set volume per dose, and the number of doses per day is spread over 24 hours. This significantly enhances in-ground treatment by maintaining aerobic conditions and allowing reaeration between doses as soil drains, minimising the risk of soil saturation (Plate 4).

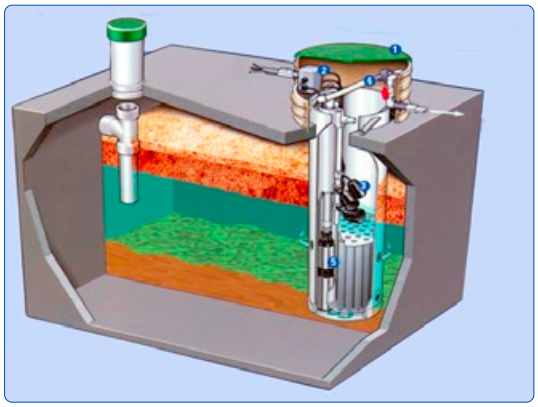


Plate 4. ***Septic tank including effluent outlet filter and pump operated by either float switch or timer controlled.***

Pump head and flow rate

A common problem with pumped discharge to PCDI land disposal systems is installation of a pump that cannot fully pressurise the entire network, resulting in uneven distribution and potentially early pump failure. Head losses occur within the system from friction losses associated with pipe fittings, pump chamber depth, elevation difference to the highest point of the land disposal system, and pipe length.

The choice of pump for a particular site is based on pump **Total Dynamic Head** in metres and pump **Flow Rate** in litres per second.

- **Total Dynamic Head** is the vertical distance in metres from pump inlet to the highest point of the PCDI lines and friction losses within pipes and fittings.
- **Flow Rate** is the amount of fluid per unit of time (seconds) moving through the pipeline in litres per second.

A basic head loss check calculation is presented in Table 2 below.

Component	Head Loss (m)	Comments
Emitter	12.0	Minimum pressure required
Lateral	0.0	Head loss insignificant
Submain	1.0	Using Netafim Ram 17 as a submain
Main	0.6	Using 25mm LDPE
Water Meter	0.9	15mm multijet turbine water meter
Disc Filter	5.0	Partially blocked filter
Tank Depth	2.0	
Elevation	**3.5**	**Uphill slope**
Total Design Head	**25.0m + 10% = 27.5m = 28m**	

NOTES:

Calculation based on Netafim Guidelines

- Distance from pump to PCDI field = 50m
- Tank depth 2.0m
- Elevation between treatment plant and irrigation field

Table 2. ***Example head loss calculation table***

Note that where pumping downslope an antisiphon valve is required to prevent siphoning of the dosing chamber.

To achieve even distribution and discharge of treated effluent within the entire irrigation field (PCDI), the discharge pump must have a sufficient flow rate at the calculated design dynamic pump head (detailed above). A calculation for the minimum **pump flow** required for a 500 linear metre PCDI irrigation field with a nominal emitter flow rate of 1.6 litres/hour/emitter with emitters at 0.5m centres is as follows (**Table 3**).

Example pump flow rate	
Total PCDI Length	500m
Nominal Dripper Flow Rate	1.6 litres/hour
Emitter Spacing	0.5m
So, Pump Flow Rate calculation	500m x 1.6/0.5
Pump Flow Rate Required	**1,600 litres/hour (0.44 litres/sec)**

NOTES:

Assumes 16mm diam (OD) dripper irrigation line (internal volume is approx. 0.158 litres/metre of irrigation line)

Table 3. ***Example pump flow rate calculation.***

Minimum pump dosing volume

In addition to the above, and to achieve even distribution of treated effluent across the entire PCDI irrigation network, a minimum volume is required per discharge dose. As a general guide, the minimum dosing volume should be in the order of five (5) times the volume of each PCDI irrigation sector, as outlined in **Table 4** below. (It is assumed the header/manifold line remains full.)

Estimated Minimum Pump Dosing Volume		
	Length of line	**Volume of line**
Dripper Irrigation Field Volume(1)	500m	500 x 0.158 = 79 litres
Minimum Dosing Volume	79 l x 5 = 395 litres/dose	

NOTES:

Assumes 16mm dia (OD) dripper irrigation line (internal volume is approx. 0.158 litres/linear metre of irrigation line)

Table 4. ***Dose volume calculation for PCDI.***

Based on the above calculation, the minimum dosing volume per discharge from the treated effluent tank should be **in the order of 395 litres, based on dose loading the full PCDI sector with each dose**.

Having calculated the head loss and flow rate required for even distribution, the pump performance curves provide the pump model required (in this case model PF1005CV) as shown in Table 5 below.

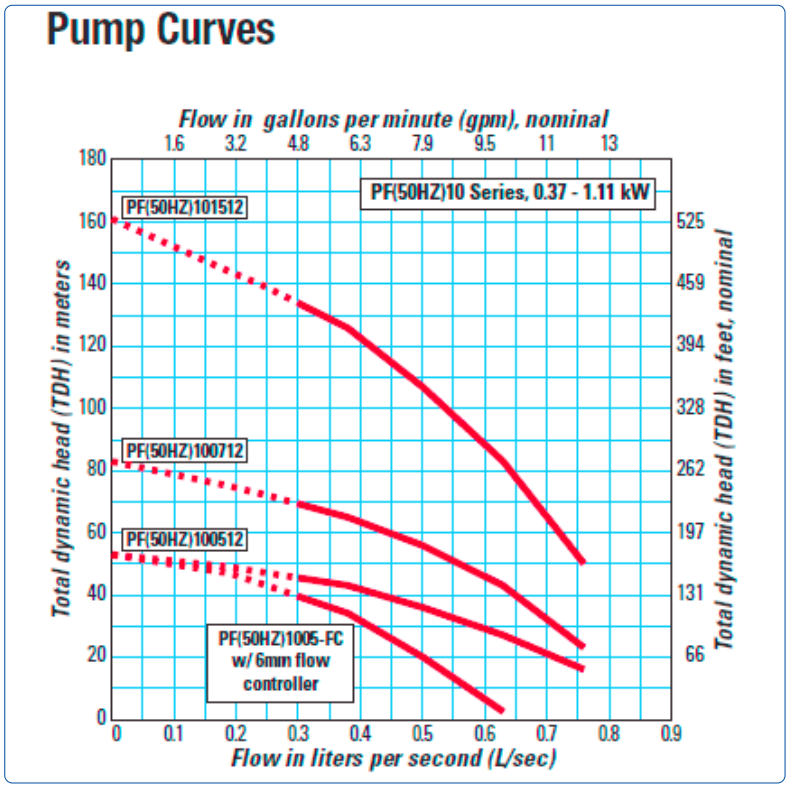


Table 5. ***Selecting the correct pump using pump performance curves.***

Distribution of effluent within a bed or trench land disposal system

Even distribution of treated effluent over the entire basal area of a trench or bed is critical for final inground treatment by minimising overloading of small areas and minimising the risk of soil saturation. Saturated flow through the soil profile flushes pathogens and nutrients to the groundwater table with minimal inground treatment and reduction. One method comprises slotted uPVC distribution line with slots facing upward, ensuring effluent gets to the far end of the trench or bed. Novaflo perforated drainage pipe is **entirely unsuited** for even distribution: the effluent discharges within the first one to two metres, and therefore should never be used.

Construction and post-construction risks

- All pipe work to be watertight (socketed and glued joints).
- Flexible inlet/outlet to all tanks.
- Ensure there are no cross connections (stormwater/sewer).
- Distribution box loading multiple beds/trenches must be watertight and the lid proud of ground level (Plate 5).
- Trenches and beds must be excavated level along the contour to avoid uneven loading, ponding and breakout.
- Distribution lines must provide even loading along the full length of trench or bed.
- Drainage aggregate must be clean (washed), otherwise fines will wash and coat the trench/bed infiltration surface and reduce infiltration, potentially resulting in trench failure.
- For new builds it is critical that construction materials and vehicles are not stored on the area designated for the land disposal system. Stockpiling materials and vehicle movements can compact the soil, reducing infiltration and potentially causing disposal system failure when installed.
- All electrical connections to be legal (Plate 6).
- Surface located PCDI must be pinned to the ground in a manner to avoiding kinking (Plate 7).
- Stormwater overland flow and runoff from pavement and driveways discharging onto land disposal area soils can cause soil saturation and contaminated runoff, and therefore must be diverted away from the land disposal area and wastewater treatment system (Plate 8).
- All lids are to be securely bolted down to prevent unauthorised access and a drowning risk.
- The wastewater treatment system tanks must be protected from vehicle traffic as the tanks are not designed for vehicle loads.



Plate 5. ***Distribution box splitting discharge from septic tank to 4 disposal beds by gravity flow.***



Plate 6. ***Example of illegal and dangerous outdoor electrical connection.***



Plate 7. ***Kinked PCDI***



Plate 8. ***Overland flow/surface water runoff risks***

Post-construction risks/maintenance

Homeowner education is critical for the longterm performance of an on-site wastewater system (Plates 9, 10 and 11). Post-construction risks and maintenance include the following.

- Homeowner to understand that use of strong bactericide chemical cleaners can have a very serious impact on treatment system bacteria required for the treatment process.
- Homeowner to understand the risk from excessive water use on the wastewater system, resulting in overloading and breakout.
- Homeowner must understand the importance of ongoing system maintenance by suitably trained and qualified providers.
- There must be no parking of vehicles, storage of materials or vehicles driving over wastewater treatment tanks and disposal area.
- Livestock to be excluded from the disposal area and WWTP by fencing.
- No disposal of paints, chemicals or hydrocarbons into the wastewater system.
- Septic tank to be regularly maintained and depth of solids/scum measured to determine pumped-out timing for removal offsite to an approved disposal site.



Plate 9. Trench distribution line full of solids.



Plate 10. Pump failure and overflow.

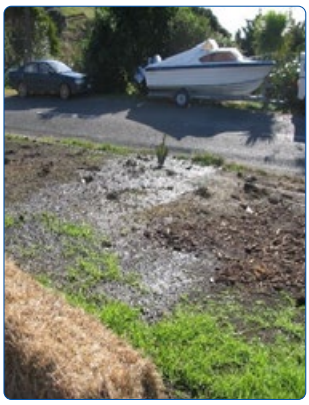


Plate 11. Disposal system breakout.

- Clean outlet filters.
- Check float switch operation.
- Check alarm operation.
- Check pressure at the highest point of the PCDI field (min 1.2ba, 120kPa).
- PCDI field not loading evenly or only part of field working due to system head loss exceeding pump capacity.
- Uneven loading due to PCDI line damage/kinks.
- Flush PCDI lines.
- Manual flush valves allow higher flushing velocities and are superior to automatic flush valves.
- Longterm performance is greatly enhanced where the homeowner has a maintenance contract with an installer or maintenance provider to regularly check system operation and undertake maintenance (at least once per year).

Consents

All on site systems require **building consent** from the territorial authority before any construction starts. On-site systems located on smaller sites or sites with large houses may also require a **discharge consent** from the regional council or unitary authority in addition to a building consent.

As-built plans

Upon completion of construction of an on-site wastewater system it is critical that as-built plans are prepared; these will be required for application for code of compliance. Plan should:

- be at a scale
- accurately show the location of all components of the on-site wastewater collection, treatment and land disposal system relative to property boundaries and structures with measured dimensions
- show all valves
- state dimensions of disposal system
- show flush taps (Plate 12).

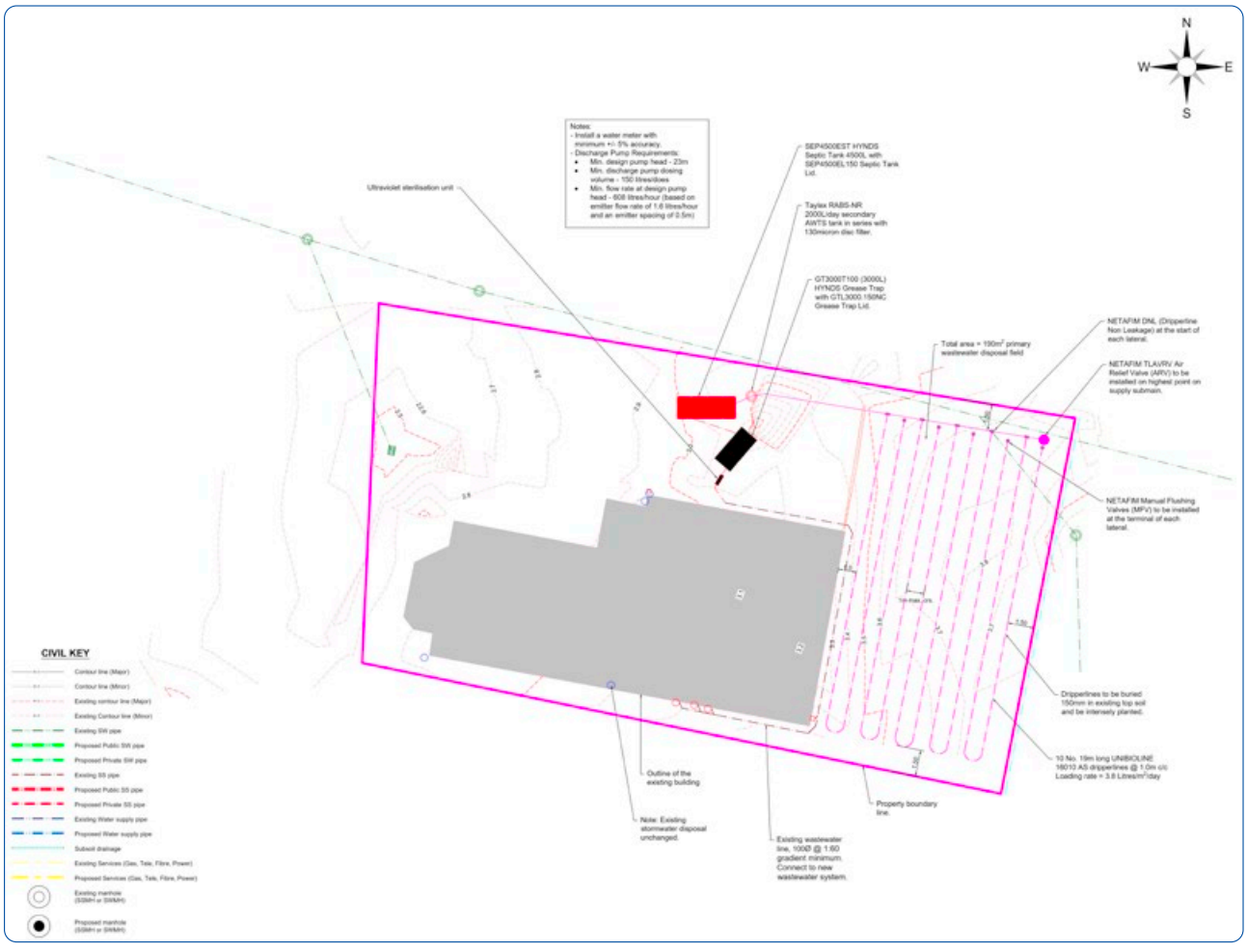


Plate 12. ***Example of as-built plan.***

Summary

An on-site wastewater system is designed to treat and discharge wastewater produced on the property within the property boundaries in such a manner that public health and environment are protected.

The successful long-term operation of any on-site wastewater system is dependent on:

- The design
- The installation
- Ongoing regular maintenance
- Homeowner acceptance of responsibility (buy-in)

The correct installation of any on-site system is therefore critical if the system is to operate effectively to protect public health and the environment.

Protecting the public, your business, your trade



Health and safety considerations are paramount, particularly during the installation and maintenance of wastewater systems. Professionals working on these systems should follow safety protocols to avoid exposure to harmful bacteria or hazardous materials, and homeowners should be educated on how to maintain the system to prevent health risks from untreated wastewater.

04

Topic 04:
Ensuring reliability and efficiency in pump systems

Ensuring pump systems are installed, serviced, and maintained to the highest standards prevents costly breakdowns, ensures long-term performance, and upholds the safety and efficiency of essential infrastructure.

Written by:

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Introduction

Pumps and pumping are becoming more common throughout New Zealand. No longer are pumps predominantly found just in rural areas, they come in all shapes and sizes for various purposes all over the country. Today pumps are used in numerous industries and applications, including:

- Urban water supply
- Rural water supply
- Sewer systems
- Stormwater systems
- Irrigation systems
- Industrial applications
- Air-conditioning systems
- Refrigeration



Figure 1. ***Different Pump examples (Grundfos Pumps).***

Interestingly, approximately 20% of energy consumption worldwide is used to run pumps.

Now that's a lot of pumps!

In this topic we discuss:

- First principle of pumping
- Common pumps
- Pump type considerations:
  - Sewer and stormwater pumps
  - Water services pumps
  - Hot water circulation pumps
- Installation faults and trouble shooting

First principle of pumping

As with any mechanical components installed in a system, designers and installers should be looking for ways to either avoid or minimise the pumping on a project, especially as mechanical devices such as pumps are:

- generally high in capital cost
- prone to failure
- have annual running costs associated with, regular periodic maintenance, energy and replacement costs.

So, you can argue that the first principle of pumping, is to avoid it where possible!

However, as we all know this is almost impossible to achieve, so we generally have to introduce a pump into our plumbing, drainage, and yes, even our gasfitting systems!

Most common pumps

Centrifugal pumps comprise the biggest family of pumps and by far the most commonly used within our plumbing and drainlaying industries. These will have been covered extensively through your apprenticeship training, so we will not spend time outlining the physical operating principles of these pumps.

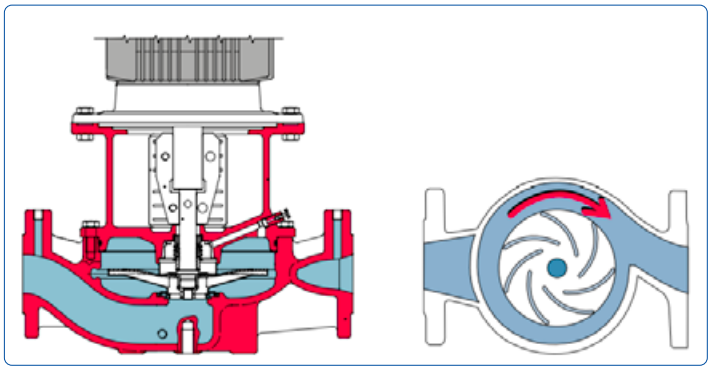


Figure 2. ***Centrifugal Pump configurations (Grundfos Pumps).***

Centrifugal pumps can be categorised in different three groups:

1. radial flow pumps
2. mixed flow pumps
3. axial flow pumps.

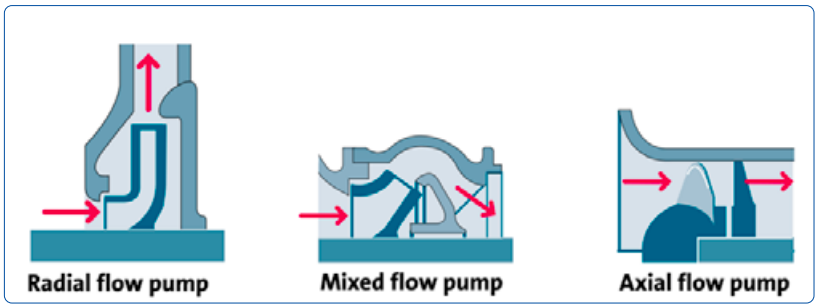


Figure 3. ***Centrifugal Pump configurations (Grundfos Pumps).***

Radial flow pumps and mixed flow pumps are the most common types used. We will explore these a little further for this CPD topic.

The table below provides a good visual overview of the capacities of the different types of pumps. Note that radial flow pumps can deliver greater head, while axial flow pumps deliver lower head but greater delivery volumes.

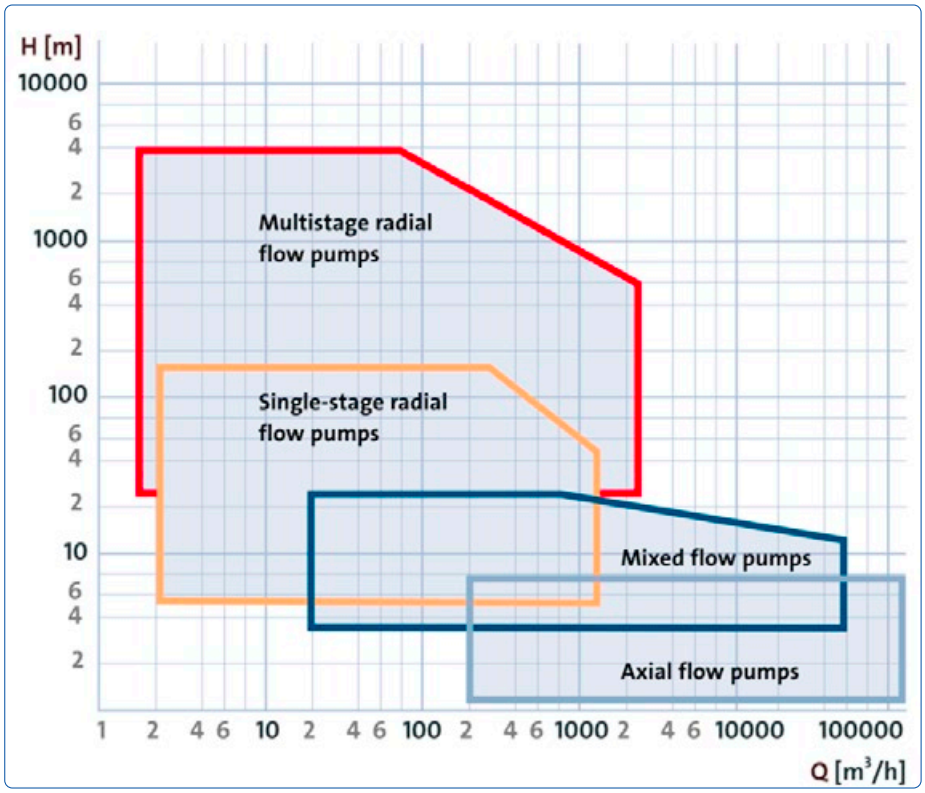


Figure 4. ***Example of different pump performances (Grundfos Pumps).***

Correct pump selection is very important – the incorrect pump can lead not only to customer complaints but also to premature failure of the pump and the overall plumbing/drainage system.

Looking at the table above, remember also that pumped pressure can be measured in two ways.

Static pressure	The pressure available when there is no water flowing. *This pressure does not indicate there will be enough water flow for the system requirements.*
Dynamic pressure	The pressure available when the water is flowing at the required flow rate. *This pressure will indicate if you have enough pressure and water flow combined for the system requirements.*

Pump Type considerations

First, let's have a look at some of the typical considerations which need to be factored in when designing, selecting or installing a pump in various applications. (These are not exhaustive.)

Consideration must be given not only to the pump in isolation, but to the entire system in order to achieve a balanced system. With self-certification potentially on the horizon this becomes even more important; the responsibility may ultimately fall upon the plumber and/or drainlayer when things go wrong.

Sewer and stormwater pumps

These pumps are usually located within a wet well type of chamber. Because the pump is submerged in the liquid, it is called a "submersible" pump.



Figure 5. ***Submersible pump examples.***

Submersible pumps (stormwater/sub-soil pumps and sewer)	
Item	**Considerations**
Effluent being pumped, stormwater, subsoil, sewer etc	This will help in the correct pump selection; the incorrect pump may have been installed.
Quality of water effluent required to be pumped.	What is the viscosity of the liquid to be pumped?
Is it expected that the effluent will contain large particles/matter?	If yes, is a submersible pump the right selection?
Size of particles being pumped to determine use of	Determines the type of pump, i.e. grinder
Volume of water to be pumped	Helps determine the size of the pump and the rising main size.
Location of pump	Location helps determine many factors including the head required to deliver the liquid to its outfall.
Location of connection to gravity drainage system	Understanding the final outfall and heights is crucial to help the best pump performance.
Power source	Is the pump single – or 3-phase? Is the power available on site?
Duty of pump	Sometimes the wrong pump selection will cause it to work outside its duty points, causing premature failure of the pump.
Size of pump well determined by inflow vs outflow (pump volume)	Understanding the wet well size helps determine the amount of start/stop required of the pump. Many utilities restrict the volume of liquid being discharged into their network, so a large wet well to hold the liquid longer with a slower pump-out may be required. One common pitfall is that the wet well is too small.
Position of inflow and height above the pump	Location of the inflow in relation to the siting of the pump is important, do not directly discharge over the pump.
Total head – resistance water is being pumped against:	What is the developed length of the rising main? How much height difference between the pump and final outfall position?
Height of water in pump well	Determines the alarms, start/stop settings.
Pipe material	Material selection and installation can have either a positive or negative impact on the pump performance.
Velocity of water in pipe	Pipe size and selection will help determine the velocity of the fluid in the rising main. If the velocity is too low then the pipe will struggle to self-cleanse; too high, and the pipe will start to exhibit deterioration, noise and may damage the outfall.
Area of external catchments (m^2)	For stormwater pumps, understanding the catchment in l/s that is discharging to the pump – has the catchment increased with additions, etc?

Water services pumps

Water service pumps can be either submersible or located above ground.



Figure 6. ***Water pump examples.***

Considerations for a Water Services pump (not an exhaustive list)

Water services pumps	
Item	**Considerations**
Location of pump and available space for ease of maintenance	Whether installing or designing, correct location for maintenance is essential.
Location and height of most disadvantaged outlet	Understand the location of most disadvantaged outlet, in height.
Flow required (calculated)	Understand the total flow required at peak times – this may require you to calculate the peak simultaneous demand of the water system to check against what has already been installed.
Type of building and estimated peak demands	Different buildings have different demands

Continued ...

Water services pumps	
Item	**Considerations**
Special applications/water requirements	What is the fluid being delivered? Type, temperature and viscosity are some of the characteristics to consider.
Total head	What is the static and working head? This information is required to help determine the correct pump and duty point.
Power source	Single phase or three-phase? Is the power available?
Pressure required at the outlet	What is the required pressure at the outlet?
Length of pipe work and number of fittings, valves etc	This helps understand the frictional losses in the system.
Pipe material	Does the pipe material selection have a negative impact on longevity?
Velocity + size of water pipe	Pipe size too small? Too large? If too small, the velocity may impact on pipe longevity (and warranty).
Noise	Too much velocity creates noise in the system. If the pump is located under a habitable space (e.g. apartment building) additional acoustic treatment of the pump space may be required.

Hot water circulation pumps

A hot water circulator pump is found on a hot water flow and return system, typically located on the return line at the hot water cylinder plant, and returns the circulating hot water for reheating.



Figure 7. ***Circulation pump examples.***

Considerations for a circulator pump (not an exhaustive list)

Hot water circulator pumps	
Item	**Considerations**
Determine flow requirement	How much water does the pump need to pass in l/s?
Lineal length of pipework at differing sizes in flow and return pipework system	This is the developed length, aids in the heat loss calculations feeding into the pump duty.
Type of hot water insulation and heat emission in (w/m)	Customer may be complaining of high electricity bills –selection and installation of the correct insulation makes a huge difference to heat losses in the system.
Delta t	Desired temperature difference between flow temperature at outlet of hot water plant and return temperature at hot water plant. (AS/NZS 3500.4, mentions outgoing at 60°C with a return no less that 55°C, that is a delta t of 5°C)
Total head	How much head is required to overcome resistance to allow the water to circulate?
Head loss in system including pipe and fittings for calculated flow.	Tabulate all the fittings etc. to calculate the head losses, which helps determine the correct circulating pump size.
Power source	Single phase or three-phase? Is the power available?
Circulating velocity	You will need to understand and calculate the pipe system to work out the velocities. If you set the pump flow too high, especially when the hot water is circulating more than 60°, then the velocity will be excessive – creating conditions for premature failure of the pipework.
Pipe material	Check max. velocity and max. temperature requirements, calculate the pipe system to double check.

Installation faults and trouble shooting

Most common pump selection and installation faults

Things do go wrong, not every single job will be perfect, however understanding the system and applying correct methodology during the selection and installation of a pump goes a long way to preventing call backs. Some common pitfalls are listed below:

- pumps incorrectly sized
- allowance not made for various duties
- poor pump suction conditions (NPSH)
- poor piping setup, for example bend positions
- make allowance of straight length of pipe on pump inlets and outlets of at least 4 x the pipe diameter after the installation of a bend
- not enough space provided for the installation of pump set
- single phase used where three-phase pumps would be more suitable
- missing vibration dampers.

Troubleshooting

Troubleshooting involves a process of elimination carried out to resolve pumping and/or system operation problems.

On thorough investigation and reporting, it is likely that a pumping problem will relate to:

- incorrect pump sizing
- various duties of the pump not being allowed for
- poor suction conditions
- poor piping setup
- not enough room provided for installation.

Some examples of very common unintended pump wear conditions

Cavitation

Cavitation can affect all pumps.

When a pump cavitates we will see a drop in performance and efficiency, to the point of complete collapse and pump failure.

Cavitation comes from vapour bubbles collapsing inside a liquid, sending shockwaves throughout the liquid. The vapour bubbles are created when there is a local pressure drop below the vapour pressure. This can happen inside the pump or in the pipes and valves containing the liquid. In fact, any obstruction that can create a local low-pressure zone can lead to the creation of vapour bubbles.

The collapse of a vapour bubble is like a small, rapid explosion where a great deal of energy is released locally, creating damage. The implosion of the bubble leads to surface erosion when the shockwaves hit the impeller blades or the pump housing. This results in tremendous noise and noticeable vibrations. These common symptoms of cavitation are often some of the first signs of an issue.

In a cast iron pump, this sounds like GAP-7 is going through the pump – *it gets very noisy*!

Another classic sign of cavitation is that the pump flow will start to decrease, when it should increase.



Figure 8. ***Examples of cavitation damage.***

Cavitation		
Common Causes of Cavitation in Pumps	**The Impact of Cavitation on Pumps**	**How to Prevent Cavitation**
Cavitation can be triggered by several factors, including: • Low Suction Pressure: Insufficient fluid supply or a high elevation can cause pressure to drop below the vapour pressure. • High Flow Rates: Excessive flow increases velocity and decreases pressure in the pump, making cavitation more likely. • High Fluid Temperatures: Warmer liquids have lower vapour pressures, increasing the risk of vaporisation. • Incorrect Pump Selection: Using a pump outside its optimal operating range can lead to pressure imbalances. • System Blockages: Obstructions in the suction line or impeller can create pressure drops that lead to cavitation.	Cavitation doesn't just make pumps noisy—it can cause serious damage, including: • Erosion: The implosion of vapour bubbles generates high-pressure shockwaves that erode pump components like impellers and casings. • Vibration and Noise: Cavitation often produces a distinctive gravel-like noise and excessive vibration. • Performance Loss: Reduced flow rates, head pressure, and efficiency are common symptoms. • Shortened Lifespan: Over time, the repetitive stress from cavitation can significantly reduce the lifespan of your pump.	Increase NPSH (Net Positive Suction Head): • Ensure the pump has adequate suction pressure by: ¤ Placing the pump closer to the fluid source. ¤ Reducing the length or increase the diameter of suction piping. • Minimising bends and obstructions in the suction line. • Control Operating Conditions: • Operate pumps within their design range to avoid pressure extremes. • Monitor Fluid Temperature: • Lowering fluid temperature can help prevent vaporisation. • Eliminate Blockages: • Regularly inspect and clean suction lines and impellers. • Choose the Right Equipment: • Use anti-cavitation impellers or consider pumps with higher NPSH ratings for demanding applications

Pump Snore

What is pump snore?

Pump Snore is a condition that occurs when water levels fluctuate and the pump begins drawing in air as well as the liquid, causing a snoring sound. Some dewatering pumps are capable of running dry for short periods, but extended snoring conditions will cause damage and increase maintenance costs.

If the submersible pump is designed to pump 10 litres a second, but the water comes in at only 8 litres a second, it will pump air for part of the time.

The problem is that if it doesn't have enough water, it won't have enough fluid to keep the motor cool. In circumstances like this your pump will overheat, and breakdowns can occur.

Most people think that when it comes to buying equipment bigger is always better! That is simply not the case when it comes to pumps. You don't want a large pump that is far too big for the job you need it to do. For a start, it's expensive. More importantly, it can also end up costing you money in breakdowns.

The picture below provides an in-house testing example of a snore formation.

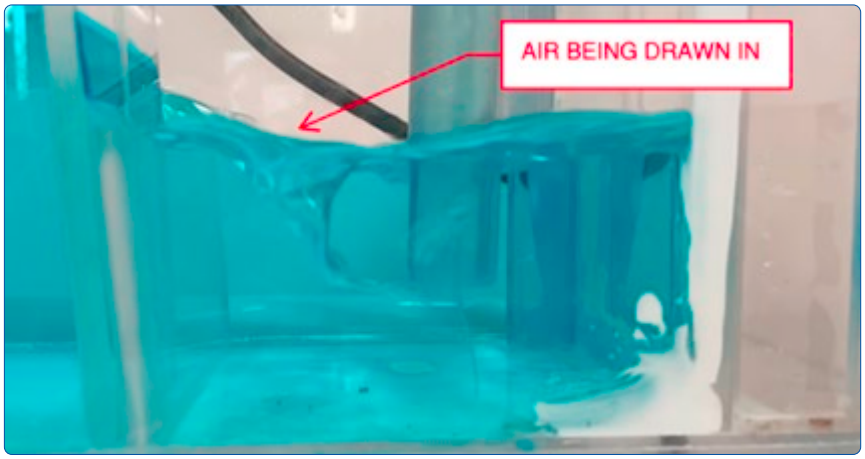


Figure 9. ***Air being drawn in.***

Noise Transmission – Vibration Dampers

To prevent the transmission of vibrations to buildings, isolate the pump foundation from the building structure by means of vibration dampeners. The correct selection of vibration damper is critical, as the incorrect selection can end up exacerbating the vibration levels.

Pump dependant, it is important to note especially with large pumps that if you are installing vibration dampeners you should always fit expansion joints on the pump suction and discharge, to prevent undue stresses on those connection points.

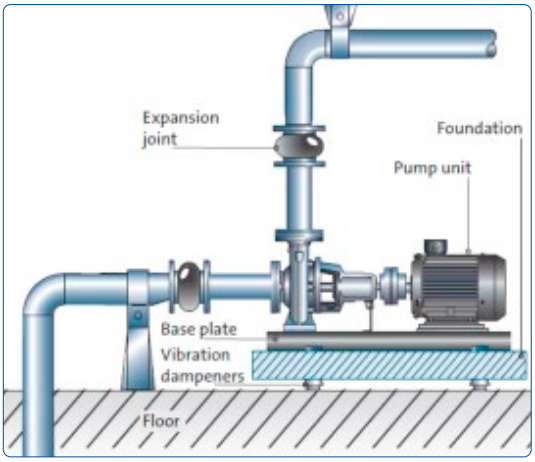


Figure 10.. ***Vibration dampeners – Grundfos***

Keep a watchful eye out

Although not directly related entirely to the pump, one common oversight can cause unintended consequences down the track.

Buildings services in the modern era have a strong focus on energy savings and sustainability. Typically in New Zealand mechanical engineers also complete the hydraulic services design, and if a booster pump set forms part of that design, engineers will look to try and maximise the incoming water pressure (street mains) to minimise the pump output, thus reducing energy costs and the carbon footprint.

The downside of this is that the pressure-reducing valve is often omitted, leaving the plumbing system exposed to daily cyclic street mains pressure. Simply put, during the day when the water consumption is high within the street mains the pressure remains within a acceptable levels; but during late night and early morning, when the usage is low, then the pressure will rise. With the plumbing system unprotected from the constant changes in pressure, pump fittings, pipework and system components can fail prematurely.

Always ask the question of the system designer if this situation ever presents itself.

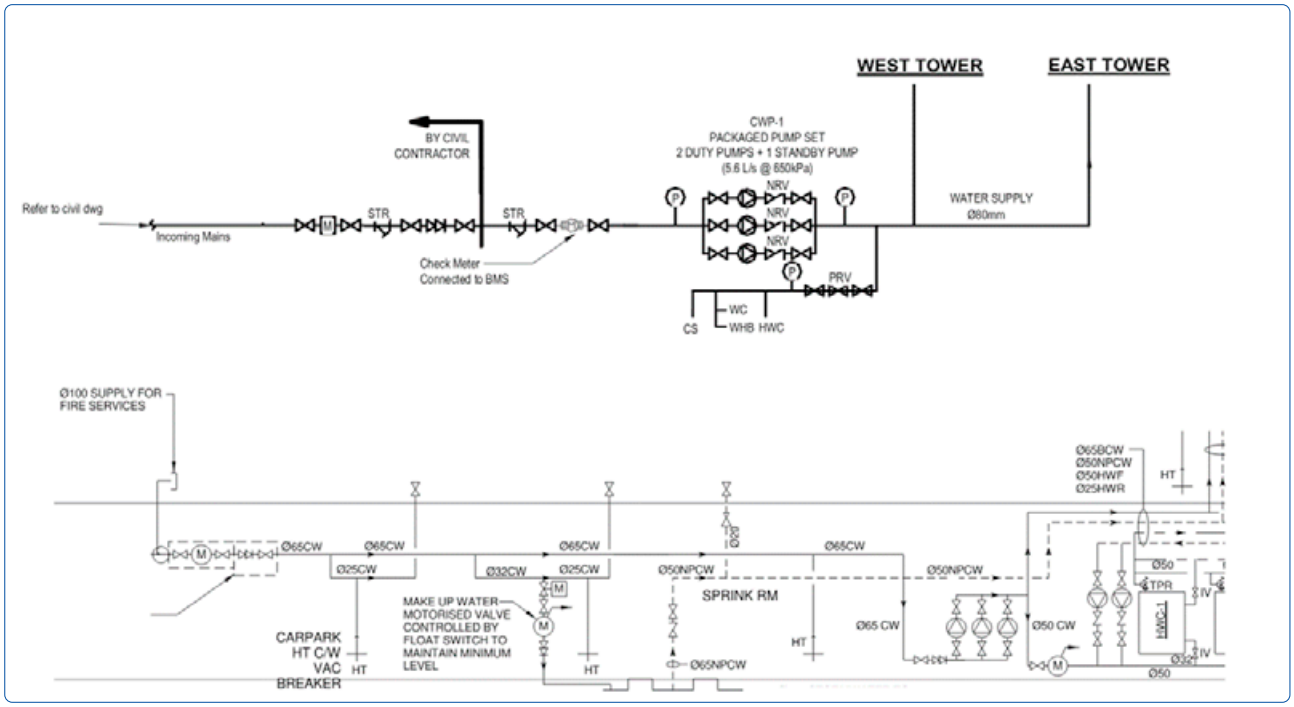


Figure 11. ***Examples of real designs, no PRV's.***

Summary

Treat a pumped system as a full system, not just a collection of small pieces. Understand the system when doing maintenance, installation or design works.

Small changes to one section of the system could have detrimental effects on another part of the system.

Pumps come in all shapes and sizes; correct selection, installation and ongoing maintenance are key to a well performing pumped system.

If in doubt, always ask.



Figure 12. ***Example of a clogged sewer pump (Watercare).***

Protecting the public, your business, your trade

Protecting the future of the plumbing industry goes hand in hand with ensuring the safety and reliability of vital systems like pumps. Properly trained and skilled professionals are essential in maintaining these systems, which play a crucial role in everything from water distribution to waste management. By investing in the right training and expertise, we ensure the pump systems are installed, serviced, and maintained to the highest standards, preventing costly breakdowns and ensuring long-term performance. This commitment not only protects your business but also upholds the safety and efficiency of essential infrastructure for years to come.

05

Topic 05:
Protecting drinking water with effective backflow prevention

This topic provides insights to help improve compliance with backflow prevention.

Written by:

Sam Wood
Plumbing and Gasfitting Consultant
S J Wood Consulting

Introduction

Water is one of our most vital resources, essential for life. But only 0.6% of the world's water is potable. Protecting the safety of this precious potable water is a responsibility shared by all plumbers. Backflow prevention is a critical part of this effort, ensuring that contaminated water cannot flow backward into potable water systems, safeguarding public health, and ensuring compliance with regulations.

In this topic we explore the essentials of backflow prevention, including common design, installation, and maintenance challenges. We'll also cover recent updates to G12 – Water supplies, highlighting new provisions for backflow prevention devices. By understanding these principles, you can better protect your clients, your business, and yourself.

This topic will:

- Identify common backflow areas for improvement, including design and installation
- Explain key backflow provisions updated in G12 – *Water supplies*
- Provide insights on compliance schedules and the Building Warrant of Fitness (BWoF) process.





Figures 1 & 2. ***Containment backflow protection.***

Introduction to design: Laying the foundations for effective backflow prevention

The design of systems containing backflow prevention is critical to ensuring the safety of potable water supplies, particularly in more complex buildings where there is a heightened risk of contamination. Effective design goes beyond selecting devices – it requires careful consideration of many elements, including standards, hazard levels, material selection, location, pressure and flow requirements and practical installation requirements.

Design

The Board has received data about the most common Requests for Information (RFIs) when applying for Building Consent regarding backflow in Complexity Level 2 and 3 buildings (buildings which are more likely to require the installation of backflow protection devices). This data was from 18 major Building Consent Authorities (BCAs) in New Zealand. The most common information which the designer had failed to provide included:

- Datasheets for the different backflow prevention devices being proposed
- Identification of the installation standards requiring to be followed
- Maintenance and inspection requirements.

Some key information was also commonly missed:

- specifying seismic restraints where needed; and
- including volume calculations.

If you are designing the plumbing installation these are important things to remember, as they will save time, which ultimately saves costs.

Specify the correct device

The first step to design is specifying the correct device for both:

- **the hazard level**
- **the type of backflow event** (back-siphonage or back-pressure).

When planning high hazard backflow prevention it is common to assume that a Reduced Pressure Zone Device (RPZD must always be installed. RPZDs are good, but if not required they may not be the most cost-effective solution. And RPZD is not the only way to protect from high-hazard situations.

When protecting from high hazard back-pressure and back-siphonage, either of the following is suitable:

- RPZD
- Air gap (N.B. the air gap is not suitable in a toxic environment)

When the backflow prevention device only needs to protect from back-siphonage then the following devices are suitable for high-hazard situations:

- Pressure Vacuum Breaker (PVB)
- Atmospheric Vacuum Breaker (AVB)

Table 2: Selection of Backflow Protection
Paragraphs 3.4.5 and 3.7.2

Type of backflow protection	CROSS CONNECTION HAZARD					
	HIGH		MEDIUM		LOW	
	back-pressure	back-siphonage	back-pressure	back-siphonage	back-pressure	back-siphonage
Air gap (see **Note 1**)	√	√	√	√	√	√
Reduced pressure zone device	√	√	√	√	√	√
Double *check valve* assembly (see **Note 2**)			√	√	√	√
Pressure type vacuum breaker (see **Note 3**)		√		√		√
Atmospheric type vacuum breaker		√		√		√
Hose connection vacuum breaker (see **Note 4**)						√

Notes:

1. *Air gaps* must not be instaled in a *toxic environment.*
2. Double *check valves* can be installed in a medium and low hazard *toxic environment.*
3. Pressure type vacuum breakers are designed to vent at 7 kPa or less. However, they require a significantly higher pressure to reseat and must be installed only in systems which provide pressures suffcient to ensure full closing of the valve.
4. Hose connection vacuum breakers are designed to be under pressure only when water is being drawn from the water supply system and for short, intermittent periods of time.

Figure 3. ***Selection of Backflow Protection – source image G12/AS1.***

Device location

Then the design must consider the location of the device. Things to consider are:

- Is a drain required? And is it sufficiently sized?
- Will the device discharge water – and risk damaging property if located inside a building in a backflow event?
- What clearances are required around the device?
- Is the device location accessible for maintenance?
- What machines, valveware upstream and downstream could impact the performance of the device?
- Is there sufficient water pressure for the valve to function correctly?

Installation

When it comes to installing backflow prevention devices there are several different considerations.

Drain requirements

A recent update to G12 – *Water supplies* requires an RPZD to have adequate drainage when installed indoors. Sizing a drain for the discharge from an RPZD is complicated and you need to consider such things as the drain gradient, the flow rate of water, and the final point of discharge.

An old rule of thumb that has been taught since the early introduction of these valves is that the size of the drain should be around four times the diameter of the water inlet to the device. This gets complicated and impractical when installing an RPZD with inlets larger than 25mm, as this would require extremely large diameter drains which in reality are rarely used at the maximum flow rate.

To avoid issues related to sizing the drain, best practice is to install the RPZD outdoors. If it must be installed indoors, refer to the manufacturer's technical literature on relief discharge rates and recommended drain sizes.

Water discharge

Devices such as hose connection vacuum breakers will discharge water when a backflow event occurs. This means they will not be suitable indoors unless in an area that is protected from the discharge of water (e.g., a non-permeable floor which has floor waste for accidental discharge).

Where possible, devices which discharge water should be installed outdoors to prevent property damage.

Heights and clearances

Heights and clearances will depend on the device.

Reduced Pressure Zone Device (RPZD) – shall be located in an area not subject to flooding and at least **300mm above the surrounding surface**.

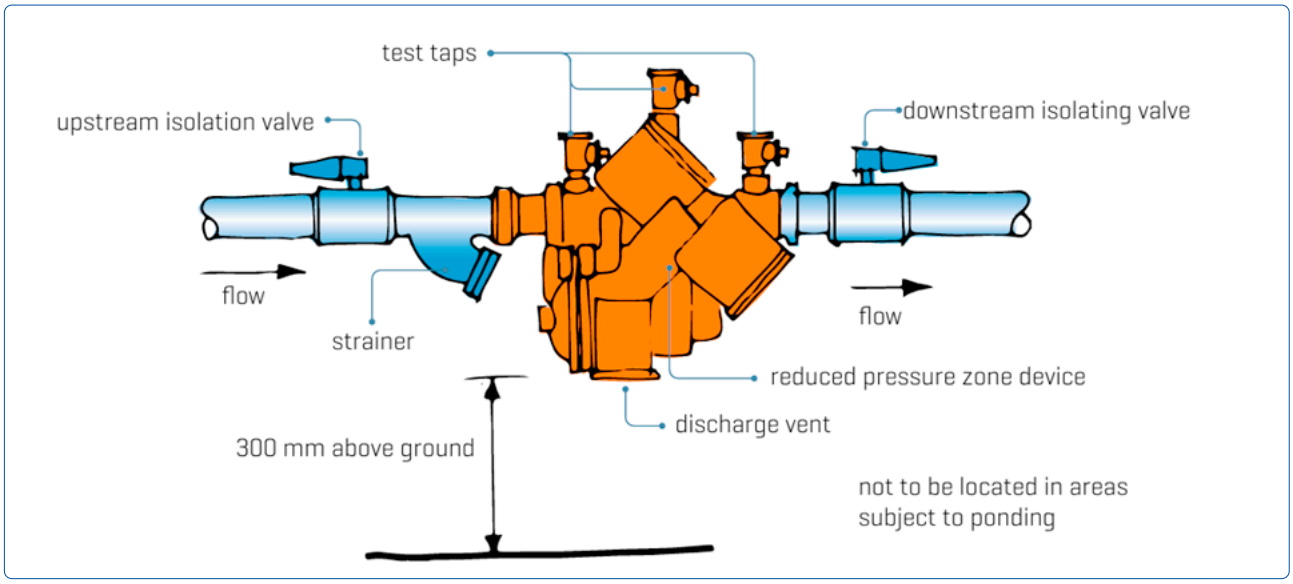


Figure 4. ***Reduced Pressure Zone Device – source image from the BRANZ Plumbing and Drainage Guide.***

Atmospheric Vacuum Breaker (AVB) – shall be located no less than **150mm above the highest outlet**, measured from the lowest part of the valve body.

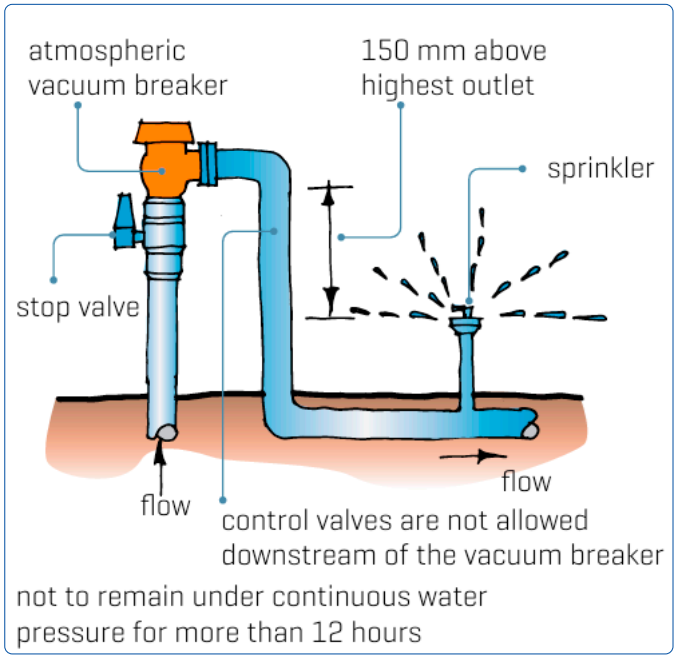


Figure 5. ***Atmospheric Vacuum Breaker – source image from the BRANZ Plumbing and Drainage Guide.***

Pressure Vacuum Breaker (PVB) – shall be located no less than **300mm above the highest outlet**, measured from the lowest part of the valve body.

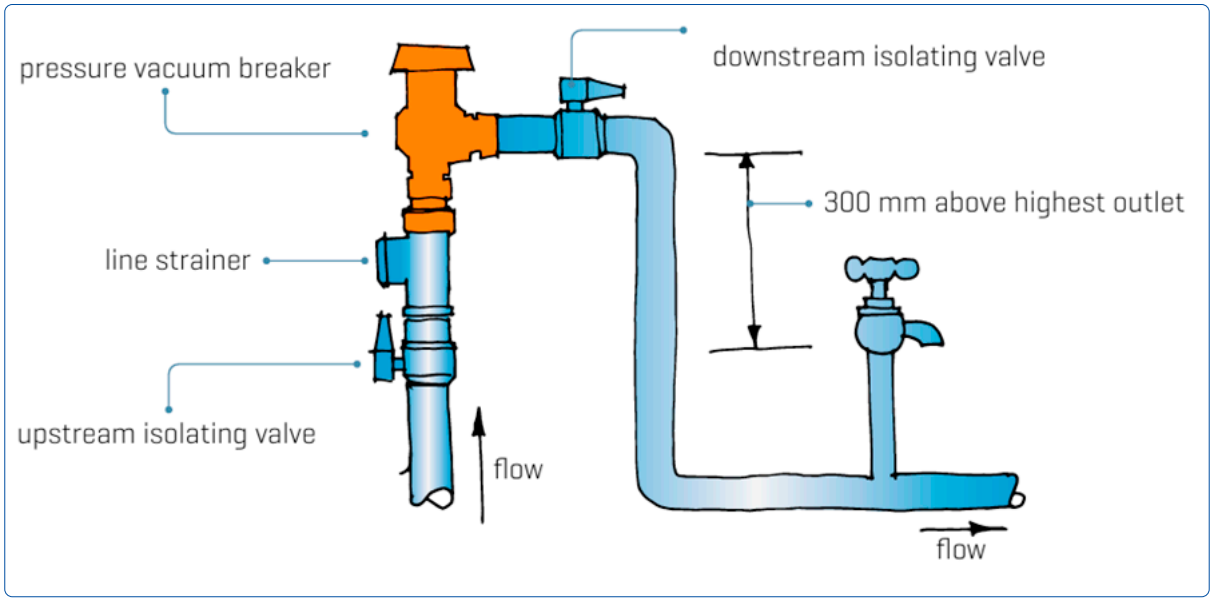


Figure 6. ***Pressure Vacuum Breaker – source image from the BRANZ Plumbing and Drainage Guide.***

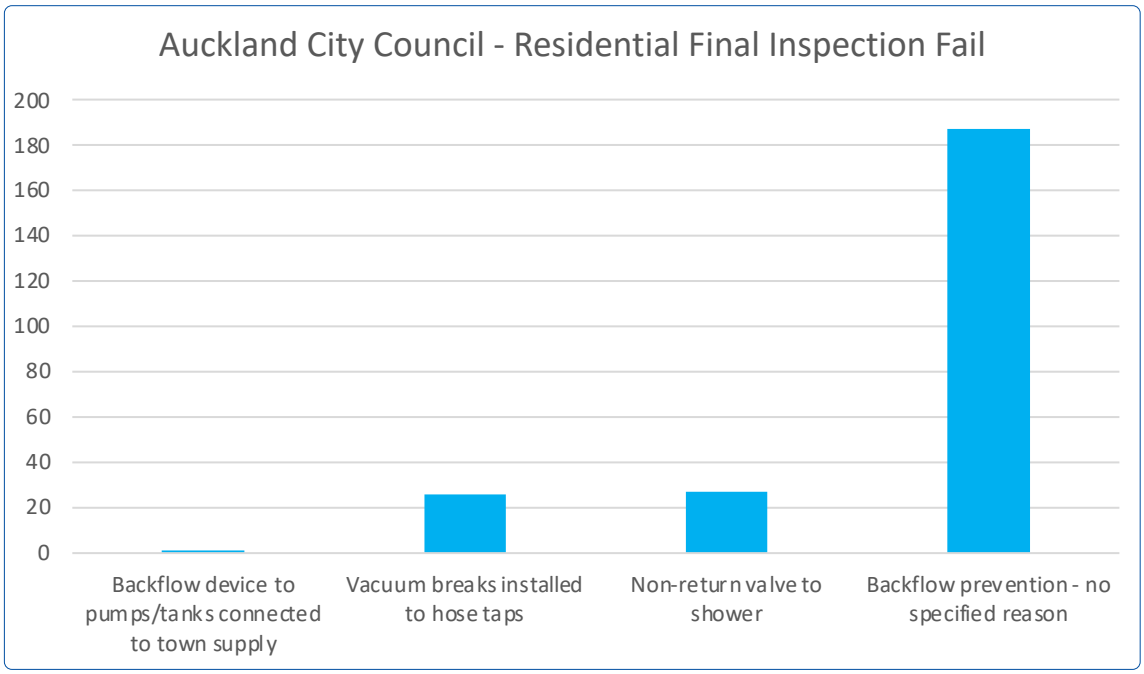
Accessible for maintenance

G12/AS1 clause 3.7.1 requires Backflow Prevention devices to be accessible for maintenance and testing. An update to G12 – *Water supplies* provides an informative note on what constitutes an accessible position. It says:

> "An accessible position excludes those which necessitate the need to maintain or test a device from a ladder or scaffolding or enter into a confined space. Where a device is fitted with test taps, an accessible position includes sufficient clearance for the performance of the applicable test procedures."

Common inspection fails from the Auckland City Council

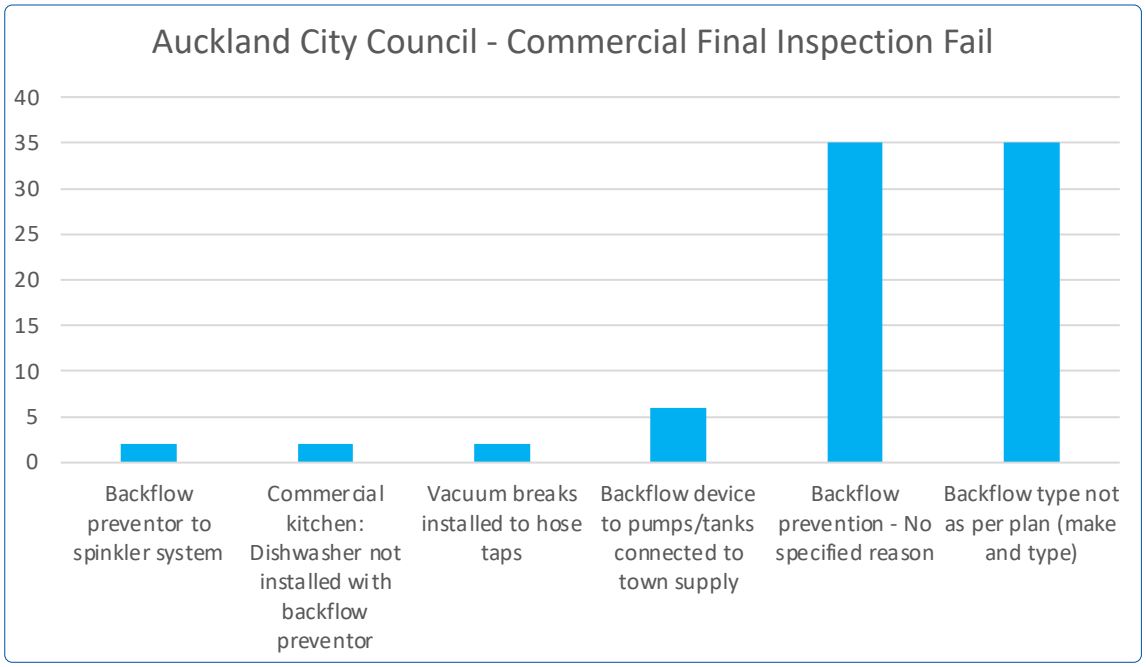
The Board reached out to the Auckland City Council to get data around inspection failure rates related to backflow protection. While this data does not represent all New Zealand, it does give some insight into the types of reasons final inspections may fail where they relate to backflow prevention.



Key points:

- Inspection failures related **to backflow prevention comprised 3.3% of failed residential final inspections.**
- There were **26 failures related to vacuum breaks on hose taps**. As of November 2024, G12 – *Water supplies* amendments added hose taps to the list of low-hazard examples, requiring all hose taps connected to the potable water supply to have suitable backflow protection such as a hose connection vacuum breaker.
- There were **27 failures related to non-return valves to a shower**. This includes things like slide showers over baths where the shower rose can be submerged.

- There were **187 other failures related to backflow prevention**. While no specified reason was given for these failures, Auckland City Council staff advised that this number included things like plumbed coffee machines, bidet toilet seats, and spray hoses next to toilets.



Key points:

- Inspection failures related to **backflow prevention comprised 8.6% of failed commercial final inspections**.
- **35 failures occurred because the backflow prevention device deviated from the consented plan**. This included installing a device not suitable to the hazard level (e.g., a double check valve rather than a RPZD).
- There were **35 other failures related to backflow prevention**. No specified reason was given for these failures.
- These failures did not relate to anything outside the boundary, as this is the responsibility of the network utility operator.

New backflow provisions

In November 2024, the transition period for the updated building code documents ended. This update has some of the most significant changes to G12 – Water supplies New Zealand has seen in a long time. A large portion of the updates relate to backflow protection. The updates include provisions around:

Additional cross-connection hazard examples

High-hazard:

- Bidets and douche seats
- Handheld bidet hoses and trigger sprays
- Connections to mobile and portable tankers
- Healthcare waste disposal equipment
- Hose taps associated with ‘soil waste dump points’.

Medium-hazard:

- Treated grey water
- Air handling units’ humidifiers without chemicals
- Exemption to medium-hazard example of swimming pools, spas and fountains filled by a hose tap
- A note about carbonated drink dispensers that pipework downstream of the backflow prevention device should not be made of copper.

Low-hazard:

- Drinking fountains and bottle fillers
- Hose taps, other than those associated with medium- or high-hazard situations.

Containment backflow protection

Containment protection, also known as boundary protection, helps protect the network water supply. New provisions require containment protection to be installed for specific higher risk buildings where it has not been provided by the network supply. This does not include premises containing only household units.

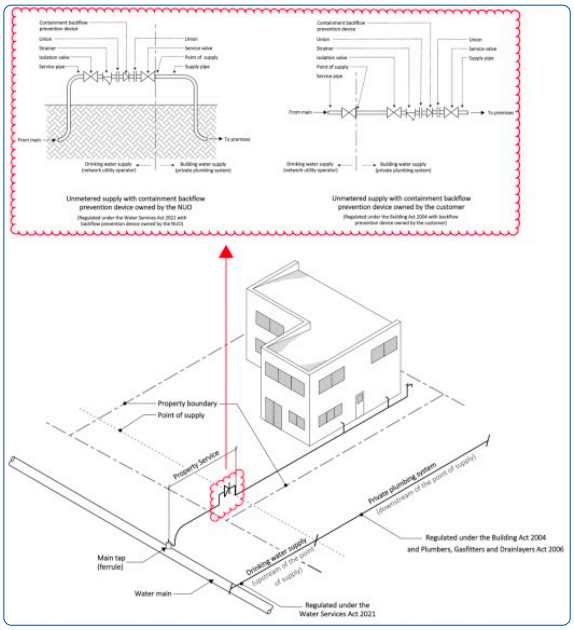


Figure 7. ***Containment backflow protection.***

General installation requirements

Many of these installation requirements should already be standard practice. But they make it clear how backflow prevention devices should be installed.

- Devices attached only after the pipework has been **flushed**
- Devices fitted with connections which allow for the **easy removal** and replacement of the device
- Devices must be **adequately supported**
- Devices must be installed with **isolation valves**
- RPZDs must be installed with **adequate drainage** provisions where installed within a building.



Figure 8. ***Dirty seat on backflow prevention device.***

Building Warrant of Fitness

In New Zealand building owners must supply a Building Warrant of Fitness (BWoF) to the local council each year on the anniversary of their building's compliance schedule issue date. The BWoF shows:

- **specified systems** in the building have been inspected and maintained
- all the requirements and procedures of the **compliance schedule** have been met.

In the Building Act 2004 a 'specified system' means a system or feature that—

i) is contained in, or attached to, a building; and

ii) contributes to the proper functioning of the building (for example, an automatic sprinkler system); and

iii) is declared by the Governor-General, by Order in Council, to be a specified system for the purposes of this Act (see subsection (2));

What is a compliance schedule?

Under the Building Act 2004 a compliance schedule is a document issued for buildings containing specified systems. These systems are features that contribute to the building's functionality, and can include safety features such as fire alarms, sprinklers, emergency lighting, lifts, or mechanical ventilation. One relevant plumbing feature is **automatic backflow preventers**. The purpose of a compliance schedule is to ensure these systems are maintained and operated effectively to safeguard the occupants and the general public.

The compliance schedule outlines:

1. The specified systems present in the building.
2. The performance standards these systems must meet.
3. The inspection, maintenance, and reporting procedures necessary to maintain compliance.

Compliance schedules are required for buildings that are not solely residential (e.g., commercial or industrial buildings with specified systems) or single residences with features like cable cars. Building owners are responsible for maintaining the systems as per the schedule and issuing an annual Building Warrant of Fitness (BWoF) to demonstrate compliance. The BWoF certifies that all inspection, maintenance, and reporting tasks listed in the compliance schedule have been fully completed for the past 12 months.

Do all buildings with a backflow prevention device require a compliance schedule?

No, not all New Zealand buildings with a backflow prevention device require a compliance schedule. A compliance schedule is only mandatory if the backflow prevention device is part of a specified system under the Building Act 2004. As mentioned above, this typically applies to non-residential or commercial buildings and certain residential properties with features like cable cars. The purpose of including backflow prevention devices in a compliance schedule is to ensure that they are inspected, tested, and maintained regularly to ensure that the devices continue to function correctly, thus reliably preventing contamination of potable water supplies via a backflow occurrence.

How do you become an IQP for testing backflow prevention devices?

IQPs are registered with the territorial authority, not nationally with the the Board. Specific requirements may vary between jurisdictions. But generally, to register as an IQP you will:

- Submit an application to the relevant territorial authority where you intend to operate.
- Provide documentation of your qualifications, practical experience, and any required accreditations specific to backflow prevention, for example an accredited 40-hour testers course.
- Provide references or proof of work history to verify your competency.

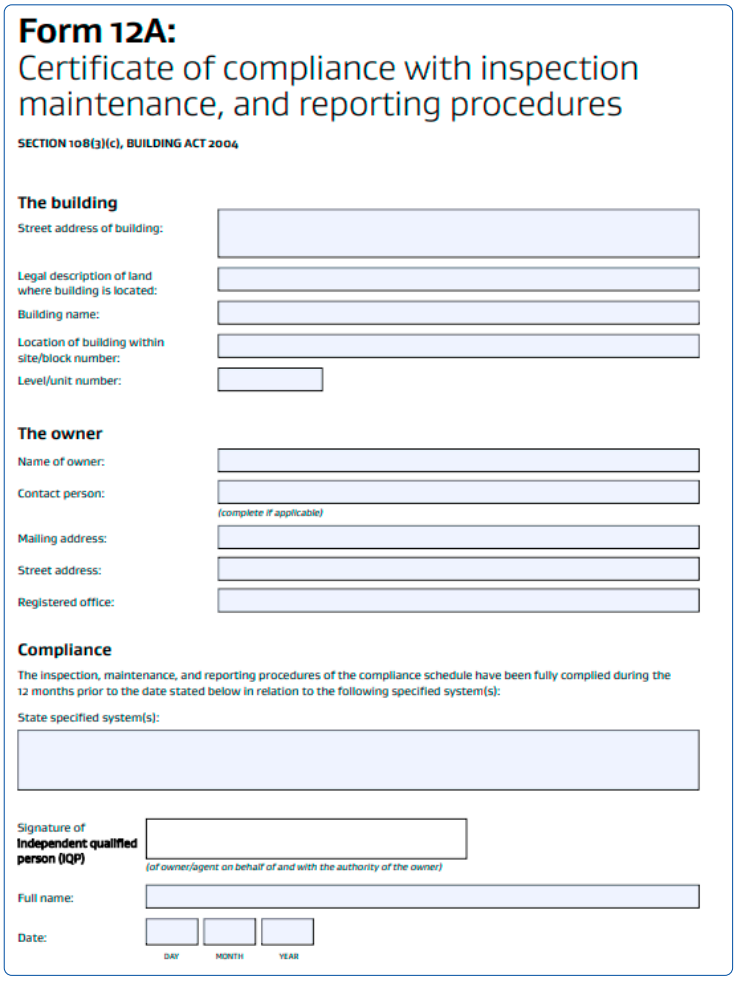
PLEASE NOTE: you will need to register with the territorial authority in each jurisdiction you are working in.

What documentation does an IQP have to supply for the BWoF?

The IQP must provide detailed records of the inspection, testing, and maintenance carried out on the backflow prevention devices. These records should include:

- Dates of inspections and maintenance.
- Results of testing, including whether the device passed or failed.
- Details of any repairs or adjustments made.

The IQP is required to complete and sign a **Form 12A**, which certifies that the backflow prevention system has been inspected and maintained in accordance with the compliance schedule for the specified period. This form is submitted to the building owner and must be included in the BWoF documentation.



Form 12A:
Certificate of compliance with inspection maintenance, and reporting procedures

SECTION 108(3)(c), BUILDING ACT 2004

The building

Street address of building:

Legal description of land where building is located:

Building name:

Location of building within site/block number:

Level/unit number:

The owner

Name of owner:

Contact person:

(complete if applicable)

Mailing address:

Street address:

Registered office:

Compliance

The inspection, maintenance, and reporting procedures of the compliance schedule have been fully complied during the 12 months prior to the date stated below in relation to the following specified system(s):

State specified system(s):

Signature of **independent qualified person (IQP)**

(of owner/agent on behalf of and with the authority of the owner)

Full name:

Date:

DAY MONTH YEAR

Figure 9. ***Form 12A***

The IQP must verify that the backflow prevention devices meet the performance standards specified in the compliance schedule. If performance standards have changed, they must document any updates and ensure testing procedures align with the latest standards (e.g., AS/NZS 2845.1:2022 for backflow prevention devices).

Requirements for a BWoF and compliance schedule are not well understood by industry, which in reality makes perfect sense, as undertaking BWoF inspections does not form part and parcel of everyday work for the majority of plumbers around the country.

However, for plumbers, particularly those working with and installing backflow preventors, these valves (or 'systems', as they are often termed in MBIE Compliance Schedule literature) are more likely than not to form part of a building's compliance schedule. Unsightly as they seem to architects, these valves play a very important role within the water supply system to protect potable water supplies from contamination from a backflow event, ultimately protecting the health and safety of the public.

By knowing which buildings require compliance schedules and annual certification through the BWoF, plumbers can better advise clients on their legal obligations, especially in existing buildings, as a new building compliance schedule would form part of the consent application for that building.

Protecting the public, your business, your trade



Backflow prevention is not just about compliance – it's about protecting lives, businesses and communities from preventable hazards. By addressing common issues in design, installation, and maintenance, and by staying informed about the latest Acceptable Solutions, practitioners can uphold their responsibility to deliver safe and reliable systems.

The updated Acceptable Solutions for G12 – water supplies provide clarity and structure to ensure consistent practices, while the compliance schedule and BWoF processes reinforce ongoing accountability. By mastering these elements, you protect not only your clients but also your professional reputation and the integrity of the water supply.

06

Topic 06: Regulatory compliance: Safeguarding gas systems in caravans

This topic provides a refresh of best practice gasfitting in caravans and reminds practitioners of the requirements needed to keep customers safe and gasfitters compliant.

Written by:

David Whitfield
PGD Industry Consultant

Introduction

It is important for gasfitters to refresh the skills and knowledge of the work they do periodically, and caravans are no exception.

Since work on caravans can be quite infrequent, gasfitters can benefit from this topic to ensure they keep their customers safe and themselves compliant with AS/NZS 5601.2.2013.

In this topic we will learn about imported caravans, new installations, servicing existing installations and ensuring the work we do is compliant.

We will do this by covering off:

a) specific installation requirements in caravans

b) flues and ventilation requirements

c) links to further information to support you

d) customer handover.

Let's remove any confusion as to what a caravan is

AS/NZS 5601.2.2013 defines a caravan as a structure that is designed to be moved from one place to another, whether towed or transported, and is intended for human habitation or use as a workplace. The definition includes a self-propelled recreational vehicle or mobile home.

A caravan is not a large structure assembled in a factory and transported to a permanent location.



Figure 1. ***Image of a caravan.***



Figure 2. ***Image of tiny home, not a caravan.***

It is important to note that for caravans or mobile homes we use AS/NZS 5601. 2 and for permanent structures (dare I say it: 'tiny homes') we use AS/NZS 5601.1. This distinction is an easy way to ensure you stay compliant.

Imported caravans

Certifying the gasfitting on imported caravans can be a tricky field for gasfitters to navigate. When issuing a GSC (Gas Safety Certificate) for work carried out on an imported caravan, the certifying gasfitter is making a professional statement that the installation is safe.

Since the caravan has been imported, New Zealand authorities require checking and verification that the whole installation is safe, including the gas appliances.

Some of the reasons for this are:

- gas appliances in imported caravans run on propane and not a mix of propane and butane, as used in New Zealand.
- gas fittings and regulators may not be approved for use in New Zealand.
- position of LPG cylinders may not meet the clearance requirements of ASNZS 5601.2.2013.

Before certifying the gas installation on an imported caravan gasfitters should ensure the appliances have either been *certified* or *endorsed*, and any *non-approved* fittings or regulators have been replaced with NZ-approved ones.

Endorsement of a gas appliance

WorkSafe approves Approved Practitioners, and a list of them can be found on their website. The endorsement includes a statement that the appliance complies with the Gas (Safety & Measurement) Regulations 2010 and NZS 5266 (the standard for the safety of gas appliances). Gasfitters can rely on an endorsement from an approved practitioner when they certify that an appliance is safe to connect to the gas.

Certification

Other than a limited amount of maintenance work, most gasfitting on a caravan with sleeping quarters is considered high-risk gasfitting. Therefore, the work would require a CoC (Certificate of Compliance), a GSC and an entry on Energy Safety's electricity and gas high-risk database.

For more information to assist you with imported caravans:

- the Board for technical advice – ***www.pgdb.co.nz***
- WorkSafe guidance – ***www.worksafe.govt.nz***
- WorkSafe Approved Practitioners Register – ***www.worksafe.govt.nz***

Gas supply for caravans

Generally, caravans are supplied by 9kg LPG cylinders mounted on the draw bar, or in a compartment on the draw bar. It's important that the clearances from ignition sources and caravan openings are met for compliance.

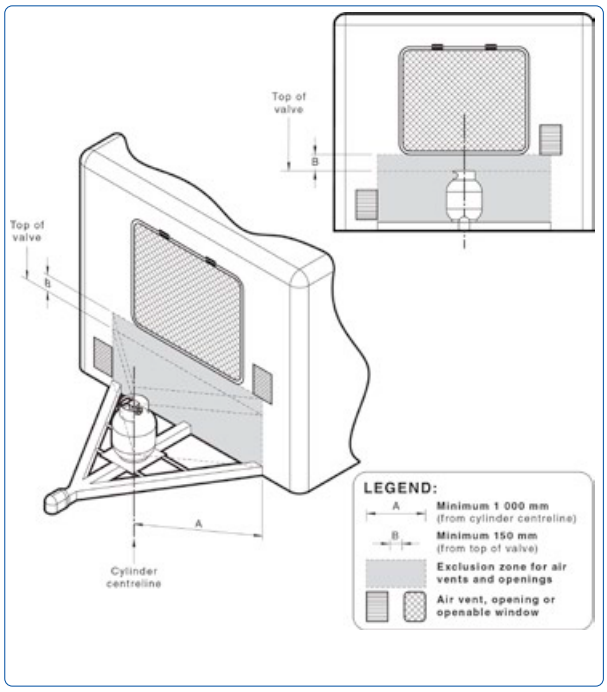


Figure 3. ***Typical cylinder-mounting location on the A-frame of caravans.***

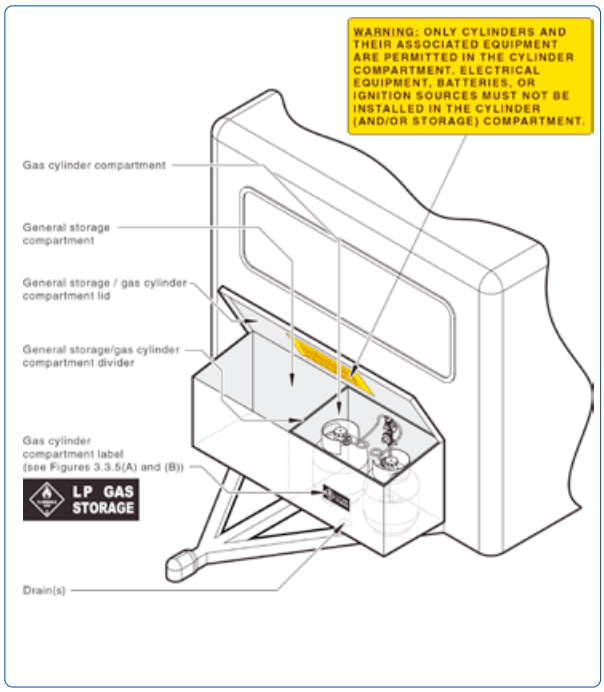


Figure 4. ***Combined cylinder compartment/LP gas locker***

Or in more modern caravans they are installed in a locker on the side of the caravan.

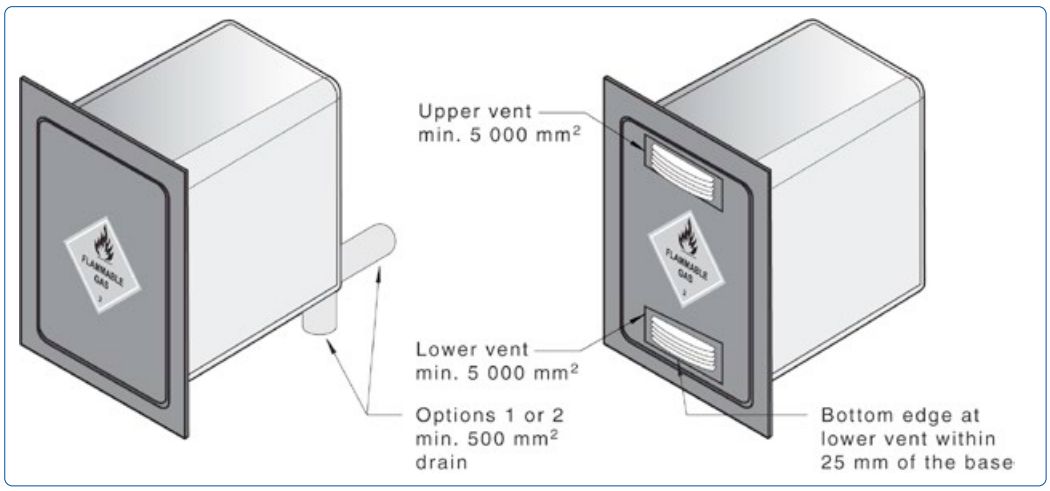


Figure 5. ***Typical LP gas lockers and cylinder compartments showing vent and drain alternatives.***

Clause 10.1 requires a gas compliance plate attached to the body work of the caravan which is clearly visible and adjacent to the gas cylinders.

A compliance plate shall be attached both for new gas installations and for modifications of existing installations. Each modification of a gas installation shall require an additional compliance plate to be attached.

Gas Installations—AS/NZS 5601.2

Gas Compliance Plate

Jurisdiction:

ACT ☐ NSW ☐ NT ☐ QLD ☐ SA ☐ TAS ☐ VIC ☐ WA ☐ NZ ☐

Type of Installation:

New Installation ☐ Alteration-Addition ☐

VIN/HIN No:_____

Gas Compliance Certificate No or Approval No:_____

Date of Test:_____

Tested By:_____ (Contractor Licence No)

This plate shall not be removed once attached.

Figure 6. ***Gas compliance plate example.***

Gas pressures and pipework

Most LPG appliances require 2.75 kPa. Section 4 of AS/NZS 5601.2.2013 states gas regulators should be set to 3kPa to ensure simultaneous operation of all gas appliances, but some regulators may not be adjustable and could be set lower than 3kPa. Gas pipework should be sized sufficiently for the operation of all appliances with a maximum pressure drop of 0.25kPa.

Section 5 of AS/NZS 5601.2.2013 states that gas pipework shall not be located where it could be damaged; that it must be secured against vibration; and that the main must run on the outside of the caravan, regardless of the number of appliances connected to the pipework.

This section provides examples of low-pressure piping that is allowed for use – i.e. combinations of copper pipe with approved hose assemblies. It also lists the pipes and fittings that cannot be used – multilayer pipe systems being one example for gasfitters to be aware of. Before you install any multilayer system, check with the manufacturer's certification that the product can be used in caravans. I am not aware of any in New Zealand that can be. The risk with multilayer pipe is that the vibrations from the moving caravan can cause it to crack over time.



Figure 7. ***Image of easily damaged gas pipe.***

One difference between gas piping for caravans and gas piping in houses is that in Appendix F of Part Two the 'pipework test and installation test' has no allowance for any acceptable pressure loss in a leakage test – so everything must be gas tight. Pipework test is 14kPa and the installation test is operating pressure. The test time is the same as other gasfitting work: two minutes for temperature stabilisation and a five-minute test period.

Section 5.2.2 (a) mentions all hoses, unions and joints are accessible, and all shut-off valves are readily accessible. Any void between the living space and a false bottom containing consumer piping shall be sealed from the living space and shall be provided with a minimum 500mm² ventilation area adjacent to any unions and joints to allow leaking gas to escape to the atmosphere.

Ventilation

Never guess or assume the ventilation requirements for caravans: doing the calculation is easier than guessing.

The free area of the total permanent ventilation for any space in which a gas appliance is installed shall be a least 4000mm² or the value obtained from the formula below:

V = (610 x U) + (650 x P)

Where

V = minimum free area, in mm²

U = input rating for all *gas appliance*s, (other than room sealed) in the space, including cookers, in MJ/h, refer to rating plate

P = number of sleeping spaces in the *caravan* or *boat*

Figure 8. ***Equation to calculate the free area.***

If you install ventilation in a caravan, ensure the customer is aware that the vents should never be covered and must be permanently open regardless of weather conditions. If you service caravans make sure you check any ventilation, as caravan owners may have covered them up.

AS/NZS 5601.2:2013 clause 7.4.4 requires a label to be fitted stating the vent must remain permanently open.

Clause 7.4.3: Ventilation equal to a minimum of 50% of the required ventilation area shall be provided as low as possible but not more than 150mm from the compartment floor.

WARNING

This vent must remain open, clean, and unrestricted to provide ventilation when gas appliances are in use.

Figure 9. ***Ventilation label.***

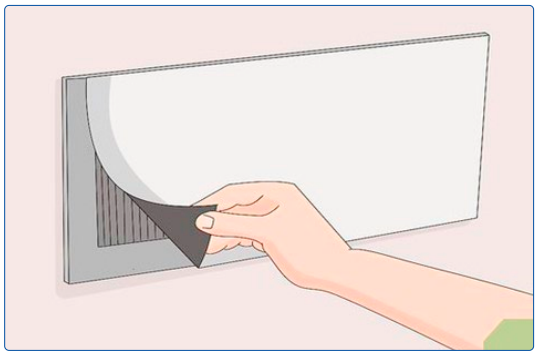


Figure 10. ***Do not cover ventilation openings.***

Gas installations

In general, there is not much difference between gas installations in caravans and in homes. In this section let's look at some of the key things to cover off.

Clause 2.9.1: Prohibition on Installation of Flueless water and space heaters. These heaters have tight restrictions on them, and considering them for a small space like a caravan might be just too difficult. To support this, quick-connect devices are not allowed to be installed.

Cooking appliance clearances

For a new installation of cooktop and rangehood Clause 6.10.1 provides the clearance from the highest part of the burner to a rangehood. In New Zealand we follow the requirements of AS/NZS 5601.2.2013: the clearance between a cooktop and the rangehood is 600mm.

In Australia they have adopted and are working to AS/NZS 5601.2.2022, where the clearance has changed to 650mm.

Gasfitters should always check the manufacturer's installation instructions for the cooker they are installing to ensure the installation also meets their clearance requirements.



Figure 11. ***Example of caravan cooker installation.***

Future exterior slide-out cooking appliances



Figure 12. ***Example of slide-out cooking appliance.***

A few Australian recreational vehicles now have slide-out cooking facilities. Most require a connection to an LPG cylinder once the cooker is pulled out, but some may already be connected to the LPG cylinder. Whatever way this is done it is new to New Zealand, and the current version of AS/NZS 5601.2.2013 does not cover some of the key safety points.

Some things to be aware of:

- The cooking appliance should have an LPG hose connection like that of a BBQ.
- A warning label should be displayed stating that the cooker should not be stowed back into its compartment whilst it is still hot.
- If the cooker is used within an outdoor area, ensure the area has sufficient air supply.
- If the appliance is permanently connected to the caravan gas supply, then check if it is an approved type on the WorkSafe suppliers' declaration database.
- If the cooker is permanently connected to the caravan gas supply it may require an interlock to ensure the gas will not remain on while stowed.

What the future holds for recreational vehicles

Outdoor holidays are very popular in New Zealand, so keep abreast of the developments to come – especially with slide-out kitchens.

If you get the opportunity to service existing caravans, then make sure your work is safe and compliant. A good servicing checklist is something to consider, with a copy offered as part of the customer handover. You can find an example of a servicing checklist on the the Board website – *https://www.pgdb.co.nz/media/1nhpfzgy/te20016-caravan-gasfitting-checklist.pdf*

If you get the opportunity to work on imported caravans then make sure everything installed complies with the New Zealand requirements.

In New Zealand caravan gasfitting work is very safe. Any accidents are generally caused by people who are not gasfitters doing gasfitting work. WorkSafe records of gas accidents since 1993 to 2019 show a decline in injuries.

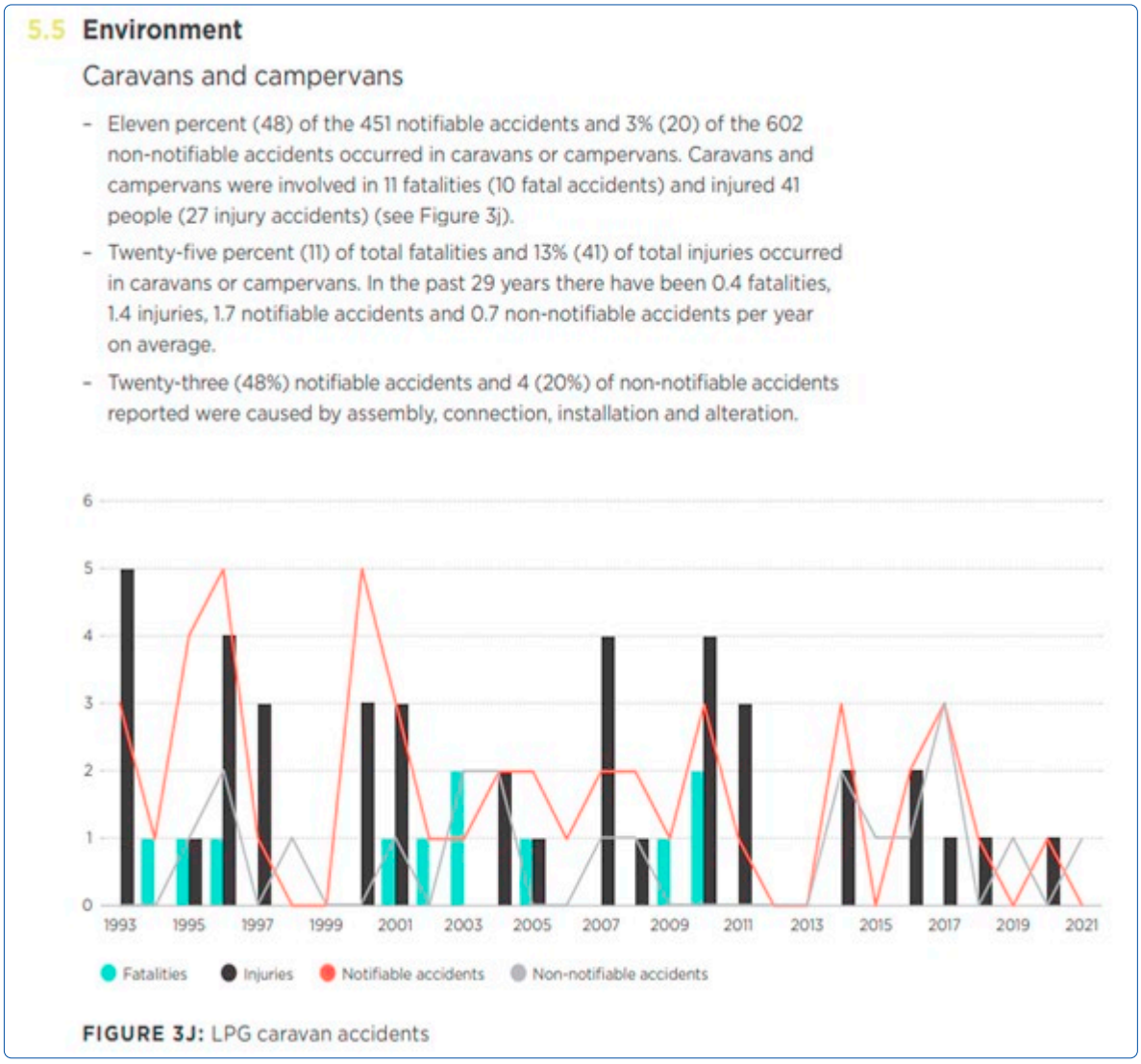


Figure 13. ***WorkSafe graph about LPG caravan accidents.***

The above graph represents data from WorkSafe around LPG caravan accidents. Note that there is a significant drop in fatalities and accidents after 2011, which correlates with the commencement of the Plumbers, Gasfitters and Drainlayers Act 2006, which removed from its definition of gasfitting an exemption for anything supplied by less that 15kg's of gas. Prior to 2010, when the Plumbers, Gasfitter and Drainlayers Act 2006 was enacted, you did not have to be a gasfitter to carry out gas installations when the gas supplied was less than 15kgs, but the updated Act disallowed this. Along with this, AS/NZS 5601.2 the gas standard for caravans was first introduced in 2010.

Summary

It is still unsure when New Zealand will adopt for citation the 2022 version of AS/NZS 5601.2.2022, so make sure you work to the current cited version.

The key principles of working on caravans are the same ones as for any other gas installation: ensure that you are competent to do the work, that it is safe and compliant, and that the customer realises the value of the job done. If you are not experienced in gasfitting in caravans, you should upskill to ensure you are competent prior to carrying out the work.

The caravan market does not always understand the risks involved in gasfitting in confined spaces like a caravan, which can lead to cutting corners to keep the price down. If this happens to you then consider not doing the work.

Protecting the public, your business, your trade

Working on gas in caravans is high risk work. Protect yourself and the public by only working on caravans if you are a registered gasfitter and have had training and experience doing this type of work.

07

Topic 07:
Carbon counting for building and construction

This topic provides insights for New Zealand's building and construction sector on its pathway to reduce greenhouse gas (GHG) emissions.

Written by:

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Peak Hydraulic Consultants Ltd

Introduction

Aotearoa New Zealand has committed to achieving net zero greenhouse gas (GHG) emissions by 2050.

According to MBIE, carbon from buildings is responsible for approximately 15% of Aotearoa's overall emissions. Embodied carbon, stemming from the materials and products a building is made from, accounts for around half of these emissions. To meet targets set by the Paris Agreement we need to slash embodied emissions by over 50% between now and 2030.

Achieving this goal will obviously require change in many sectors of the economy – including building and construction.

Emissions Reduction Plan

The previous Labour Government released Aotearoa New Zealand's first Emissions Reduction Plan, which outlined the actions to be taken across sectors to reduce our emissions. This was one of the steps needed to meet our 2050 net-zero greenhouse gas (GHG) emissions goal.

What does that mean for the building and construction sector?

The Emissions Reduction Plan sets out the actions required to meet our first emissions budget (2022–2025) and set New Zealand on the path to meet the second (2026–2030) and third (2031–2035) emissions budgets.

This will enable New Zealand to transition to a low-emissions future in a way that is achievable and affordable.

Under the first emissions plan, building and construction initiatives had five key focus areas:

1. Reducing the whole-of-life embodied carbon of buildings
2. Accelerating the shift to low-carbon buildings
3. Improving the energy efficiency of buildings
4. Shifting energy use away from fossil fuels
5. Establishing the foundations for further emissions reduction in the future.

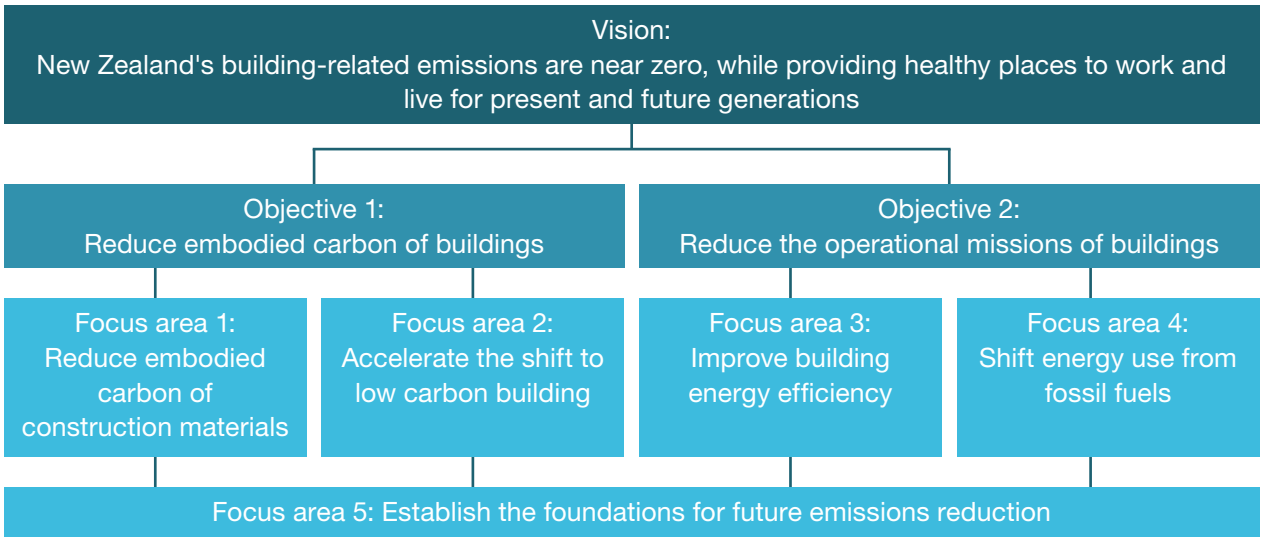


Figure 1. ***Five Key Focus Areas.***

Proposed reporting of embodied carbon

What was proposed in the emissions reduction plan was that from 2025 onwards, obtaining a building consent would require a mandatory detailed report of the embodied and operational carbon of the project.

The Government of the day intended to collect and review these reports during the initial year (2025) to establish specific carbon caps that will apply from 2026 to 2030.

In early December 2024, however, the new Government released an updated “Second Emissions Plan” advising that this report will not be mandatory right now. But it will no doubt come into fruition in the near future.



Figure 2. ***Emissions Reduction Plans, First and Second.***

If the Second Emissions Reduction Plan has delayed mandatory reporting, why is this in CPD?

Good question. Despite the delay, carbon counting is ever present within modern-day designs: almost every commercial project has some form of carbon recording/counting attributed to the design, installation and operations of the building, especially as we head towards a low/zero carbon future.

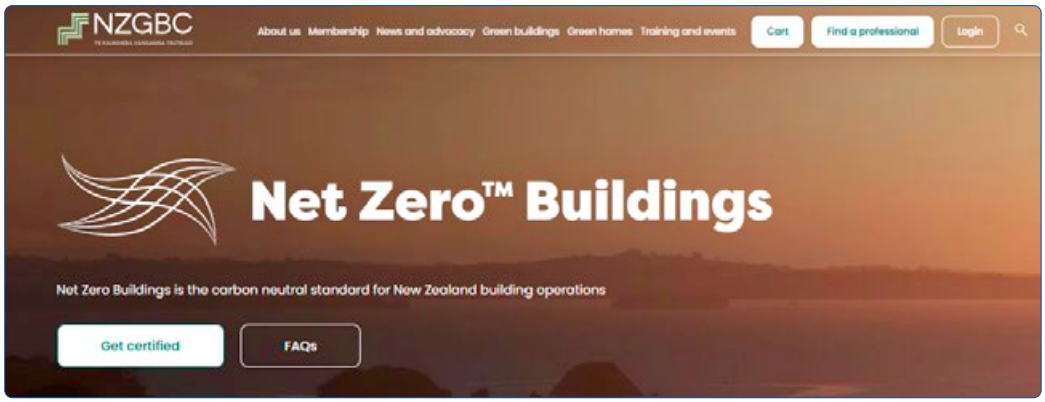


Figure 3. ***New Zealand Green Building Council.***

This leads to a few questions to help us understand what all this carbon talk is about.

What is carbon?

The term “carbon” is a short description of “carbon dioxide equivalent (CO_2e)”, which is an internationally accepted measure of all the greenhouse gases normalised with respect to carbon dioxide.

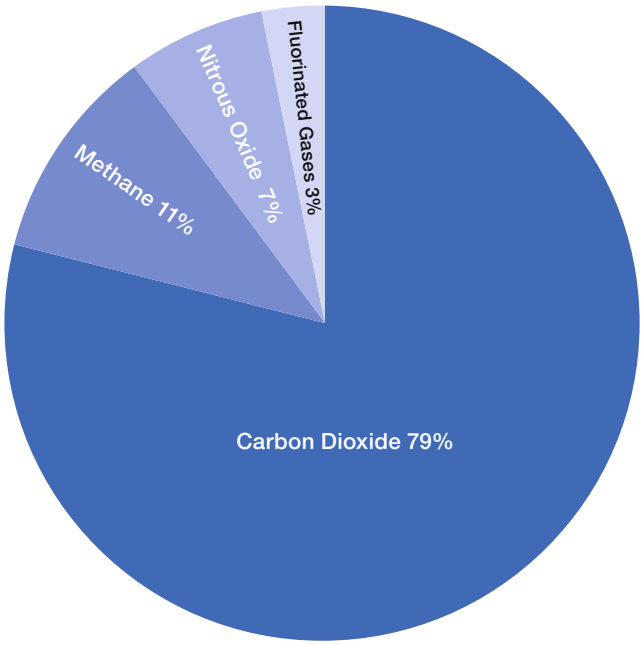


Figure 4. ***Example of greenhouse gases – note CO_2 has the largest share.***

What is embodied carbon?

Embodied carbon encompasses the carbon emitted in the extraction, manufacturing, transport, and site assembly of building materials, including carbon released by plants and machinery throughout the building process itself. In the case of rebuilds, demolition adds to the embodied carbon of a site.

What is operational carbon?

Greenhouse gas emissions that result from a building's energy and water use during the building's operational lifetime.

It typically includes emissions associated with space heating, hot water, cooling, ventilation and lighting systems, as well as the energy used in cooking, equipment and lifts. It also includes emissions associated with water usage, such as drinking water supply and water treatment.

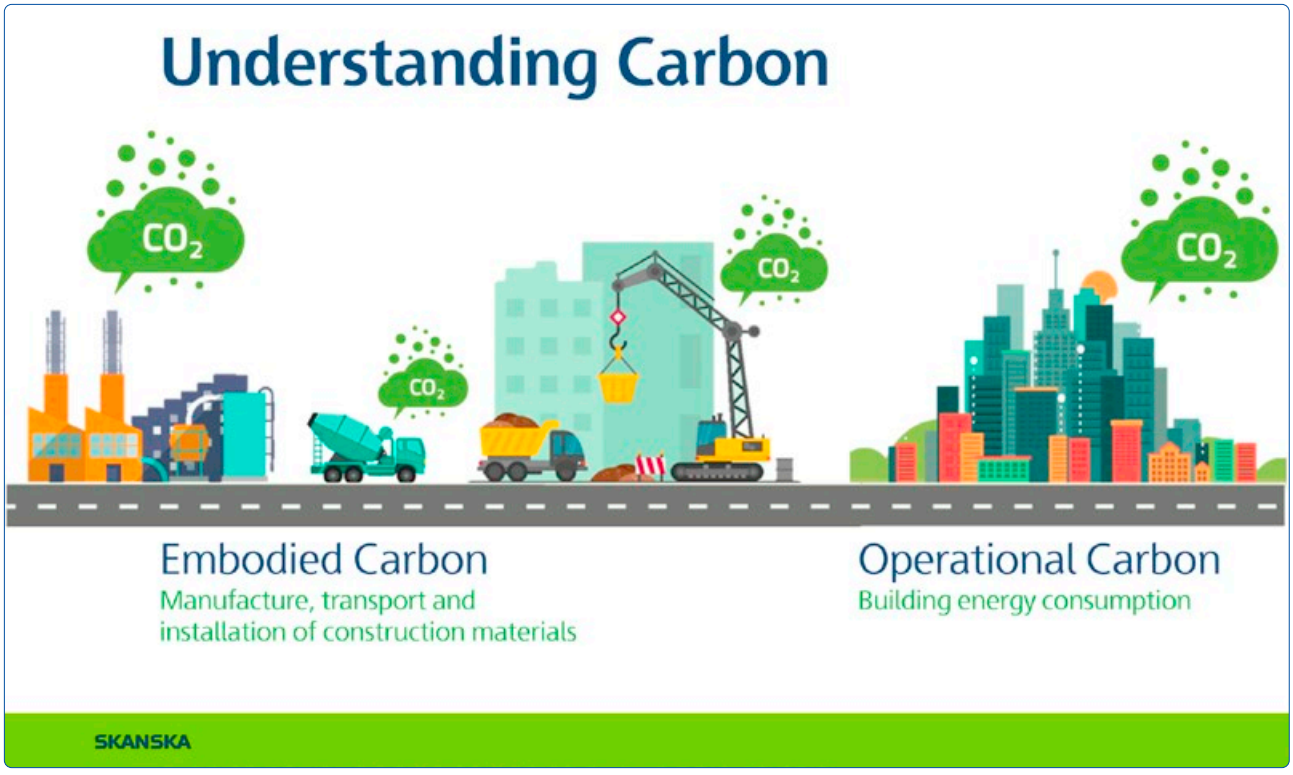


Figure 5. ***Example of Embodied and Operational Carbon (Re-Think the Future).***

If carbon is invisible, how do we weigh it?

As a colourless, odourless gas, carbon dioxide is hard to visualise!

Thinking of it this way might help: 1kg of carbon dioxide would fill a large beach ball (with a diameter of slightly over 1m). This is the same amount of carbon dioxide produced by driving an average car 3.7kms. Or the same as using half a litre of petrol in your car, or making 16 cups of tea.

Typically, the universally used weight of carbon is in tonnes. We mentioned a balloon previously – a tonne of carbon dioxide is equal to the size of a hot air balloon with a CO_2 volume of 500m^3.



Figure 6. ***Visual volume example of 1 tonne of C0$_2$.***

What does this have to do with plumbing, gasfitting and drainlaying?

Good question, because at this present time there are no forceful rules and regulations in effect requiring our industry to focus on carbon counting. Most of the industry will have heard of “Green Star” buildings: these buildings must meet several mandatory benchmarks for a lower-carbon, higher-performing project, before using a combination of optional credits to achieve a rating. The higher the rating the more sustainable (or better) the building is, and the lower its carbon footprint.

In essence, this is a form of carbon counting, albeit purely voluntary. The contractors engaged in these buildings must meet strict criteria and must also strictly follow the specifications of the project, including material selections. If. for example, you swap out all the water pipework for a cheaper supplier – but that supplier has a higher carbon footprint for its material manufacturing processes – then without knowing it you may have put the overall total Green Star rating at risk!

What is a carbon cap?

Designs need to comply with a ‘reference’ building, which is the same building but with predetermined carbon limits on it already. Every single component of the building must be measured and come under those limits. Essentially, that is the carbon cap.

Designing buildings to achieve the caps that will be put in place from 2026 onwards could also affect which materials are chosen.

If the cap says a total of X kilograms of CO_2 is allowed in the reference building, you somehow have to balance your materials to make sure you are below that. If, for example, your building is carbon heavy with concrete, maybe you're going to have to use less carpet.



Figure 7. ***Key Features of Green Star Buildings in NZ.***

How to measure embodied and operational carbon

For each component within each product in a building, whether it be structural, carpet or air conditioning units, the embodied carbon will be measured and stated in a report.

Some products have a product declaration certificate – known as an EPD – stating the exact number of kilograms of CO_2 embodied in the product.

The majority of consultancies that deal with embodied carbon have their own internal software programmes providing 3D outputs of buildings which highlight key areas of high and low amounts of embodied carbon. Below is an example of a building's structural model providing a simple visual of carbon intensity per floor.

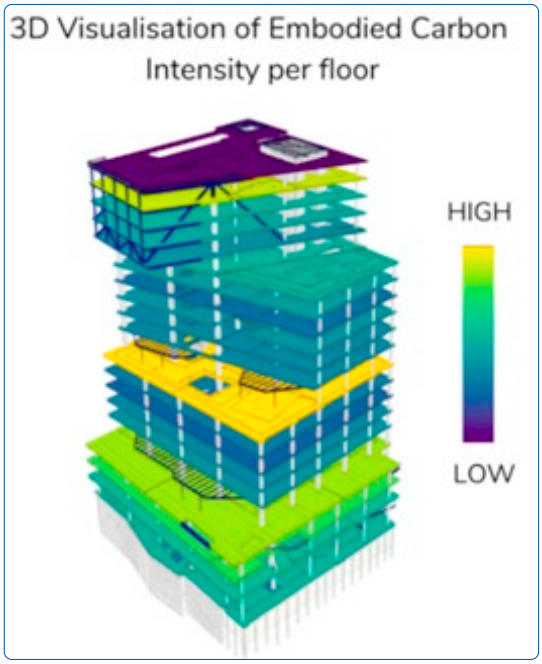


Figure 8. ***3D Carbon Intensity Modelling.***

EPDs in relation to plumbing, gasfitting and drainlaying

Architects and builders will need to integrate carbon accounting into their project planning, and yes, this will also affect plumbers, gasfitters and drainlayers, especially those working in the design realm.

This includes using environmental product declarations (EPDs) to accurately report the carbon content of materials used. Products with verified EPDs will likely become more prevalent, as those without may pose compliance risks or incur higher costs owing to the need for additional verification processes.

This shift will influence material selection and could potentially drive up design costs due to the increased research required.

What is an EPD?

An Environmental Product Declaration (EPD) is a standardised document that details the environmental impact of a product based on its lifecycle assessment (LCA), generally from raw material extraction through to disposal. EPDs are critical in the construction industry as they provide transparent and verified information that influences design and construction decisions for improved environmental performance.

Life cycle

The building is split up into lifecycle stages, which form the basis of the assessments.

The embodied carbon of an entity is the sum of all the greenhouse gas emissions that occur at each stage of its lifecycle. Emissions are measured in units of kg CO_2-e. In LCA studies, they are reported in the environmental impact category known as 'Global Warming Potential' (GWP).

The diagrams below illustrate this using the module framework for lifecycle stages.

Emissions occurring at each lifecycle stage are accounted for in a ‘module’.



Figure 9. ***Life Cycle Stages (Modules, 3 examples).***

EPD Documents

EPDs can be reasonably lengthy documents. Mastering them requires a topic with its own dedicated chapter to really understand how to read, interpret and implement the data.

Below is an example of a 12-page document for a hot water circulation pump.



Figure 10. ***Example EPD Report for 1 x circulation pump.***

The environmental impacts associated with the product are quantified in a table, usually towards the back end of the document. Carbon emissions are displayed as GWP in kg CO_2e.

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1PCS of MAGNA3 40-80/100															
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq	9.85E+01	4.16E+00	8.22E-01	1.47E+00	2.83E+00	0	0	1.9E+02	0	0	6.01E-01	5.58E+00	1.16E-01	-7.94E+00
GWP-fossil	kg CO_2 eq	9.84E+01	4.16E+00	3.62E+00	1.48E+00	4.61E-01	0	0	1.89E+02	0	0	6.04E-01	5.56E+00	1.17E-01	-7.92E+00
GWP-biogenic	kg CO_2 eq	-3.75E-03	-7.35E-03	-2.83E +00	-2.18E-02	2.37E+00	0	0	1.64E+00	0	0	-8.92E-03	1.22E-02	-1.45E-03	-2.11E-02
GWP-luluc	kg CO_2 eq	6.06E-02	6.71E-03	2.95E-02	1.34E-02	8.54E-05	0	0	2.05E-02	0	0	5.6E-03	1.82E-04	1.06E-04	-2.44E-03
ODP	kg CFC11 eq	4.73E-08	3.29E-13	4.06E-09	2E-11	3.77E-13	0	0	3.48E-09	0	0	7.87E-14	2.65E-11	1.96E-13	-2.16E-11
AP	mol H^+ eq	7.28E-01	1.23E-01	1.63E-02	8.81E-03	7.62E-04	0	0	4.03E-01	0	0	3.64E-03	3.77E-03	3.62E-04	-7.46E-02
EP-freshwater	kg P eq	1.49E-03	3.41E-06	6.21E-05	5.65E-06	1.4E-07	0	0	7.04E-04	0	0	2.21E-06	7.5E-06	1.35E-05	-1.14E-05
EP-marine	kg N eq	7.93E-02	2.93E-02	3.64E-03	4.25E-03	2.78E-04	0	0	9.64E-02	0	0	1.77E-03	9.95E-04	8.62E-05	-8.56E-03
EP-terrestrial	mol N eq	8.48E-01	3.21E-01	3.65E-02	4.71E-02	3.5E-03	0	0	1.01E+00	0	0	1.96E-02	1.13E-02	9.47E-04	-9.19E-02
POCP	kg NMVOC eq	2.49E-01	8.27E-02	1.02E-02	8.09E-03	7.24E-04	0	0	2.57E-01	0	0	3.36E-03	2.66E-03	2.72E-04	-2.76E-02
ADPE	kg Sb eq	8.32E-03	7.91E-08	5.16E-05	1.25E-06	3.87E-09	0	0	2.92E-05	0	0	4.01E-08	2.21E-07	3.15E-09	-1.02E-03
ADPF	MJ	1.39E+03	5.19E+01	5.39E+01	2.02E+01	1.04E+00	0	0	3.97E+03	0	0	8.24E+00	3.09E+01	1.75E+00	-9.48E+01
WDP	m^3 world eq deprived	3.48E+01	1.44E-02	3.97E-03	2.38E-02	3.39E-01	0	0	4.21E+01	0	0	7.31E-03	7.44E-01	-1.63E-03	-5.33E-01

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

Figure 11. ***Example one results table from the report (pump).***

Request for Tender (RFT)

Depending on the size and complexity of a project you are tendering on, you are likely to be asked to fill out a sustainability section. An increasing number of tenderers are now including more in this space, including a reference to EPDs with respect to material/plant selections if alternatives are provided as a cost-saving proposal.

The designers will already have been through that process, working with a sustainability consultant who will have done the carbon counting for the project.

How is sustainability defined within your company, and what progress has been made in these areas?

- *Briefly explain your companies sustainability approaches to modern projects*
- *Please attached your companies sustainability policy to this tender.*

How does your company plan to address sustainability issues in future?

- *This maybe covered in your companies sustainability policy.*

What sustainability benefits are included in your offer of product or service to this project?

- *Suitably explain the environmental and/or social benefits using your product/service may have compared to equivalent options.*

For any proposed alternative material selections, please confirm the selected alternative/s come complete with a valid EPD.

- *Provide confirmation that the embodied carbon is either equal or less that the specified material/s.*

What are the main social and environmental risks for this contract?

- *Provide an explanation of the key challenges your company has identified to this contract on the above and provide details on your plans to effectively manage these challenges.*

Our Supplier Code of Conduct extends beyond its immediate suppliers and contractors. Does your company understand and monitor the employment/sourcing models of your own supply chain to address sustainability risk, including but not limited to Modern Slavery?

- *Explain what measures you have put in place with your sub-contractors/suppliers etc and how you monitor their performance against those measures.*

Figure 12. ***Example questions extracted from a Request for Tender.***

Looking forward

The pending carbon counting initiative is expected to transform how the construction industry operates in New Zealand.

It will encourage more sustainable practices and innovations, aligning with global efforts to mitigate climate change impacts.

As the construction industry adapts to these changes, continuous learning and adaptations will be key to success. This is, after all, very new to a lot of us!

Protecting the public, your business, your trade



As New Zealand's building and construction sector works towards reducing greenhouse gas (GHG) emissions, it is essential to recognise the role skilled tradespeople play in this transition. By training and equipping plumbers and other industry professionals with the right knowledge and tools, we are not only protecting the future of their trade and business, but also ensuring the sector remains adaptable and resilient in the face of evolving environmental standards. This commitment to sustainability helps secure the long-term growth and success of the industry.

08

Topic 08:
The Building Act 2004 and Building Consents

The Building Act 2004 sets out the rules for the design, construction, alteration, demolition and maintenance of buildings in New Zealand. It includes requirements for obtaining a building consent, and lists work that does not require a building consent.

Introduction

It's important that everyone involved in the design, construction and maintenance of buildings understands their roles and responsibilities under the Building Act. This helps to ensure buildings comply with the Building Code and are safe, healthy and durable.

Practitioners need to understand when plumbing and drainage work requires a building consent, and when a building consent is not required. Where a building consent is required, plumbers and drainlayers are responsible for ensuring their work complies with the consented plans and specifications. If you want to deviate from the consented plans and specifications in any way, it's important you understand what is required prior to the work being carried out.

In this topic we will learn about key legal requirements for plumbing, gasfitting and drainlaying work, including:

- The Building Act 2004
- The Building Code
- Building Consent requirements
- Work that does not require a building consent, and
- What to do if you want to deviate from the consented plans and specifications.

The Building Act 2004 and the Building Code

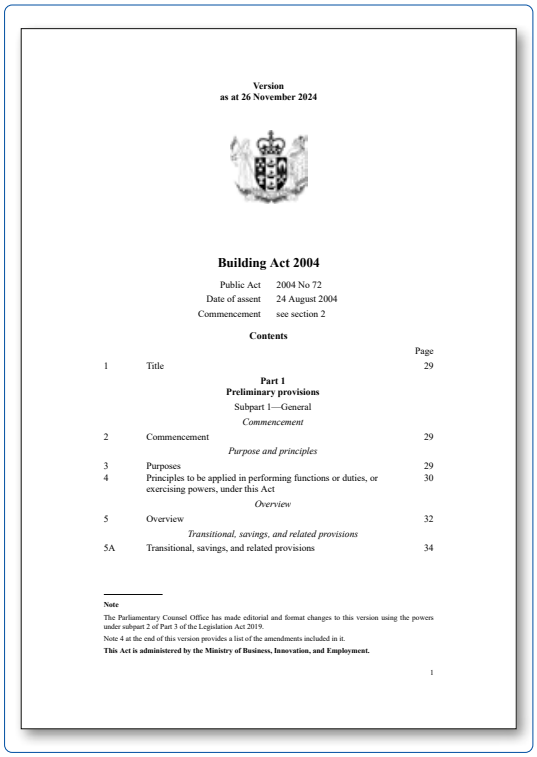
What is the Building Act?

The Building Act sets out the rules for the design, construction, alteration, demolition and maintenance of new and existing buildings in New Zealand.

It is the primary legislation governing the building industry, and its purpose is to ensure buildings are safe, healthy and durable.

The Building Act aims to encourage better practices in building design and construction to provide greater assurance to consumers. This means:

- setting clear expectations of the standards buildings should meet (Building Code)
- providing guidance on how to meet those standards
- more certainty that capable people are undertaking design, construction and inspection
- more scrutiny of the building consent and inspection process
- better protection for homeowners through mandatory warranties.



Version
as at 26 November 2024

Building Act 2004

Public Act 2004 No 72
Date of assent 24 August 2004
Commencement see section 2

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Note

The Parliamentary Counsel Office has made editorial and format changes to this version using the powers under subpart 2 of Part 3 of the Legislation Act 2019.

Note 4 at the end of this version provides a list of the amendments included in it.

This Act is administered by the Ministry of Business, Innovation, and Employment.

1

Figure 1. ***The Building Act 2004***

It has an impact in one way or another on all New Zealanders, and it applies to everyone involved in the design, building, construction and maintenance of buildings in New Zealand.

Roles and responsibilities under the Building Act

The purpose of the Building Act is to ensure that people can use buildings safely without endangering their health. The Building Act outlines responsibilities for owners, owner-builders, builders, designers, Building Consent Authorities and Territorial Authorities, and product manufacturers or suppliers.

It is important to understand how the Building Act applies to you.

Responsibilities under the Building Act 2004 include:

Building owners are responsible for obtaining a building consent if one is needed.

Designers are responsible for making sure their designs meet the Building Code. A designer is someone who prepares plans and specifications or gives advice for building work. In some situations, plumbers, gasfitters and drainlayers may be considered designers.

Builders – under the Building Act, a builder means anyone who carries out building work. This includes plumbers, gasfitters and drainlayers. Plumbers, gasfitters and drainlayers are responsible for making sure their work complies with building consent plans and specifications.

For work that is not covered by a building consent, plumbers, gasfitters and drainlayers are responsible for ensuring that their work complies with the Building Code, and that all products used in carrying out the work are used in a manner that complies with the Building Code.

Product manufacturers and suppliers are responsible for ensuring the product will comply with the Building Code, if installed in accordance with the manufacturers information.

Similarly, regulatory bodies have certain responsibilities.

The Ministry of Business, Innovation and Employment (MBIE) is responsible for managing the system that regulates building work and monitors its effectiveness. This includes reviewing the Building Code and producing documents to show ways to comply with it. MBIE is also responsible for monitoring Building Consent Authorities and investigating complaints.

Building Consent Authorities are responsible for issuing building consents, carrying out inspections, and ensuring applications for building consents comply with the Building Code.

Territorial Authorities are responsible for holding records on properties; they manage dangerous, insanitary and earthquake-prone buildings.

Building Consent Authorities and Territorial Authorities have different roles and responsibilities under the Building Act. However, their functions are often undertaken by a local council.

It's important everyone is clear about their roles and responsibilities, as this helps to ensure buildings comply with the Building Code.

The Building Code

The Building Code explains how a building is expected to perform so that it complies with the Building Act.

All new building work in New Zealand must comply with the Building Code, even if it doesn't require a building consent. This ensures buildings are safe, healthy and durable for everyone who may use them.

The Building Code provides flexibility around the design and construction of our buildings.

The Building Code states how a building must perform in its intended use rather than describing how the building must be designed and constructed.

By focusing on how buildings perform rather than how they are built, designers, architects and tradespeople can meet the performance requirements in flexible and innovative ways.

The Building Code consists of three general clauses and 38 technical clauses and is contained in Schedule 1 of the Building Regulations 1992.

The Code clauses are divided into groups and given a letter A to H. These groups are divided further into clauses, indicated by numbers. There are general clauses and technical clauses.

The Building Code covers:

- structural stability
- fire safety
- access
- moisture control
- durability
- services and facilities
- energy efficiency.

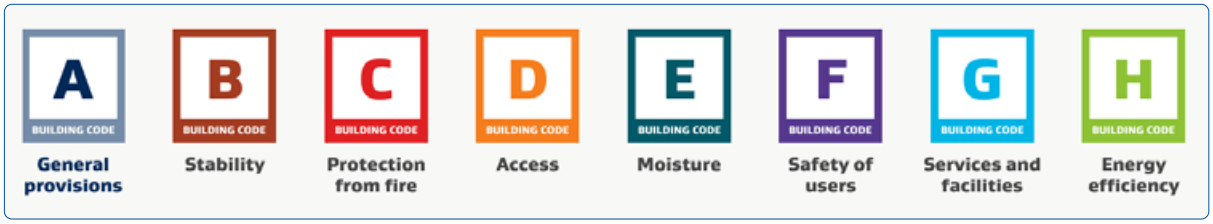


Figure 2. ***Building Code Clause Sections***

Within each technical clause the requirements are explained in three levels:

1. Objectives – social objectives from the Building Act
2. Functional requirements – functions the building must perform to meet the Objective
3. Performance criteria – the performance criteria the building must achieve. By meeting the performance criteria, the Objective and Functional Requirements can be achieved.

E Moisture deals with building to manage water. It contains Building Code clauses E1 Surface water, E2 External moisture and E3 Internal moisture.

G Services and facilities contains Building Code clauses G1–G15, which confirm the adequate and safe provision of sanitary fixtures and services such as gas, electricity and water.

H Energy efficiency contains Building Code clause H1 which requires many buildings, such as housing, to achieve an adequate degree of energy efficiency and contains requirements for hot water systems to be constructed to limit heat losses.

Key Building Code clauses relevant to Plumbing, Gasfitting and Drainlaying work



E1 Surface water

Disposal of rainwater from external surfaces and confirmation surface water cannot enter the building.



G1 Personal hygiene

Providing sufficient sanitary fixtures (toilets, showers and basins) for sanitation.



G11 Gas as an energy source

Requires the safe installation of gas-fuelled appliances.



G12 Water supplies

Requires the safe supply, storage, reticulation and delivery of hot and cold water.



G13 Foul water

Requires the safe disposal of foul water to prevent illness and the loss of amenity due to odour and accumulated matter.



H1 Energy efficiency

Provides for the efficient use of energy and sets physical conditions for energy performance.

Figure 3. Key Building Code clauses relevant to Plumbing, Gasfitting and Drainlaying work

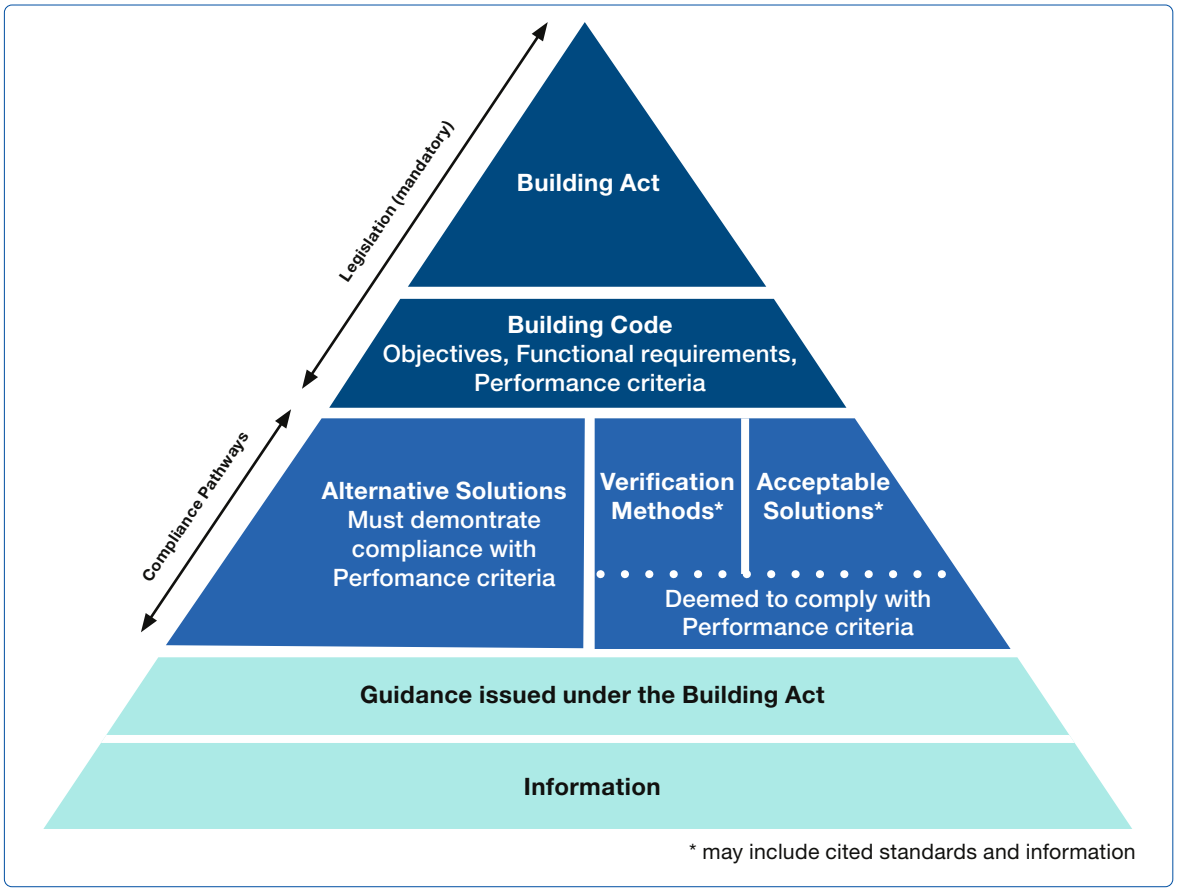


Figure 4. ***Regulation framework showing ways to comply with the Building Code***

How to comply

How do you show that plumbing, gasfitting and drainlaying work is compliant with the Building Code?

One way is to follow a solution that is deemed to comply with the Building Code. There are two ways you can do this:

1. By using an **Acceptable Solution**. This is the simplest way to meet the performance requirements of the Building Code. Acceptable Solutions include details and materials that are deemed to comply with the Code.
2. By using a **Verification Method**. In a verification method, calculations or tests are done by an experienced engineer or designer to show that the design complies with the Building Code.

Alternative solutions

There is a different way of showing a building complies with the Building Code – it's called an **alternative solution**. Alternative solutions are appropriate for complicated, new or unique projects, or when a design is not deemed to comply. They must demonstrate compliance with the performance criteria of the Building Code. Some examples include using testing or standards to demonstrate that New Zealand requirements are met – and calculations, test results, models or simulations not contained in the deemed-to-comply solutions.

By making comparisons to the deemed-to-comply solutions, alternative solutions allow designers to be more creative and innovative in the design and materials of a building.

Whether you choose a deemed-to-comply pathway or an alternative solution, buildings must always meet the Building Code performance requirements.

Information and guidance

You may need information and guidance to help you make decisions to show compliance with the Building Code.

MBIE publishes a range of information and guidance that may help; this is available on the *building.govt.nz* website.

One way to comply is to use Acceptable Solutions or Verification Methods, which contain 'cited' information. All 'cited' information is deemed to comply; however, 'non-cited' information can still be used to support alternative solutions.

'Cited' information may include standards, codes of practice or guidance materials which are referenced in Acceptable Solutions or Verification Methods.

'Non-cited' information is not referenced in Acceptable Solutions or Verification Methods. This includes New Zealand or overseas standards, codes of practice and other information provided by the building and construction industry.

This information may help to show compliance as an alternative solution.

Guidance
These documents are provided for assistance. They are not in ended as a means of establishing compliance with the Building Act or Building Code, and they do not have the same status accorded to Acceptable Solutions and Verification Methods under the Act.
Toilets privacy and access for people with disabilities *https://www.building.govt.nz/building-code-compliance/g-services-and-facilities/g1-personal-hygiene/toilets-privacy-and-access-for-people-with-disabilities* Help for designers and building owners planning commercial building toilet layouts (includes privacy and accessibility).
Prevent scalding from tap water *https://www.building.govt.nz/building-code-compliance/g-services-and-facilities/g12-water-supplies/preventing-scalding-from-tap-water* Guidance and information about suitable hot water temperatures in taps, as well as Building Code requirements.
Copper water pipe and fittings *https://www.building.govt.nz/building-code-compliance/g-services-and-facilities/g12-water-supplies/copper-water-pipe-and-fittings* Information about the manufacturing standards of copper pipes and fittings in New Zealand.

Continued ...

Guidance
Drains from hot water cylinder relief valves *https://www.building.govt.nz/building-code-compliance/g-services-and-facilities/g12-water-supplies/drains-from-hot-water-cylinder-relief-valves* Guidance about the function of pressure relief valves as well as how to comply with the Acceptable Solution G12/AS1.|
Well-sealed shower penetrations prevent water damage *https://www.building.govt.nz/building-code-compliance/e-moisture/e3-internal-moisture/well-sealed-shower-penetrations-prevent-water-damage* Guidance on preventing water damage from inadequately sealed penetrations in shower linings.
Pipe suitability for hot and cold water services *https://www.building.govt.nz/building-code-compliance/g-services-and-facilities/g12-water-supplies/pipe-suitability-for-hot-and-cold-water-services* Guidance about the suitability of pipe material in the consenting and inspection process.
Reducing drain blockages *https://www.building.govt.nz/building-code-compliance/g-services-and-facilities/g13-foul-water/reducing-drain-blockages* Guidance about the change within G13/AS3 which will reduce the likelihood of drain blockages.

Confirming building work meets Building Code requirements

Building Consent Authorities (councils) assess plans and specifications in consent applications to ensure the proposed building work (including plumbing and drainage work) will comply with the Building Code. When they are satisfied the proposed work will meet the requirements, they will issue a building consent for the work to proceed.

After the work has been completed, the council will issue a code compliance certificate if the finished building work:

- complies with the consented plans, and
- all inspections have been passed, and
- all necessary certificates have been supplied.

the council will issue a code compliance certificate. This certifies that the building work has met the requirements of the Building Code.

Even if plumbing and drainage work does not need a consent, it must still meet Building Code.

Summary

New Zealand's building regulatory system is built on the Building Act 2004 and anchored by our performance-based Building Code. It provides for the regulation of buildings, building work and various occupations in the building industry, and the setting of building performance requirements.

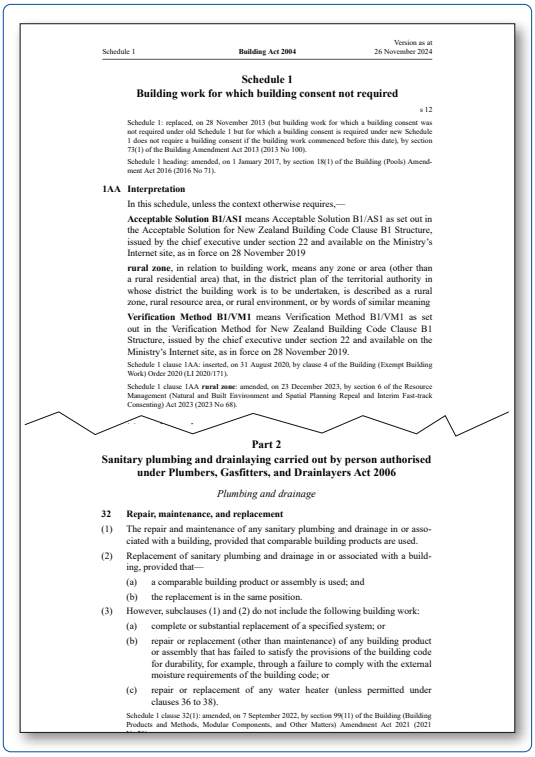
Work that does not require a building consent – Schedule 1 of the Building Act 2004

Some plumbing and drainage work does not require a building consent. Plumbing and drainage work that does not require a building consent is listed under Part 2 of Schedule 1 of the Building Act 2004.

All work listed here is exempt provided that the work is carried out by persons authorised under the Plumbers, Gasfitters and Drainlayers Act 2006. This work is considered low-risk, and includes conditions to manage risk.

Detailed information regarding plumbing and drainage work for which a building consent is not required, and several examples, are provided in this section. All plumbing and drainage work – whether needing a building consent or exempt – must still comply with the Building Code and other relevant legislation, including:

- *Plumbers, Gasfitters, and Drainlayers Act 2006*
- *Gas Act 1992*
- *Gas (Safety and Measurement) Regulations 2010*
- *Electricity Act 1992*
- *Electricity (Safety) Regulations 2010*
- *Resource Management Act 1991*
- *Fire and Emergency New Zealand Act 2017*
- *Health and Safety at Work Act 2015*
- *Local Government Act 2002*



Schedule 1 Building Act 2004 Version as at 26 November 2024

Schedule 1
Building work for which building consent not required

s 12

Schedule 1: replaced, on 28 November 2013 (but building work for which a building consent was not required under old Schedule 1 but for which a building consent is required under new Schedule 1 does not require a building consent if the building work commenced before this date), by section 73(1) of the Building Amendment Act 2013 (2013 No 100).

Schedule 1 heading: amended, on 1 January 2017, by section 18(1) of the Building (Pools) Amendment Act 2016 (2016 No 71).

1AA Interpretation

In this schedule, unless the context otherwise requires,—

Acceptable Solution B1/AS1 means Acceptable Solution B1/AS1 as set out in the Acceptable Solution for New Zealand Building Code Clause B1 Structure, issued by the chief executive under section 22 and available on the Ministry's Internet site, as in force on 28 November 2019

rural zone, in relation to building work, means any zone or area (other than a rural residential area) that, in the district plan of the territorial authority in whose district the building work is to be undertaken, is described as a rural zone, rural resource area, or rural environment, or by words of similar meaning

Verification Method B1/VM1 means Verification Method B1/VM1 as set out in the Verification Method for New Zealand Building Code Clause B1 Structure, issued by the chief executive under section 22 and available on the Ministry's Internet site, as in force on 28 November 2019.

Schedule 1 clause 1AA: inserted, on 31 August 2020, by clause 4 of the Building (Exempt Building Work) Order 2020 (LI 2020/171).

Schedule 1 clause 1AA **rural zone**: amended, on 23 December 2023, by section 6 of the Resource Management (Natural and Built Environment and Spatial Planning Repeal and Interim Fast-track Consenting) Act 2023 (2023 No 68).

Part 2
Sanitary plumbing and drainlaying carried out by person authorised under Plumbers, Gasfitters, and Drainlayers Act 2006

Plumbing and drainage

32 Repair, maintenance, and replacement

(1) The repair and maintenance of any sanitary plumbing and drainage in or associated with a building, provided that comparable building products are used.

(2) Replacement of sanitary plumbing and drainage in or associated with a building, provided that—
(a) a comparable building product or assembly is used; and
(b) the replacement is in the same position.

(3) However, subclauses (1) and (2) do not include the following building work:
(a) complete or substantial replacement of a specified system; or
(b) repair or replacement (other than maintenance) of any building product or assembly that has failed to satisfy the provisions of the building code for durability, for example, through a failure to comply with the external moisture requirements of the building code; or
(c) repair or replacement of any water heater (unless permitted under clauses 36 to 38).

Schedule 1 clause 32(1): amended, on 7 September 2022, by section 99(11) of the Building (Building Products and Methods, Modular Components, and Other Matters) Amendment Act 2021 (2021

Figure 5. ***Do you need a building consent?***

Discretionary building consent exemptions

Even if work is not listed as exempt building work, you can still apply for a discretionary exemption from the requirement to obtain a building consent through your local council if the building work is low-risk, complies with the Building Code, and is unlikely to endanger people or property. It is recommended that you talk to your council first before applying for a discretionary building consent exemption.

Offences and penalties – notices to fix

If your work does not meet the requirements of the Building Act, your council can issue you with a 'notice to fix' for any breaches of the Building Act and/or Building Code. You can be issued with a notice to fix not just current consented building work, but all breaches of the Building Act 2004 – for example, non-compliance with the requirement to obtain a building consent where necessary, or the requirement for all building work to comply with the Building Code. It is an offence to fail to comply with a notice to fix. On

conviction, you are liable for a maximum fine of $200,000 and a further $20,000 for each day the offence is continued. An instant fine of $1,000 can also be issued if a notice to fix is not complied with.

Who can undertake exempt work

Some exempt building work requires that an authorised professional carry out, supervise, design or review the design of the proposed work. Exempt plumbing and drainlaying work must be carried out by persons authorised under the Plumbers, Gasfitters and Drainlayers Act 2006.

Exempt work must comply with the Building Code

All exempt building work must comply with the Building Code. After the building work is completed, if the building complied with the Building Code immediately before the work commenced, the building must continue to comply. If the building did not comply immediately before the work began, the building must continue to comply at least to the same extent as it did previously.

In essence, you cannot leave the building at a lower standard than it was prior to commencing the work.

Exempt plumbing and drainage work

Part 2 of Schedule 1 of the Building Act 2004 lists sanitary plumbing and drainlaying work that does not require a building consent. This work must be carried out by persons authorised under the Plumbers, Gasfitters and Drainlayers Act 2006, and must comply with the Building Code. The following section provides detailed information regarding plumbing and drainage work for which a building consent is not required, along with several examples of exempt work.

The following pages provide detailed information regarding plumbing and drainage work for which a building consent is not required, along with several examples of such work.

Repair, maintenance, and replacement of sanitary plumbing and drainage (exemption 32)

This exemption enables a range of work relating to the repair, maintenance and replacement of sanitary plumbing or drainage to be done without a building consent, as long as it is carried out by an authorised plumber or drainlayer.

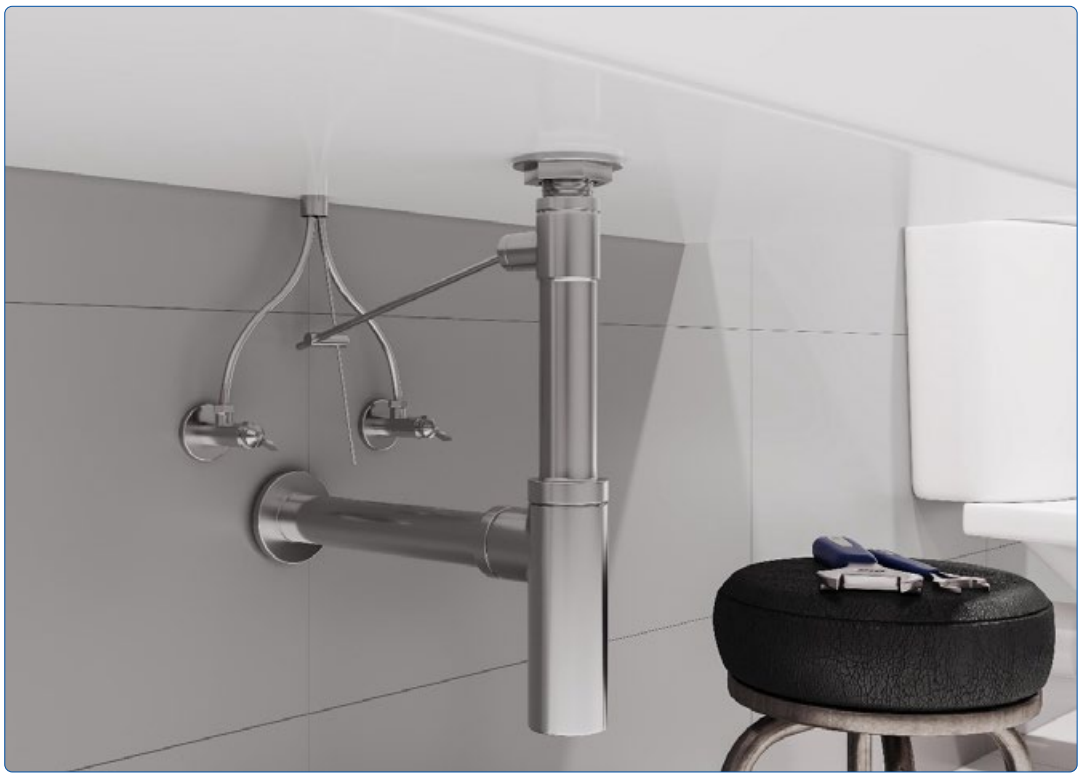


Figure 6. ***Basin connections***

What the law says

Schedule 1 of the Building Act 2004

32. Repair, maintenance, and replacement

1. The repair and maintenance of any sanitary plumbing and drainage in or associated with a building, provided that comparable materials are used.
2. Replacement of sanitary plumbing and drainage in or associated with a building, provided that:
   a) a comparable component or assembly is used; and
   b) the replacement is in the same position.
3. However, subclauses (1) and (2) do not include the following building work:
   a) complete or substantial replacement of a specified system; or
   b) repair or replacement (other than maintenance) of any component or assembly that has failed to satisfy the provisions of the Building Code for durability, for example, through a failure to comply with the external moisture requirements of the Building Code; or
   c) repair or replacement of any water heater.

How it works

For repairs and maintenance, comparable materials must be used. For replacement work, comparable components or assemblies can be used providing the replacement is in the same position.

Examples

What is exempt

1. A homeowner wants to replace an existing vanity with a new one. A building consent is not required as they are replacing an existing sanitary fixture with another comparable fixture in the same position.
2. A section of a glazed earthenware drain is damaged and requires replacement. A drainlayer proposes to replace the damaged section with uPVC. This does not require a consent as it is considered to be a comparable component in the same position.

What needs consent

1. A commercial building owner needs to replace a backflow preventer (reduced pressure zone device). As an automatic backflow preventer is a specified system and the work involves a complete replacement, a building consent is required.

Drainage access points (exemption 33)

This exemption covers work to drains via a purpose-made access point and carried out by an authorised person.



Figure 7.Access point

What the law says

Schedule 1 of the Building Act 2004

33. Drainage access points

The opening and reinstatement of any purpose-made access point within a drainage system that is not a NUO system or part of a NUO system.

Examples

What is exempt

A drain is blocked by a back-up of waste material within the drainage system after a child flushed a hand towel down the toilet. The drainlayer fixes the problem by opening a purpose-made access point, removing the towel, clearing the blockage and reinstating the access point.

What needs consent

A multi-storey apartment building has a blocked drain and no access points can be found. The drainlayer determines that several access chambers will need to be installed for future access. As this involves more than opening and reinstating access points, and since it is not considered minor drain alterations, a building consent is required.

Minor alteration to drains (exemption 34)

This exemption relates only to residential dwellings and enables an authorised drainlayer to undertake minor alterations to existing private drainage without needing a building consent.

This sort of drainlaying work usually occurs during alterations to existing bathrooms, kitchens, or laundries. New connections to public drainage are specifically excluded from this exemption.



Figure 8. ***Gully trap***

What the law says

Schedule 1 of the Building Act 2004

34. Minor alteration to drains

2. Alteration to drains for a dwelling if the alteration is of a minor nature, for example, shifting a gully trap.

3. Subclause (1) does not include making any new connection to a service provided by a network utility operator.

Examples

What is exempt

1. A plumber is relocating the kitchen sink to an adjacent wall. A drainlayer needs to shift the existing external gully trap servicing the kitchen a short distance to receive the discharge from the repositioned sink wastepipe.
2. A toilet pan has been repositioned in an existing dwelling's bathroom and is reconnected one metre downstream from the previous drain connection.
3. Installing a new access or rodding point for unblocking drains.
4. Capping a branch drain following the removal of sanitary fixtures from an outbuilding associated with a dwelling.
5. A network utility operator has provided a new sewer lateral connection at the boundary of an existing dwelling and capped the previous lateral. A drainlayer reroutes a two-metre length of drain to reconnect to the new network utility operator lateral.

What needs consent

1. A dwelling's branch drain is intended to be extended by 16 metres. As the branch drain will exceed 10 metres, it comes under requirement for venting under Building Code clause G13 – Foul water. As the length and venting requirements of the drain are more than a minor alteration, a building consent is required.
2. A motel owner plans to reconfigure their laundry, which includes adding another laundry tub. As a consequence, the main drain will need to be extended by several metres around the perimeter of the building. Although the drain extension is minor, the installation of an additional laundry tub is outside the scope of this exemption. Furthermore, as the building is not a dwelling, it is not covered by this exemption and a building consent is required.
3. A drainlayer proposes to reposition a dwelling's drain connection into the network utility operator drain, which traverses the property and is covered by an easement on the title. A building consent will be required, as this is a new connection to a network utility operator drain.

Alteration to existing sanitary plumbing (excluding water heaters) (exemption 35)

This exemption enables an authorised plumber to carry out alterations to sanitary plumbing.

This exemption applies only as long as the alterations do not increase the total number of sanitary fixtures within any existing building, and do not modify or affect any specified system.

If you are not sure if this exemption applies to your proposed work, it is recommended either that you seek a discretionary exemption from the council or apply for a building consent, rather than risk exempting the work incorrectly.

Where sanitary plumbing work could adversely affect the structural performance of structural elements such as floor joists or wall framing, the work may require a building consent. If you are not sure, you should first seek professional advice from a suitably qualified person, such as a Licensed Building Practitioner, Chartered Professional Engineer or Registered Architect.



Figure 9. ***WC relocation***

What the law says

Schedule 1 of the Building Act 2004

35. Alteration to existing sanitary plumbing (excluding water heaters)

1. Alteration to existing sanitary plumbing in a building, provided that:
   a) the total number of sanitary fixtures in the building is not increased by the alteration; and
   b) the alteration does not modify or affect any specified system.
2. Subclause (1) does not include an alteration to a water heater.

Examples

What is exempt

1. Repositioning or replacing sanitary fixtures such as a bath, bidet, wash hand basin, shower or toilet pan within an existing bathroom in a dwelling.
2. Moving a toilet pan from a toilet compartment into an adjacent existing bathroom in a dwelling.
3. Remodelling an existing kitchen within the same space, leaving the kitchen sink in the same position.
4. Moving an existing laundry tub in a dwelling to a new location within the adjacent kitchen.
5. Relocating, removing or shifting an existing hose tap.
6. Removing a bath with a shower over it and replacing this with a new proprietary shower enclosure and a new bath within the existing bathroom space. As the existing bath/shower arrangement has two sanitary fixtures, each fixture can be replaced and relocated without the need for a building consent.

What needs consent

1. Moving a vanity, bath and shower within an apartment of a multi-level building. This building work involves new penetrations through a fire separation, which is a specified system.
2. An ensuite is proposed which includes the addition of a shower, hand basin and toilet. These sanitary fixtures are additional to those that already exist in the building, so a building consent is required.
3. A restaurant owner decides to increase the number of sanitary fixtures to allow for increased customer capacity. This work will require a building consent.
4. Installing a new testable backflow prevention device in a building that is not a dwelling. As this device is a specified system, a building consent is required, and the compliance schedule will also need to be amended.

Repair and maintenance of existing water heater (exemption 36)

This exemption enables an authorised plumber to repair and maintain water heaters associated with buildings



Figure 10. ***Mains pressure storage water heater repair***

What the law says

Schedule 1 of the Building Act 2004

36. Repair and maintenance of existing water heater

The repair or maintenance of any existing water heater using comparable materials, comparable components, or a comparable assembly

Examples

What is exempt

1. Repairing a leaking open-vented water storage heater.
2. Repairing a valve-vented water storage heater.
3. Replacing sacrificial anodes.
4. Repairing valves associated with water heaters.
5. Repair or maintaining solar water heating system collectors.

What needs consent

While repairing an existing open-vented storage water heater, a plumber is asked to replace the existing wood burner and wetback system. As replacing the wood burner and wetback is not considered to be repairs or maintenance, the building work requires a consent.

Replacement of open-vented water storage heater connected to supplementary heat exchanger (exemption 37)

This exemption enables an authorised plumber to replace open-vented water storage heaters associated with existing supplementary heat exchangers such as wetbacks or solar collection panels. The replacement water storage heater must be comparable and in the same position.



Figure 11. Example of an existing HWC installation with wet back installed prior to 2017 (safe-tray absent).

What the law says

Schedule 1 of the Building Act 2004

37. Replacement of open-vented water storage heater connected to supplementary heat exchanger

The replacement of any water-storage heater connected to a solid-fuel heater or other supplementary heat exchanger if the replacement:

a) is a comparable open-vented water storage heater; and

b) is fixed in the same position, and uses the same pipework, as the replaced water storage heater.

Examples

What is exempt

1. Replacing an open-vented water storage heater with a comparable open-vented water storage heater in the same position, using the same pipe work and connected to solar water heating collectors.
2. Replacing an open-vented water storage heater with another open-vented water storage heater in the same position, using the same pipe work and connected to a solid-fuel heater wetback.
3. Replacing an external water storage heater with a heat pump water storage heater (e.g. replacing an open-vented water storage heater with another open-vented storage heater) in the same position, using the same pipe work and connected to a heat pump.

What needs consent

1. Replacing an open-vented water storage heater with a valve-vented water storage heater. As the water-storage heaters are not comparable, a building consent will be required.
2. Replacing and relocating an open-vented water storage heater and reconnecting it to the existing wood burner with a wetback. As the replaced water storage heater will not be fixed in the same position, a building consent is required.
3. Replacing an open-vented water storage heater and adding a wetback where there was no wetback before.
4. Adding a roof-mounted solar collection panel which will be connected to an existing open-vented water storage heater.

Replacement or repositioning of water heater connected to controlled heat source (exemption 38)

This exemption enables an authorised plumber to replace and/or reposition an existing water heater of any type, as long as all the heat sources of the replaced or repositioned water heater are controlled.

This exemption will not apply if a water heater has a heat source that is not controlled, such as a wetback connected to a solid-fuel heating appliance, or a solar thermosiphon system.

A controlled heat source has controls or devices that ensure the water temperature in the storage tank is no greater than 90 degrees Celsius.



Figure 12. ***Continuous flow gas water heater replacement***

What the law says

Schedule 1 of the Building Act 2004

38. Replacement or repositioning of water heater that is connected to, or incorporates, controlled heat source

The replacement of any water heater (including the repositioning of an existing water heater) if the replacement water heater is connected to, or incorporates, a controlled heat source or, if connected to or incorporating more than 1 heat source, 2 or more heat sources all of which are controlled.

Examples

What is exempt – Water storage heaters

1. Replacing an existing valve-vented water storage heater with a thermostatically controlled valve-vented water storage heater, for example electric to electric, gas to gas, electric to gas, or gas to electric.
2. Repositioning an existing valve-vented water storage heater that has a controlled heat source.
3. Replacing an existing open-vented water storage heater with a valve-vented water storage heater that has a controlled heat source.
4. Repositioning an open-vented water storage heater, when in the new position it is connected to a controlled heat source.

What is exempt – Solar water storage heaters

5. Replacing and/or repositioning an existing water storage heating system comprising a water storage heater that includes controlled solar water heating collectors.
6. Replacing or repositioning an existing electric or gas water storage heater with a water storage heater system that includes controlled solar collectors.

What is exempt – Heat pump water storage heaters

7. Replacing a water storage heater with a heat pump water storage heater.
8. Replacing and repositioning an internal water storage heater with an external heat pump water storage heater.
9. Replacing an external water storage heater with an external heat pump water storage heater.

What is exempt – Instantaneous water heaters

10. Replacing or repositioning an instantaneous water heater that is thermostatically controlled.
11. Replacing an existing storage water heater with a gas instantaneous water heater.

What needs consent

1. Adding a solar collector to an existing water storage heater (even if the existing water storage heater has provision for solar connection). A building consent is required because this exemption only covers replacement or repositioning of existing water heaters.
2. Adding a wetback (not a replacement wetback) connected to a water storage heater. A building consent is required because this exemption only covers replacement or repositioning of existing water heaters. Also, the wetback is an uncontrolled heat source.
3. Adding a split heat pump (not a replacement split heat pump) to an existing water storage heater. A building consent is required because this exemption only covers replacement or repositioning of existing water heaters.

Summary of exempt plumbing and drainage

Some plumbing and drainage work does not require a building consent. Plumbing and drainage work that does not require a building consent is listed under Part 2 of Schedule 1 of the Building Act 2004.

This list includes plumbing and drainage work that does not require a building consent, provided the work is carried out by persons authorised under the Plumbers, Gasfitters and Drainlayers Act 2006. This work is considered low-risk and includes conditions to manage risk.

All plumbing and drainage work, whether it needs a building consent or is exempt, must still comply with the Building Code and other relevant legislation.

Building Consent amendments and minor variations

Where a building consent is required, plumbers and drainlayers are responsible for ensuring their work complies with the consented plans and specifications.

If you want to deviate from the consented plans and specifications in any way, you need to advise the owner and talk to the council about whether this requires a formal amendment, or can be accepted as a minor variation.

A **formal amendment** to a building consent entails a proposed significant difference from the consented plans after the building consent is issued. Since a formal amendment is considered a major change, it may require the submission of revised plans and specifications accompanied by an application form to the council. All formal amendments must be processed by the building consent authority within 20 working days.

Minor variations are a change to the design in the consented plans after the building consent has been issued. So long as the changes are small enough and do not affect Building Code compliance, the council can exercise its discretion as to whether it is significant enough to require an amendment to the building consent.

Minor variation approval should be sought and granted prior to the work being carried out. However, this may not always be possible. Seeking approval after work has been carried out should be done with caution, noting that the council has the responsibility to determine what action should be taken with the proposed variation, such as whether it is minor or major. Once the building consent authority has made the appropriate approvals, it may be determined that the variation is deemed not to meet the 'minor' threshold. Product substitution can be a minor or major variation.

Every council will have different processes in place to assess a minor variation. Typically, minor variations are made on-site by the building inspector, but some minor variations are assessed and approved by office-based building consent authority staff.

Involving the designer in the process when considering a minor variation helps ensure the proposed change does not adversely affect other parts of the building work. Depending on the proposed variation, the designer may need to provide a certificate of design work.

You should advise the owner if you are thinking about making changes to the plumbing or drainage work in any way that differs from the approved building consent plans and specifications. Ultimately, the owner is responsible for Building Code compliance and for obtaining a code compliance certificate – the owner needs to agree to any proposed changes. Tradespeople and designers may also be held responsible (or can be held liable) for complying with the approved consent.

Example scenarios for minor variations versus formal building consent amendments

Scenario 1: Minor variation for product substitution

The plumber contacts the plumbing inspector advising that the designer wants to change the water supply pipework material from copper to polybutylene and seeks approval for a minor variation. The plumbing inspector considers this a minor variation because: the polybutylene pipework system is manufactured in

accordance with the NZS Standard; will achieve an equivalent level of performance to the Building Code as the specified copper would; the swap from copper to a polybutylene system isn't likely to affect Building Code compliance of other parts of the work; and the consequences of building failure due to the product substitution wouldn't be significantly worse than if the currently specified product were used.

However, the plumbing inspector advises that approval from the consent applicant/building owner is required first for the change in material before the minor variation can be granted, recording this as a file note. The plumbing inspector then updates relevant consent records.

Scenario 2: Formal amendment for product substitution

A plumber wishes to use an alternative polypropylene piping system from overseas that they have read about on the internet, approaching a building inspector for a minor variation approval.

The inspector considers this not to be a minor variation because the new piping system is unfamiliar (it also doesn't state the relevant information required by the building product information requirements) and falls outside Acceptable Solution G12/AS1, requiring an alternative solution assessment. They then advise the plumber that the consent applicant needs to apply for an amendment to the building consent, demonstrating how Building Code compliance would be achieved using this alternative product. The inspector records the conversation with the plumber in form of a file note on the consent file and updates relevant consent records.

Scenario 3: Minor variation to bathroom layout

A bathroom on an upper level is approved to be laid out in a particular way. During the project, the owner proposes to move the vanity from the outside wall to an interior wall. They contact a building inspector to seek a minor variation, explaining that the additional pipe work will not affect any structural elements such as floor joists or wall framing, and G12 + G13 compliance will still be achieved.

The building inspector agrees to approve this as a minor variation, as the proposed building work does not deviate significantly from the original building consent design. However, the building inspector informs the owner that upon completion of the work, they will require a revised floor plan and plumbing schematic for their records. The decision to grant the minor variation is recorded in the form of a file note and relevant consent records are updated.

Scenario 4: Formal amendment to convert existing wardrobe into a WC compartment

In a similar situation, an owner wants to convert an existing wardrobe in an adjacent bedroom into a WC compartment and approaches a building inspector for a minor variation. This work would not be considered a minor variation as this work deviates significantly from the original building consent design. The building official advises that this requires a formal amendment to the building consent as issues such as B2 Durability, E3 Internal moisture, G4 Ventilation, G1 Personal hygiene, G12 Water supplies and G13 Foul water will need to be considered. The building inspector then notes the decision not to grant the minor variation as a file note on the consent file and updates relevant consent records.

Scenario 5: Minor variation by adding a shower head above a bath

The plumbing inspector is undertaking a pre-line plumbing inspection. During the inspection, the plumber advises the plumbing inspector that the owner wants to add a shower head above the bath.

The plumbing inspector considers this a minor variation, because there will be no additional Building Code requirements regarding E3 Internal moisture or F2 Hazardous building materials (such as safety glass), as the walls surrounding the bath are already covered in waterproof linings and the proposed shower is clear

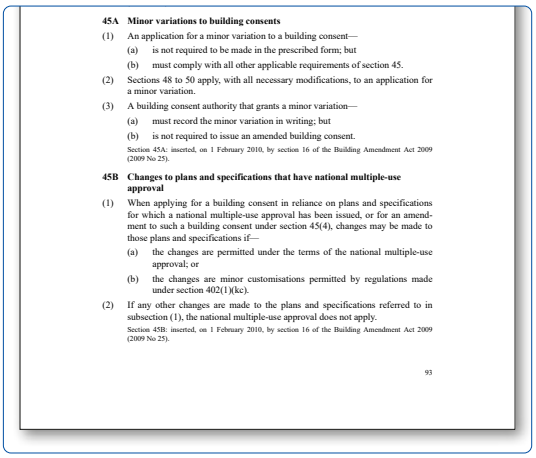
of any windows. The plumbing inspector notes the proposed minor variation on the approved plans and records the decision to grant the minor variation on the inspection notes and consent file.

When back at the office, the plumbing inspector also updates relevant consent records. The next day the plumbing inspector inspects the new plumbing work.

Scenario 6: Formal amendment to replace a bath with an open wet area shower

An owner intends to replace a bath with a tiled open wet area shower, proposing a minor variation to the plumbing inspector. The plumbing inspector considers that this is not a minor variation because it is a significant change to a complex construction method affecting a number of different Building Code requirements such as E3 Internal moisture and B2 Durability. The inspector advises that the owner should apply for an amendment to the building consent providing the wet area shower design.

The plumbing inspector then records this discussion on the inspection notes, places a copy on the consent file and updates relevant consent records.



45A Minor variations to building consents

(1) An application for a minor variation to a building consent—
- (a) is not required to be made in the prescribed form; but
- (b) must comply with all other applicable requirements of section 45.

(2) Sections 48 to 50 apply, with all necessary modifications, to an application for a minor variation.

(3) A building consent authority that grants a minor variation—
- (a) must record the minor variation in writing; but
- (b) is not required to issue an amended building consent.

Section 45A: inserted, on 1 February 2010, by section 16 of the Building Amendment Act 2009 (2009 No 25).

45B Changes to plans and specifications that have national multiple-use approval

(1) When applying for a building consent in reliance on plans and specifications for which a national multiple-use approval has been issued, or for an amendment to such a building consent under section 45(4), changes may be made to those plans and specifications if—
- (a) the changes are permitted under the terms of the national multiple-use approval; or
- (b) the changes are minor customisations permitted by regulations made under section 402(1)(kc).

(2) If any other changes are made to the plans and specifications referred to in subsection (1), the national multiple-use approval does not apply.

Section 45B: inserted, on 1 February 2010, by section 16 of the Building Amendment Act 2009 (2009 No 25).

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Figure 13. ***The Building Act 2004, section 45***

Summary

Key points:

- Build from the approved building consent plans and specifications. Look after them on site and refer to them frequently throughout the project.
- If you are thinking about varying the plumbing or drainage work in any way that differs from the approved plans, advise the owner. Ultimately, the owner is responsible for the building work and for obtaining a code compliance certificate.
- If you want to make a change to consented work, talk to the council about whether it requires a formal amendment or can be approved as a minor variation.
- Obtain a written record of any amendment agreed to by the building consent authority (for example, site inspection notice/record).
- Give as much notice of proposed changes as possible to avoid or limit delays.
- Explain why the proposed change is necessary and be prepared to offer your view on how it complies with the Building Code (the designer may have primary responsibility for this). It will help support any request for an amendment.

Conclusion

It's important to understand your roles and responsibilities under the Building Act 2004. It's also important to understand when work you've been asked to do requires a building consent and when a building consent is not required. You are responsible for ensuring all your work complies with the Building Code, even if the work doesn't require a building consent.

Where a building consent is required, you are responsible for ensuring your work complies with the consented plans. If you want to deviate from the consented plans in any way, it's important you advise the owner and seek approval the council prior to the work being carried out.

Protecting the public, your business, your trade



New Zealand's building laws help ensure that people can use buildings safely without endangering their health.

It's important plumbers, gasfitters, drainlayers and other industry professionals understand their roles and responsibilities under the Building Act 2004.

09

Topic 09:
Ensuring compliance and reliability in gas certification

This topic provides key insights into improving gas certificate compliance, addressing common areas of failure and nuanced situations for providing gas certificates.

Written by:

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Gas certification: A vital tool for safety and clarity

Gas certification might feel like a hassle, but it's crucial for ensuring gasfitting work is both safe and compliant. One key purpose of completing a gas certificate is to encourage the gasfitter to pause and evaluate the safety of the entire installation – not just the specific work done.

This is particularly important when working on an alteration or addition to an existing installation, which is classified as high-risk gasfitting. Before the introduction of the Gas (Safety & Measurement) Regulations 2010 (GSMR) – which formalised certification requirements – there were cases where gasfitters ensured their work was safe but overlooked safety issues in the existing installation.

Gas certificates don't just protect the public – they protect you too. When completed properly, they provide a clear record of the work you performed, offering peace of mind if changes are made to the installation later. If someone else modifies the system, the certificate makes it clear who was responsible for what.

In this topic, we'll cover:

- The Board's efforts to support the industry in improving gas certification practices
- Common areas for improvement and practical ways to address them
- How to approach certification in more complex situations, such as transportable structures
- How to ensure second-hand and/or imported appliances are safe to install.

By focusing on these areas, we can all contribute to raising safety standards and maintaining professionalism in the industry.

Supporting industry through gas certificate reviews

Meeting compliance obligations can feel overwhelming. However strong our technical knowledge, it sometimes seems that we also need to be legal experts just to keep up with our responsibilities. Gas certification is no exception.

The Gas (Safety & Measurement) Regulations 2010 (GSMR) outline New Zealand's gas certification requirements. Although these regulations have been in place since 2013, compliance issues with gas certification remain a recurring theme in Board prosecutions.

To proactively support the industry and improve compliance, the Board began voluntary reviews of gas certificates in May 2023. By November 2024, 68% of gasfitters contacted had participated in these reviews, which provide valuable feedback and guidance to help improve certification practices.

These reviews are yielding great results. An example of a positive outcome from one review is:

- A gasfitter using a self-designed gas certificate template was found to have an error in the wording of a required statement, which did not meet legal standards.

- A Board Technical Assessor identified the issue and provided guidance on how to correct it.
- Six months later, a follow-up review showed the gasfitter had fully addressed the issue, and their certification was fault-free.

This kind of success, just one of the reviews' many success stories, reflects the Board's purpose of protecting the health and safety of the public. By working together on these reviews, we can make compliance simpler and ensure gasfitting work meets the highest safety standards.

Common areas for improvement identified in gas certificate reviews

The Board's reviews of gas certificates have highlighted some recurring issues. These include:

- **Incorrect risk classification:** Mislabelling the category as High, General, or Low risk.
- **Failure to lodge high-risk records:** Missing entries in WorkSafe's high-risk database when required.
- **Incomplete documentation:** Certificates missing manufacturer's installation instructions or a reference to where they can be accessed online.
- **Insufficient identification:** Using only initials instead of the gasfitter's full name.
- **Lack of specificity:** Omitting the specific location of the work performed.

Let's delve into each of these issues in more detail, providing practical guidance to help you avoid these common pitfalls and ensure your certifications meet all requirements.

Understanding risk categories in gas certification

Certification requirements vary depending on the risk category of the work, making it essential for gasfitters to correctly identify the risk. Proper classification ensures that all required gas certificates are issued, and any high-risk records are lodged when necessary.

Certification requirement	Low-risk	General	High-risk
Certificate of compliance	Optional	Required	Required
Gas Safety Certificate	Required	Required	Required
Entry on WorkSafe's Electricity and Gas High-risk database	Not required	Not Required	Required

When determining the risk category, don't rely on assumptions. Instead, review each installation against the specific criteria outlined in Regulation 5A of the GSMR.

Example:
Suppose you're replacing a Continuous Flow Water Heater (CFWH) with a newer model. According to Regulation 5A, this work can be considered low-risk – but only if specific conditions are met.

If the gas connection layout for the new CFWH differs from the old one, you might need to reposition the gas pipework. This additional work moves the installation out of the low-risk category. Now it becomes an alteration to an existing installation, which is classed as 'high-risk'.

This example highlights why it's critical to evaluate each installation carefully. Misclassifying the risk can lead to non-compliance, so always check the regulations to ensure your work meets the correct standards.

5A Meanings of low-risk, high-risk, and general gasfitting

(1) In these regulations, **low-risk gasfitting** means gasfitting that comprises any of the following:

(a) the replacement of a gas appliance with an equivalent gas appliance, but only if—

(i) the work on the replacement appliance, or the replacement appliance itself, does not result in any of the following:

(A) the repositioning of pipework:

(B) the repositioning of flue system components:

(C) a change in the installation pressure:

(D) a change in the gas type:

(E) a significant change in energy consumption:

(F) a change in the ventilation:

(G) a change to the operation of the installation; and

(ii) the appliance is not located in a specified caravan or boat:

(b) the maintenance of fittings and appliances in an installation, other than repair work that is carried out following an accident that is notifiable under section 17 of the Act:

(c) the replacement, in an installation, of fittings that are instrumentation and related controls, but only if the work does not result in the repositioning or disturbance of pipework (other than instrumentation and related controls pipework):

(d) the setting, in connection with a gas installation, of safety devices, combustion conditions, and controls that are not designed to be adjusted by a consumer or gas refueller:

(e) gasfitting in a gas engineering workshop, manufacturing facility, gas test facility, laboratory, hospital, research project, or teaching institution, but only if—

(i) the work is the installation of temporary pipework between fittings (or between gas appliances, or between fittings and gas appliances), or the repair of fittings and gas appliances; and

(ii) the fittings or appliances are used for experimental, testing, demonstration, teaching, or research purposes:

(f) gasfitting for the purpose of testing in accordance with NZS 5255 or NZS 5256.

Figure 1. ***GSMR Regulation 5A.***

The importance of lodging high-risk records

High-risk records are the only publicly accessible documentation of gasfitting work. Under the GSMR, a record of high-risk gasfitting must be lodged on WorkSafe's database.

Common reasons records aren't lodged

- **Misidentification of Risk:** The gasfitter did not recognize the work as high-risk and, therefore, didn't realise a record was needed.
- **Administrative Oversights:** The certifying gasfitter failed to lodge the record, possibly due to an administrative error.
- **Access Issues:** Some gasfitters experienced difficulties accessing the database to lodge the record.

WorkSafe Support

WorkSafe manages the database; if you encounter access issues, their support team is available to assist you. Ensuring records are properly lodged is crucial to maintain compliance and transparency.

www.worksafe.govt.nz/contact-us/

Figure 2. ***WorkSafe logo.***

Attaching manufacturer's instructions to Certificates of Compliance (CoC)

Under Regulation 47 of the Gas (Safety & Measurement) Regulations 2010 (GSMR), a Certificate of Compliance (CoC) must include a copy of any manufacturer's instructions used during the gasfitting work. This applies to both new appliance installations and replacements.

However, attaching installation instructions isn't always practical, especially if you're working with hard copy instructions while issuing a digital gas certificate. For such cases, the regulations provide an alternative:

> "If it is impractical to attach a copy of a particular manufacturer's instructions, or of any certified design, to a certificate of compliance, the certificate must instead contain a reference to where the documents can be found, in a readily accessible format, through electronic means."

This means you can provide a URL link to the manufacturer's instructions. However, ensure the link is specific to the relevant instructions – not a general link to the manufacturer's website. For example, say you were installing a Rinnai Infinity EF26:

Instead of this…

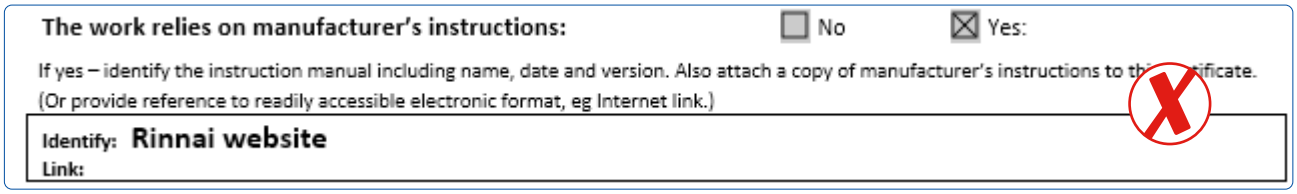


Figure 3. ***Incorrect way to provide reference.***

You should do this…

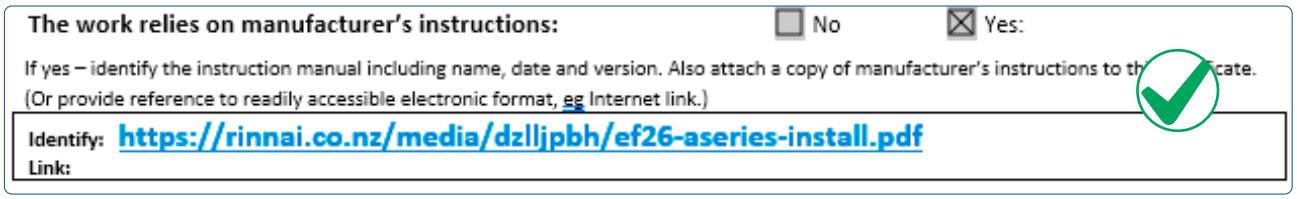
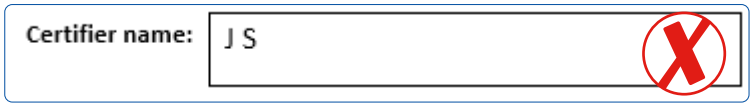


Figure 4. ***Correct way to provide reference.***

Why full names are required on gas certificates

The GSMR explicitly require gas certificates to accurately document the certifying gasfitter and anyone working under them. Using only initials or partial names does not meet this requirement and could render the certificate invalid.

So, when providing a name, instead of this;



Or this…

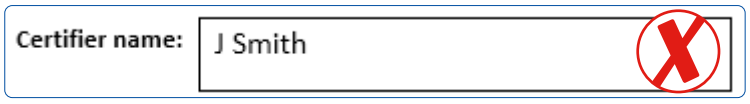


Fig 5. ***Incorrect name.***

You should do this…

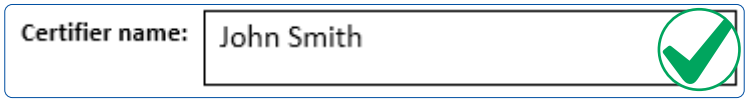


Figure 6. ***Correct name.***

The importance of full names

1. **Clear identification**

Including the full name ensures that everyone involved in the installation can be clearly and uniquely identified. This applies to both:

- The certifying gasfitter responsible for the overall work
- Individuals who worked under their supervision.

2. **Accountability and Compliance**

Full names provide a traceable record, ensuring compliance with regulatory requirements and accountability for the work performed.

3. **Avoiding invalid certificates**

Certificates that use only initials or partial names may fail to meet legal standards, potentially invalidating the document. This can have serious consequences, such as non-compliance penalties or complications during investigations.

In some circumstances this was simply a result of the certifier not putting the full name in. But often the problem happens when company software systems are configured to record only initials or part names for assigned workers. While this might seem like a minor oversight, it creates a compliance risk by failing to include the required full names.

The importance of specific location details on gas certificates

Gasfitters often excel at providing the address of a property on gas certificates, which works well for smaller sites like residential homes. However, larger and more complex sites – such as schools, hotels, or commercial buildings – require greater specificity.

Why specific locations matter

1. **Clarity and accuracy**

   On larger sites there may be multiple buildings, rooms, or areas with similar installations. Without clear identification of the specific location, it can be unclear which installation the certificate covers.

2. **Accountability**

   By specifying the exact location, the gasfitter ensures there's no ambiguity about which work they are certifying. This reduces the risk of being held responsible for unrelated installations or work.

Best practices for recording location details

1. **Be specific**

   - For a **school**, include the name of the building (e.g., "Science Block, Room 12").
   - For a **hotel**, identify the room (e.g., "Room 305, West Wing").
   - For a **commercial site**, specify the area or floor (e.g., "Kitchen, Ground Floor, Building B").
   - For a **part of an installation**, describe the relevant area (e.g., "Room 12, Science block to gas heater")

2. **Use Site Plans if needed**

   On particularly complex sites, refer to a site plan and include a reference to it in the gas certificate for additional clarity.

3. **Digital tools**

   When using digital gas certificates, consider incorporating a map or floor plan with marked locations to further eliminate confusion.

Key takeaways

Providing detailed location information on gas certificates significantly improves their clarity and quality. It:

- prevents misunderstandings about what installation the certificate applies to
- protects certifiers from being held accountable for work they didn't complete
- ensures compliance with regulatory standards and fosters trust in the certification process.

Certifying gas installations on portable buildings

Certifying gas installations in portable buildings – such as prefabricated structures delivered to another site – can present unique challenges.

Key questions to consider

1. **What address do you use?**

   Since the building is moved from one location to another, determining the correct address for the gas certificate can be problematic.

2. **How do you confirm the install is safe?**

   Although the gasfitting may be safe at the time of installation, anything could happen to it during transport.

3. **Who is responsible for the installation?**

   The gasfitter connecting the gas at the new site didn't do the original installation and wouldn't want to be responsible for someone else's work.

These are important questions that many gasfitters have encountered. The flow chart below provides a recommended pathway when certifying installations on portable buildings.

Following this pathway is not mandatory. But it is a pathway to help ensure all compliance obligations are met while ensuring the installation is safe and gasfitters are not inadvertently taking responsibility for work they didn't complete.



Figure 7. ***Prefabricated building.***

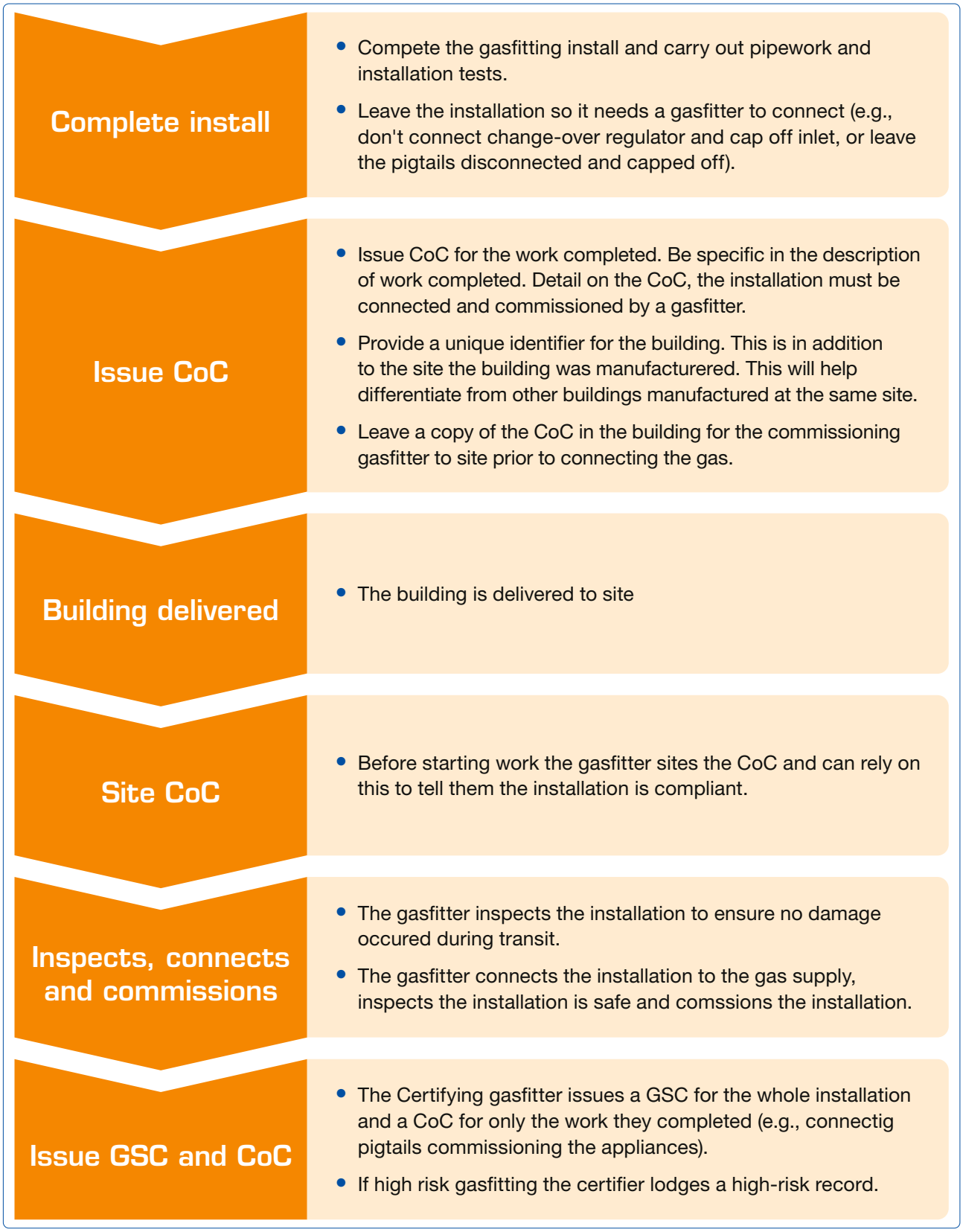
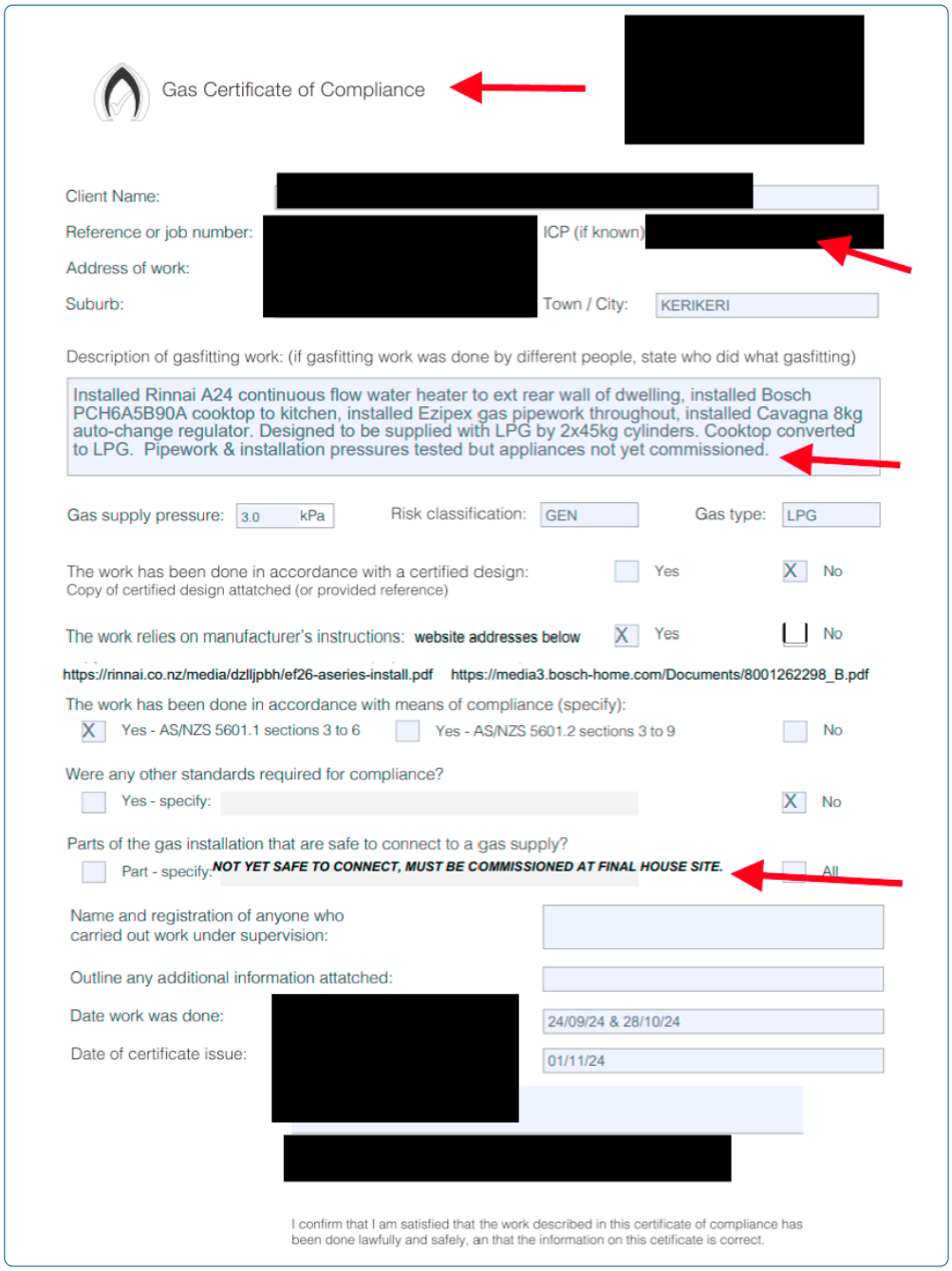


Figure 8. ***Certification pathway for buildings transported to site.***

The below redacted CoC is an example of one provided for a prefabricated building not yet delivered. Notice some key elements:

- It is a CoC and not GSC, as it is not yet safe to connect the gas
- An identification number was provided (this was redacted for privacy)
- The certificate description specifies what work was done but makes it clear that the installation must be commissioned once on site
- The certificate makes it clear that it's not yet safe to connect until the installation is commissioned.



Gas Certificate of Compliance

[redacted]

Client Name: [redacted]

Reference or job number: [redacted] ICP (if known) [redacted]

Address of work:

Suburb: Town / City: KERIKERI

Description of gasfitting work: (if gasfitting work was done by different people, state who did what gasfitting)

Installed Rinnai A24 continuous flow water heater to ext rear wall of dwelling, installed Bosch PCH6A5B90A cooktop to kitchen, installed Ezipex gas pipework throughout, installed Cavagna 8kg auto-change regulator. Designed to be supplied with LPG by 2x45kg cylinders. Cooktop converted to LPG. Pipework & installation pressures tested but appliances not yet commissioned.

Gas supply pressure: 3.0 kPa Risk classification: GEN Gas type: LPG

The work has been done in accordance with a certified design: ☐ Yes ☒ No
Copy of certified design attatched (or provided reference)

The work relies on manufacturer's instructions: website addresses below ☒ Yes ☐ No

https://rinnai.co.nz/media/dzlijpbh/ef26-aseries-install.pdf https://media3.bosch-home.com/Documents/8001262298_B.pdf

The work has been done in accordance with means of compliance (specify):
☒ Yes - AS/NZS 5601.1 sections 3 to 6 ☐ Yes - AS/NZS 5601.2 sections 3 to 9 ☐ No

Were any other standards required for compliance?
☐ Yes - specify: ☒ No

Parts of the gas installation that are safe to connect to a gas supply?
☐ Part - specify: ***NOT YET SAFE TO CONNECT, MUST BE COMMISSIONED AT FINAL HOUSE SITE.*** ☐ All

Name and registration of anyone who carried out work under supervision:

Outline any additional information attatched:

Date work was done: [redacted] 24/09/24 & 28/10/24

Date of certificate issue: 01/11/24

[redacted]

I confirm that I am satisfied that the work described in this certificate of compliance has been done lawfully and safely, an that the information on this cetificate is correct.

Figure 9. ***Example of CoC when provided prior to a building being delivered to site.***

Figure 10 shows a set up for a change-over regulator without it being installed. This prevents the installation being connected to the gas without a gasfitter connecting it. Another option to prevent the installation being connected is to install the change-over regulator but leave the pigtails disconnected and capped with POL caps.



Figure 10. ***Example of gas installation with the change-over regulator not connected.***

Certifying a second-hand or imported appliance

We've all been there – a customer asks you to install a gas appliance they've supplied. It could be a second-hand cooker bought online, or a specialist appliance imported from overseas. Refusing the job might protect you from potential issues, but it also means losing out on the immediate work and potentially any future jobs from that client. Instead of refusing, there's a pathway to ensure the installation is safe and compliant.

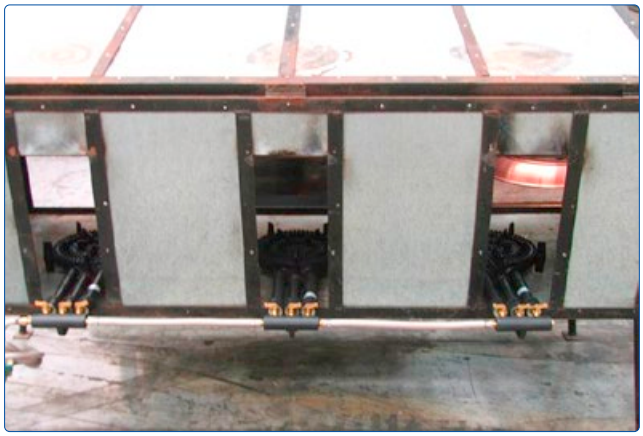


Figure 11. ***Small-batch manufactured BBQ.***

Understanding supplier declarations and endorsements

Most gas appliances require a supplier declaration to confirm compliance with New Zealand standards. However, where small-production appliances supply 21 or fewer units in New Zealand per year, the appliance can be endorsed by an Approved Practitioner.

Who is an Approved Practitioner?

An Approved Practitioner is an individual authorised by WorkSafe to issue endorsements for gas appliances which do not fall under the usual certification regime. To become an Approved Practitioner, a person must meet the following criteria set by WorkSafe:

- **Competence and Technical Knowledge:** Demonstrated ability to assess the safety and suitability of appliances.
- **Business Structures and Insurance:** Appropriate business arrangements, including liability insurance, to support their role.
- **Compliance Expertise:** A thorough understanding of compliance standards and the ability to undertake or assess appliance testing and commissioning.

A register of Approved Practitioners is available on WorkSafe's website, ensuring gasfitters can easily find someone qualified to provide endorsements.

The role of NZS 5266 in appliance safety

An endorsed appliance must comply with NZS 5266 – Safety of Gas Appliances, which outlines essential safety requirements for gas appliances not covered by a recognised certification regime. Gasfitters with an active trade license can access this standard through the Standards New Zealand library via their trade login.



Figure 12. ***NZS 5266 Safety of gas appliances***

Key points about endorsements

1. **Appliance-Specific endorsements:**
   - Endorsements are issued for individual appliances, not batches.
   - For example, if 10 identical appliances are imported, each requires its own separate endorsement.
2. **Endorsements are not always mandatory:**
   - While an endorsement may not be legally required for every installation, **all gasfitting must be safe**.
   - Obtaining an endorsement ensures the appliance is assessed for safety and compliance, providing peace of mind for both the gasfitter and the customer.
3. **Benefits of getting an endorsement:**
   - Ensures the appliance complies with safety standards.
   - Protects the gasfitter from liability by demonstrating due diligence.
   - Builds trust with the customer by showing a commitment to safety and compliance.

Let’s build a safer future together

This topic was written to support gasfitters in strengthening their understanding of gas certification practices. Proper gas certification isn't just a regulatory obligation – it’s a crucial element of protecting your customers, your business, and the reputation of the gasfitting trade.

If you have questions about gas certification you can call the Board’s technical helpdesk for support. Phone: 0800 743 262.

Protecting the public, your business, your trade



While the process of gas certification may seem like an extra step, certification is crucial for confirming that gasfitting work is compliant and safe. It encourages professionals to assess the entire system, particularly during alterations, to prevent overlooked hazards. Certification not only protects the public but also the gasfitter by documenting the work performed, clearly showing who is responsible for the work. In complex cases, like second-hand appliances, there is a certification pathway which ensures safety and maintains industry professionalism.

APPENDIX 1:
Checklist for classifying risk

If any of these apply the work is low risk:

Low risk gasfitting	✓
Replacement of a gas appliance with an equivalent gas appliance (like for like). Only if you don't change the: • pipework • flue • installation pressure • gas type • gas consumption • ventilation • operation of the installation and the appliance is not in a caravan or boat.	◯
Maintenance of fittings and appliances, but not after a notifiable accident	◯
Changing instrumentation and controls without changing pipework	◯
Setting safety devices, combustion conditions, and controls	◯
Testing in accordance with NZS 5255 or NZS 5256	◯
Gasfitting in a gas engineering workshop, manufacturing facility, gas test facility, laboratory, hospital, research project, or teaching institution, only if: • the pipework is temporary • the installation is for experimentation, testing, demonstration, teaching, or research.	◯

If any of these apply and the work is not low-risk, then the work is high-risk.

High Risk Gasfitting	✓
Alteration or addition to an existing installation	◯
Work not carried out according to AS/NZS5601.1 or AS/NZS5601.2	◯
Gas pressure-raising equipment is present	◯
Repair work following a notifiable accident	◯
Working in domestic premises with a maximum operating pressure of greater than: • 7 kPa for natural gas • 14 kPa for LPG	◯
Work in a building with more than 3 storeys and 3 or more separate dwellings	◯
Work in a caravan or boat with an operating pressure of more than 3 kPa	◯
Any installation where the operating pressure is more than 200 kPa	◯
Within 20 metres of a hazardous area	◯
When air pressure within the building, or for combustion, is controlled by a mechanical system	◯
Work in a caravan or boat with sleeping accommodation.	◯

General gasfitting is any work that is neither low-risk nor high-risk

10

Topic 10:
Tips for dealing with customer complaints and challenging jobs

This topic considers work situations which may be difficult or challenging and offers some tips for how to deal with them.

Written by:

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Plumbers, Gasfitters and Drainlayers Board

Introduction

Every practitioner has dealt with a job that has gone pear-shaped for one reason or another. It may be the site which ends up being more challenging than you thought. Or the installation which turns out to be more complicated than you expected.

Or it may be the customer who changes their mind halfway through the job and suddenly wants everything done differently but for the same price and within the same timeframe.

Whatever the cause, some jobs are just more difficult than others. Sadly, difficult jobs often end up as complaints to the Board.

In this topic, we are going to look at a scenario that often confronts practitioners: the incomplete job – and what you can do to best protect yourself in such a situation. We are also going to look at some tips and tools you can use for dealing with an unhappy client.



Figure 1. ***Unfinished building site***

What to do if you are kicked off site

Sometimes the relationship with a customer – homeowner, builder, or project manager – can go sour. In the worst case scenario, the practitioner might be kicked off the site partway through the job, or choose to leave because they feel they can no longer continue.

Situations like this can end up with the client making a complaint to the Board about the practitioner. If this happens to you, there are some important steps you can take to protect yourself and put yourself in the best position to respond to any complaint.

A picture paints a thousand words

Take photos of your work. There is no better record of what you have done than a photograph. Another practitioner (such as one of the Board's technical advisors in an investigation, or a practitioner member of the Board in a disciplinary hearing) can easily look at your photos and see what you have done.

Some practitioners take photos of the work they do every day and this really is best practice. It is a visual record of what you have done and when. It also shows what state the work is in at the end of every day.

If taking photos every day seems too much, try and take them at the end of each significant stage of your work.

Upload your photos to your work recording system or your cloud storage on a regular basis. Don't leave them on your phone, as you could lose them if your phone gets lost or stolen.

If the worst happens and you are asked to leave the site, make sure you take photos of the state of your work before you go so you have a record of how the job looked when you left. Should a complaint be made, these photos will be critical in being able to show that your work was incomplete and not negligent or incompetent.

Record what you have done

As well as taking photos of your work, make sure your job card or work records are complete up to the point in time when you last left the site. Try and do this as soon after you leave the site as possible, while everything is still fresh in your mind. It is much harder to remember things months (or even years) after you leave the site.

Issue a gas certificate

If you are doing gasfitting work and are removed from the site before you can finish the job, your best safeguard is to issue a certificate of compliance for the work you have done. It is worth doing this even if the work is low-risk gasfitting.

Because the work is not complete, you will not be able to complete the certificate – but you should fill in the parts you can, and clearly state the installation is incomplete.

You should provide a copy of the certificate to the client. Doing this is about protecting yourself because you have done what you should. The certificate also protects any new gasfitter who may be brought in to complete the installation.



Figure 2. ***Locked out***

Walking off site

Sometimes you may find yourself in a situation where you can no longer continue with a job you have started, and you may end up walking off the site.

Where this happens, it is even more important that you take steps to record the state of the work when you left. As in the section above, take photos and make a record of the work you have done identifying the work that has been:

- completed
- started but not yet finished
- not yet started.

You should also complete any documentation that applies, such as as-builts (recording the work you have started) and a gas certificate (noting the work is not yet finished). You should provide a copy of any gas certificate to the customer. This is not for them. This is to best protect you.

Finishing an incomplete installation

What if you are the new practitioner who is asked to come in and complete a part-finished installation?

Some practitioners won't complete work that has been started by another practitioner, particularly if the relationship between the client and that practitioner has completely broken down. But if you do agree to complete work started by someone else, there are a few things you should do to safeguard yourself.

Record the work before you begin

First, before you do any work you should take photos of the work that has already been carried out. This is especially important if any of that work may be negligent or incompetent rather than just incomplete. You may need to be able to show what work is yours and what isn't. Where you have to re-do work, take before-and-after photos.

You should also record what state the job was in before you start, to make it clear what you have done and what was already done when you started.

Talk to the previous practitioner

Depending on the circumstances, you may want to consider ringing the previous practitioner and finding out why they left the site. Sometimes the customer's version of what happened and why will be different from the practitioner's; it pays to find out from them directly what happened.

Get all the paperwork

If the work is consented work you should ask the customer for copies of all relevant resource and/or building consent documents such as plans, designs, schematics, calculations, and specifications. You should also ensure you have all the manufacturer's instructions as the appliances may already have been

purchased. If the work is gasfitting, ask for any certificates that have been issued for the work you are going to be doing and any other gasfitting work on the property.

Taking the time to find out as much as you can before taking on an incomplete job may help you avoid ending up in the same position as the previous practitioner.

Avoiding getting thrown off site

The best way to deal with getting kicked off site or having to walk off is to try and avoid it happening in the first place.

Talk to the customer

The single biggest thing that will help you to avoid this is good communication. Keep your customer informed about what is going on with the work. Tell them if there will be delays and why. Talk to them about any changes that may be needed. Most importantly, talk to them about any issues or concerns. Good communication is key to managing your relationship with the customer and keeping their expectations in check.

When talking fails

Even with good communication, sometimes things will still go wrong and the customer will end up making a complaint.

When that happens, it pays to have a process in place for dealing with their complaint. Dealing with issues the right way and as they arise may stop the situation from escalating to the point where the relationship breaks down completely and you have to leave the site.

Dealing with complaints is hard

Dealing with customer complaints is not easy, but having a good process in place can help. It gives you a clear approach you can follow, a way to deal with the matter when emotions may be high. It may also offer you a way of dealing with concerns when they are small, before things become unpleasant.

Some things to think about:

- Everyone makes mistakes. If you have made a mistake, consider owning it, fixing it, and learning from it.
- Try not to get caught up in the emotions of the situation. This is really hard, but it will help to focus on the facts of the situation and what, if anything, you can do. If necessary, wait for a couple of hours to cool off before responding to a complaint.
- Learn from a complaint. Is there something you can do to improve how you work to make sure you don't have to deal with a similar situation again in the future?
- Remember how important your reputation is. Word-of-mouth is probably the biggest way the public finds practitioners. What do you want your clients to be telling others about you?
- If possible, consider fixing any issue first and then discussing the situation with the customer. It is much harder for the customer to complain if you have fixed whatever it is they want to complain about.
- Don't ignore complaints and hope they will go away. They never do, and ignoring them will almost always makes the situation worse!

Process for dealing with a complaint

A complaints process doesn't have to be complicated. In fact, the clearer and simpler the process, the easier it is for you to follow and your customers to understand.

Timeframe for dealing with complaint

As well as having a good process to follow, it is important to deal with complaints in a timely way. That doesn't mean they need to be dealt with immediately. It may be useful to take some time to let any anger or stress lessen before you try to deal with a complaint you receive. But it is important to deal with it and not put it in the "too hard" basket and hope it will go away.

A suggested timeframe might be:

- Day 1 – complaint received
- Day 1 or 2 – acknowledge complaint
- Week 1 – seek further information or clarification if needed
- Weeks 2 to 3 – respond to complaint setting out your view of the complaint and suggesting any options for resolving the complaint
- Weeks 4 to 5 – if appropriate, take any action to resolve the complaint.

Acknowledge the complaint

Acknowledging the complaint is not a nicety, it is a critical first step in dealing with it.

Acknowledging a complaint doesn't mean the complaint has merit. It just acknowledges that the client is unhappy about something. If they have taken the time to write and make a complaint, take the time to write back and acknowledge it.

An acknowledgement doesn't have to say anything substantive about the complaint. It can just say you have received the complaint and you will respond.

Be clear about what they are complaining about

This may sound obvious, but it is not always clear what the customer is concerned about, especially if they are upset.

If the customer has complained by phone or text, ask them to put their concerns in an email and to clearly identify the particular work they are concerned about and why. Not only should this give you the information you need, it may help them to focus on the work rather than their emotions.

Go back to the customer with any questions you may have and ask them to provide any information you need to respond to their complaint. For example, they may have the manufacturer's instructions for any appliances and you may need to see them to be able to respond to their complaint.

Remember, you are the person with the skills and training. You client won't necessarily know what they are talking about (even if they think they do), so you may have to guide them with questions to get the information you need.

Providing your response

Once you have all the information you need, respond to their concerns.

If you accept that something is wrong, say so and why. If you don't think anything is wrong, say that and why. Provide a proper explanation and use plain language so the client will understand.

If you do accept that something is wrong, say what you will do to fix it. If there is something wrong but it isn't because of anything you have done, say what you can do to help resolve the issue. If that involves more cost for the client, clearly state that and what that cost will be.

The most important things about responding to a customer's complaint are to:

- be professional – you are the expert in this area
- be clear, and
- provide the client with all the information they need to understand your response to their complaint.

Resolving matters

If you say you are going to do something to resolve the complaint, make it a priority to do it. Saying you will do something in response to a complaint but then not doing it, or not doing it promptly, will not resolve the complaint and will likely make things worse. The sooner you do whatever you have agreed to do, the sooner you can close the complaint and move on.

If you have to do further work for the client as part of resolving their complaint, make sure they are aware of what costs you will cover (if any) and what additional costs they must cover (if any). Make sure they have agreed to this in writing before you begin or you may end up having another complaint about the work you did to address their first complaint!

Keep records of the complaint

It is good practice to keep any records of a complaint and how you dealt with it. If possible, you should keep them with the work records for the job.

It is also good practice to review a complaint once it has been resolved to see if there is anything you can learn from it. Not all complaints will mean you should make changes to your work practices, but some might. It may be something as simple as introducing a new checklist for that kind of work going forward, to make sure you don't end up in the same position again.

Not all complaints can be resolved

Having a complaints process doesn't mean all complaints can be resolved. Nor is a practitioner expected to accept they have done something wrong in every case.

Some complaints won't be able to be resolved between you and the client. You may consider you have done nothing wrong in the circumstances, and you are entitled to come to that view. People complain for a number of reasons after all, and not all complaints are legitimate.

However, even if the complaint is not resolved and ends up as a complaint to the Board or a Disputes Tribunal hearing, it looks better for you if you have a complaints process in place and can show the steps you have taken to try and resolve the client's concerns.

Conclusion

It goes without saying that work can be tough sometimes. Things can and do go wrong. Whether they go wrong because of something you have done, something someone else has done, or for any other reason, it isn't possible to avoid challenging jobs.

But it is possible to put yourself in the best possible position to protect yourself by how you deal with those challenging situations.

Take photographs (and save them somewhere safe). Write things down. Record things that happen at the time they happen. Have a process for dealing with complaints and follow the process. Even if it doesn't result in the complaint being satisfactorily resolved, you can show you tried. This is the best way to protect yourself.

Protecting the public, your business, your trade



Protect your business, your industry, and the public by knowing how to handle a complaint properly. The reputation of both your business and the industry depends on your ability to manage these situations effectively. Stay calm, gather all relevant information to fully understand the concern, respond promptly, and document the steps you've taken to address the issue. By doing so, you're ensuring the continued protection and credibility of your business and the industry as a whole.

Notes

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