National Certificate in Building, Construction, and Allied Trades Skills (BCATS)

Demonstrate knowledge of the plumbing industry within a BCATS environment

Unit Standard – 25333

Level 2, Credit 2

Name: _____

What you need to do

By the end of this module, you should be able to demonstrate knowledge of the plumbing industry covering:

- major industry sectors
- industry work processes
- industry clients, supply and inter-trade relationships
- the impact of regulatory and trade bodies on the industry and
- industry jobs and their training requirements.

How you will be assessed

Your teacher/tutor will give you a worksheet that you need to complete, which your teacher/tutor will mark.

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Glossary of Terms

Term	Meaning
Plumber	A person licensed to carry out sanitary plumbing work.
Sanitary plumbing	Plumbing work involved with installing potable water supplies, reticulating potable and hot water, and installing waste and foul water discharge systems.
Domestic hot water	Water heated for household uses.
PGDB	Plumbers Gasfitters and Drainlayers Board
Building Consents Authority	Usually a local council. BCAs provide treated mains water and issue building consents.
Building consent	A document issued by the BCA approving proposed building, plumbing and drainlaying work.
Plumbing Inspector	An employee of the BCA who checks that plumbing work complies with regulations.
Drainage system	Drains installed below ground by a drainlayer (not by a plumber).
Elevated drainage	A discharge system installed by a plumber above ground, which is then connected to the drain.
Potable water	Water that is safe to drink.
Waste water	Water that has been used for washing or bathing, but does *not* contain human waste (i.e. urine and/or excrement).
Foul water	Waste water that contains human waste.
Gully trap	The entrance to a drain which is visible and open above ground.
Waste pipe	Drainage piping which conveys waste water only and discharges in the open air above the gully trap.
Discharge pipe	Drainage piping which conveys waste or foul water, and is either connected to a discharge stack or directly to the drain.
Discharge stack	Receives waste or foul water from discharge pipes and is connected to the drain.
Ventilation pipe	A pipe which allows air into and out of waste pipes, discharge pipes, and/or discharge stacks in order to prevent the loss of trap seals.
Trap seal	A water seal that prevents foul gases escaping from the drainage system and entering the building.

Introduction to Major Industry Sectors

Plumbing work includes a variety of tasks and skills, including:

- supplying potable cold water via pipes to sanitary fixtures
- installing sanitary fixtures (from where water is drawn)
- installing water heaters and hot water pipes to sanitary fixtures
- installing discharge pipes and systems
- connecting discharge pipes and systems to drainage
- installing elevated (above ground) drainage systems (stacks) and connecting them to the drainage system at just above ground level
- installing back-flow prevention systems to protect the potable water supply.

Plumbers may also:

- provide water proof flashings for penetrations of roofs and walls
- install roof and wall claddings
- install rain water handling systems
- install fire sprinkler systems.

The plumbing industry

Plumbers are responsible for designing, installing and maintaining systems in order to carry water.

Drinking water systems involve piping potable (clean) water from the supply toby to users through fixtures such as taps.

Non-drinking water systems can include piping recycled water for use in sanitary appliances, such as washing machines and toilets.

Plumbers must make sure that any installation is fit for its intended purpose, reliable, and safe for end users.

Potable (clean) water must be protected from contamination at all times. This includes preventing used water (non-potable water) from entering the potable supply. This is called back-flow prevention and is an area of work that some plumbers specialise in.

Plumbing systems must be installed so that they comply with the Building Code, which specifies that the system must be durable. Components of systems that are difficult to access or replace will need to be able to last for 50 years.

Plumbing systems must also be able to be serviced in the event of component failure or blockages. An example of component failure would be the replacement of valves, which wear out. Such valves therefore need to be installed in accessible positions.

An example of a blockage would be the flushing of an object such as a toy into a plumbing system, which then blocks a discharge pipe. That system would require access points which would allow entry into the pipework in order to inspect and remove the blockage.

Plumbers are also responsible for installing plumbing systems in ways that conserve water and protect the environment. The plumber must therefore be able to design simple systems to minimise pipe lengths and size, while also delivering adequate flows. The systems must be jointed correctly, and pipes prevented from damage so that foul water can safely leave the building.

On larger or commercial installations the plumber must be able to complete plumbing systems to other trades people's designs.

More complex systems will be designed by engineers or architects. These systems could involve larger pipe sizes; deliver higher water temperatures; require a greater knowledge of how buildings are constructed (including how to keep fire cells intact); and a wider knowledge of plumbing materials and jointing methods.

In these complex designs, water delivery systems are likely to have greater back-flow protection requirements than simple systems, as well as more complex pipework involving pumps, storage tanks and different combinations of energy use.

Some plumbers may also decide to extend their existing skills by learning how to fit sprinkler systems, which is a growing area of work.

Plumbers also often carry out work on roofing rainwater handling systems. This work could be as simple as installing spouting and downpipes, or connecting to storm water drains; or may involve more complex systems, such as rainwater collection tanks which pump a supply of water for domestic purposes.

Common Work Processes

Work commonly carried out by plumbers includes installing and maintaining:

- water supplies
- drainage systems
- pipework within property boundaries
- sanitary systems
- rain water handling systems
- wastewater systems
- back flow prevention systems
- sprinkler systems.

Water supply

The plumber is responsible for ensuring that installed water supplies are potable and can not become contaminated.

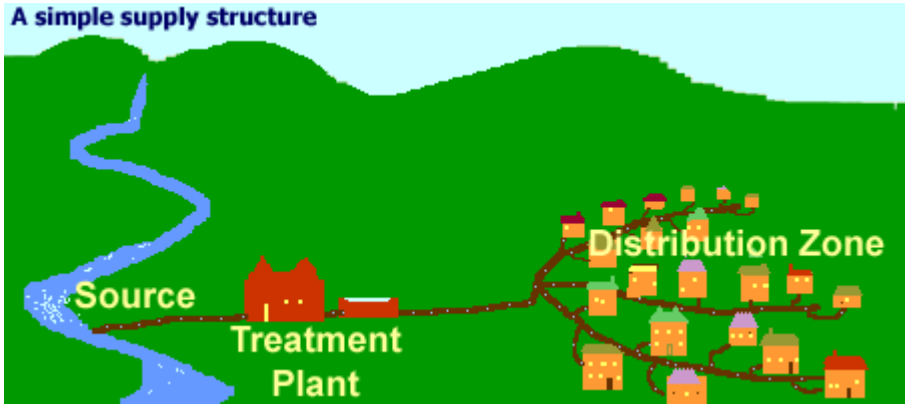
Common water supplies include:

- treated mains supply, as provided by the local council
- bore water, which is pumped up from below ground and stored in tanks
- rain water, which is collected from roof run-off and stored in tanks.

Treated mains supply

Councils supply water mains, which run beneath the streets and through to a shut-off valve at the property boundary called a "toby".

Plumbers connect service pipes from the toby to the building, and then continue this piping within the building to all outlets.



Bore water

Bores are commonly used in rural areas were there is no treated mains supply. Plumbers will install the pump and storage tank(s), and will either site the tank(s) uphill from the building to create a gravity feed, or install secondary pumps to move water from the storage tank(s) to the building. Plumbers will also install the following pipework:

- from the pump to the storage tank(s)
- from the storage tank(s) to the building
- within the building to all outlets.

Rainwater

Rainwater can also be used in country areas where there is no treated mains supply. Plumbers will install the rainwater handling system so that the rainwater storage tank is supplied from rainfall on the roof. Plumbers will install the pipework from the storage tank to all outlets in the building, as well as a pump to move water from the tank to the outlets.

Back flow prevention

Sometimes plumbers will need to install a back-flow prevention system in order to prevent the potable water supply from becoming contaminated. The simplest method of achieving this is a non-return valve which enables water to flow forwards into the building, but not backwards into the water supply.

Fire sprinkler systems

Some buildings require sprinkler systems, which spray water if a fire is detected. Plumbers are responsible for installing the system of overhead water pipework and sprinkler heads.

These systems are designed so that water sits permanently in the pipework and, in the event of a fire the sprinklers are quickly activated.

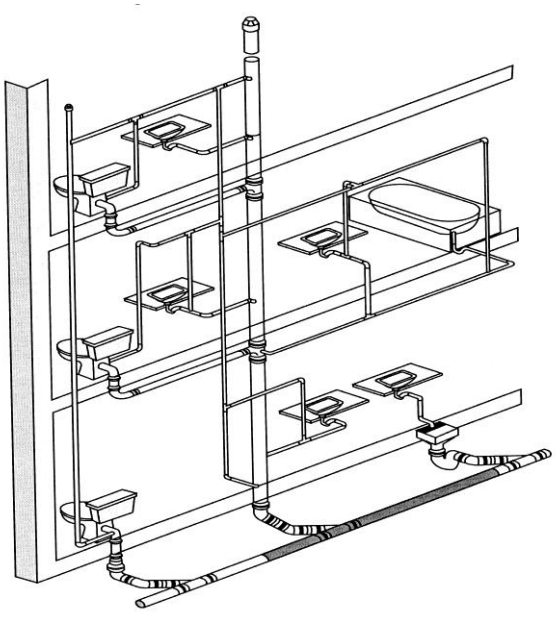
In constructing this system the plumber would therefore need to provide back-flow protection between the sprinkler system and the connected potable water supply.

Drainage systems

Drainage systems that are below ground must be installed by drainlayers, *not* by plumbers.

However, multi-storey buildings usually have all of their sanitary fixtures discharging into "stacks", which eventually connect to the drain. These stacks are elevated (above ground) drainage and *are* installed by plumbers.

On the right is an example of a stack showing how the large pipes connect together the other smaller pipes to take waste away. A



similar approach is used to get the water into the sanitary fixtures.

Sanitary systems

'Sanitation' refers to hygienic methods used to prevent human contact with hazardous wastes. Proper sanitation is important for the prevention of disease, and for promoting human and environmental health.

Plumbers and drainlayers are specially trained in hygienic methods for managing wastes using sanitary plumbing systems, which enable the safe discharge of used water (or "foul water") from a building.

Foul water will enter the drainage system either via a gully trap or by direct connection with the drain. Underground drainage pipes, installed and maintained by drainlayers, discharge foul water that carries organic and other matter.

In some situations organic matter can remain in the sanitary system after most of the water has been discharged, and can begin to rot and emit offensive smells. This accumulation of organic matter can be a hazard to human health, as well as cause the corrosion of pipes and blockage of drainage pipes.

To achieve a sanitary system plumbers will:

- install traps on the outlets of fixtures
- adequately size discharge pipes and stacks
- ventilate the system when needed.

Traps

Traps contain water, which forms a seal in order to prevent any foul gases from the drainage system entering the building. If the water seal dries up, is evacuated (sucked) or compressed (blown out), then foul gases will be able to enter the building.

Adequate sizing

It is important that pipes are used that are big enough to handle the amount of liquid and waste that will flow through them. Large enough pipes prevent restrictions or blockages from occurring in the sanitary plumbing system.

Ventilation

Ventilation allows air to flow into or out from the system in order to prevent the loss of trap seals by vacuum or compression.

Rainwater systems

Plumbers will install spouting around the perimeter of roofs, and/or gullies within roofs, in order to collect rainwater running off. Downpipes will then convey this water to:

- a storage tank, if rain is the water supply
- a storm water drain (*not* the foul water drain).

Waste water

Waste water is that which has been used for washing or bathing, but does not contain human waste. Waste water can be discharged from a waste pipe in the open air just above a gully trap, as well as into a stack or drain.

Foul water

Foul water is that which has been used to flush away human waste.

Client Base

Plumbing work is carried out for two types of clients:

- directly
- by sub-contract.

Direct clients

The home owner or business owner hires the plumber directly and pays them for their work.

By sub-contract

A main contractor hires the plumber and pays them for their work. Examples of main contractors include:

- architects
- builders
- property management companies
- water heating appliance retailers
- gas suppliers

Note:

- Gas water heaters require a cold water supply to, and hot water outlet pipe from, the appliance to the fixtures.
- Many plumbers also become gasfitters.

Supply Relationships

Plumbers need a range of supplies so as to carry out their work, including:

- sanitary fixtures, appliances and equipment
- pipe and fittings
- taps, faucets, mixers and control valves
- tools and materials.

Sanitary fixtures, appliance and equipment suppliers

Fixtures

Fixtures are secured firmly to the building and piped in and out of. Examples of fixtures include:

- basins
- baths
- showers
- tubs
- sinks
- toilets.

Appliances

Appliances are connected to the water supply by flexible hoses. Examples include:

- dishwashers
- washing machines.

Pipes and fittings are installed in order to convey water to and from fixtures and appliances.

Taps, mixers and faucets are the outlets from which water flows when they are opened.

Control valves regulate and make the system work, and can differ for various water pressure systems.

Plumbers can purchase directly off individual suppliers for appliances, fittings and materials. Because they need such a wide range of products, most plumbers prefer to buy through a plumber's merchant.

Manufacturer's guarantee systems

Normally any company that manufactures or supplies appliances, equipment, pipe or fittings guarantees their product against failure under normal conditions for a set period of time.

The guarantee may or may not include the cost of labour to fix the problem.

Certain circumstances will cancel the guarantee, such as where:

- the product has been installed incorrectly
- the product is misused or subjected to unduly harsh conditions
- the guarantee has not been properly registered through the completion and return of documents to the manufacturer.

Pipe and fittings

Plumbing merchants, such as Plumbing World and Mico, sell and supply pipes and fittings to plumbers. They may also source and provide appliances, tools and equipment.

Product training

Product training is provided to trades people involved in installation work by the supplier of appliances, equipment, pipe or fittings. Installers are trained in:

- how the product works
- correct installation
- how to find and fix faults.

Often a plumber will not be allowed access to the product without having first received product training from the supplier. Upon completing this training a plumber may be certified as an accredited installer.

Accredited supply networks

Some material or equipment suppliers will only supply their appliances or equipment to plumbers who have taken part in training on the companies products so as to become certified as accredited installers.

Trade accounts

Trade accounts are simply charge accounts that plumbers open with merchants and suppliers of fixtures, appliances, tapware and equipment.

This enables plumbers to purchase goods without the upfront payment of cash; instead the merchant sends the plumbers a bill for "payment due" at the end of the month.

Trade discount

In return for shopping at a particular merchant, plumbers often receive a reduced price on some items. This is a usually a set percentage less than the retail price of the goods. For example, with a 10% trade discount goods worth $100 would be reduced to $90.

Relationships with other Trades

Sanitary plumbing includes the tasks of installing potable (clean) water supplies, reticulating potable and hot water, installing sanitary fixtures and appliances, installing waste and foul water discharge systems; and connecting these to drainage systems. Plumbing requires a current practicing license. No unlicensed person is legally allowed to carry out plumbing work.

The Plumbers Gasfitters and Drainlayers Registration Act 1976 controls the plumbing industry.

Like all construction-related trades, plumbers cooperate with various other trades in the course of their work, including

- builders
- gasfitters
- electricians
- roofers.

Builders or carpenters

Builders and carpenters build the structures within which the water pipes, fixtures and appliances must be installed. Their involvement is often needed in order to provide mounting, access and penetrations.

Roofers

In situations where gas flues need to go through specialised roofing material, roofing contractors will often be required to provide the flashing.

Electricians

Electricians install and maintain permanent wiring to power points and sometimes electrical control systems for gas fired equipment. Electricians must also be licenced.

Gasfitters

Gasfitters install gas pipes, appliances, equipment, flues, and ventilation and are responsible for servicing gas appliances. Many plumbers also become gasfitters.

Requirements of Industry Bodies

Various industry bodies control the plumbing industry:

- Ministry of Business, Innovation and Employment (MBIE).
- Plumbers Gasfitters and Drainlayers Board.
- Standards New Zealand.
- Building Consent Authorities.
- Trade and professional associations.
- Industry Training Organisations.
- WorkSafe NZ.

Industry bodies

When working in the plumbing, gasfitting or drainlaying trades in New Zealand, there are a number of industry bodies that have an impact on the way trades people work and provide their services. For the plumbing, gasfitting or drainlaying trades these include:

Ministry of Business, Innovation and Employment (MBIE)

The Ministry of Business, Innovation and Employment (MBIE) administers the Building Act and Building Code and also oversees a range of other building and housing related acts and regulations (including occupational licensing in the building trades).

They are also the government body responsible for the Plumbers, Gasfitters and Drainlayers Board.

Plumbers, Gasfitters and Drainlayers Board (PGDB)

The PGDB is a ministerially-appointed board which is tasked with promoting high quality-standards, professional conduct, and public health and safety in the plumbing, gasfitting and drainlaying trades.

The PGDB administers a registration and licensing scheme for the certification of competent plumbers, gasfitters and drainlayers.

The PGDB's responsibilities include:

- setting and marking registration exams
- registering plumbers
- issuing practicing licenses
- prosecuting unlawful plumbing work.

Standards New Zealand

Standards NZ is an agency of the Standards Council, a Crown entity operating under the Standards and Accreditation Act 2015.

The majority of quality standards in New Zealand are developed in partnership with Standards Australia, and set agreed minimal specifications for products, processes, services or performance in both countries.

New Zealand standards are used by a wide range of organisations to enhance their products and services, improve safety and quality, and meet industry best practices. Quality standards help to keep our homes, buildings, playgrounds and health services safe.

Building Consent Authorities

A Building Consent Authority (BCA) is an organisation or individual accredited to administer building control functions. This is most commonly done by Territorial Authorities (local authorities or councils).

BCAs administer the requirements of the Building Code. They make sure that the work that has been done meets the Building Code.

They have to check the work before it starts, while it is underway and when it is finished. This is shown in the table below.

What the BCA does	When	What they are checking
Issue building consents	Before any building work starts	Checking that the details shown on drawings meet the Building Code
Perform inspections	As building progresses	Checking that construction, insulation, lining, bracing, weather tightness, plumbing, and electrical work complies with the Building Code
Issue Code Compliance Certificates	When the building is completed	Checking that all the requirements of the Building Code are met.

Trade and professional associations

Trade and professional associations provide industry information and trade upskill sessions to members. A major trade association in New Zealand is Master Plumbers, Gasfitters and Drainlayers New Zealand Incorporated, which was established in 1901 and has 16 regional associations. For more information visit www.masterplumbers.org.nz.

Industry Training Organisations (ITOs)

Industry training organisations (ITOs) set the skill standards and arrange training for people employed in the industries the ITO is responsible for. Almost all apprentices in New Zealand are enrolled with an ITO.

The ITO for the plumbing, gasfitting and drainlaying trades is the Skills Organisation. For more information on this ITO visit skills.org.nz.

Job Roles and Training

Job roles

Traditional roles within the plumbing industry include:

- Trainee plumber
- Licensed plumber
- Certifying plumber

Apprentice plumbers:

As they are only learning the trade, apprentice plumbers must work under the direct supervision of a Certifying plumber for one year. They must also apply annually to the PGDB for a Limited certificate license.

Licensed plumbers

To become a Licensed plumber you need to:

- Secure a placement with a Certifying plumber who is willing to train you.
- Enter into a training agreement with your employer and the ITO.
- Hold a Limited certificate trainee plumber license.
- Successfully complete a plumbing apprenticeship.
- Successfully complete the National Certificate in Plumbing.
- Pass the Registration examination as set and marked by the PGDB.
- Gain registration with the PGDB.
- Pay an annual licensing fee.

A Licensed plumber must be supervised by a Certifying plumber as they are ultimately responsible for ensuring the work is done competently.

Certifying plumbers

Licensed plumbers may continue their studies, and upon passing advanced level examinations set by the PGDB, may apply for registration as a Certifying plumber.

Certifying plumbers may:

- carry out plumbing work
- direct the work of licensed plumbers
- supervise apprentice plumbers
- raise the building consent for plumbing work.

A Certifying plumber may also choose to either:

- work for an employer, or
- become an employer of registered and/or apprentice plumbers.

Plumbing trainer and/or assessor
Either of these roles requires experience and the Certifying plumber license class. Plumbing trainers work in polytechnics, private training establishments or for equipment suppliers.

Assessors work for polytechnics, private training establishments or the Skills Organisation.

Other roles
There are other related roles where training and certification as a plumber may be an advantage, but is not necessarily a requirement, for example working as a supplier or merchant's sales representative, or for an ITO.

Training requirements

For information on the licensing, registration and training of plumbers see the Plumbers, Gasfitters and Drainlayers Board website (www.pgdb.co.nz) and the website for the Skills Organisation (skills.org.nz) as they are the ITO who serves the plumbing industry.