

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

**Demonstrate knowledge of the
glass industry within a BCATS
environment**

Unit Standard – 25328

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 glass 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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Level 5, 234 Wakefield Street
PO Box 2615
Wellington

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 **Glossary of Terms**

Term	Meaning
Industry bodies	Organisations that play a role within an industry in a regulatory, support or advisory capacity. This includes regulatory bodies, industry training organisations and trade or professional associations.
Float glass	Flat glass panels
NZS	New Zealand Standard
Supplier	A business who has products, like glass, available for sale and supply
Commercial premises	A commercial premises is one where goods or services are sold
Residential premises	Residential dwellings (where people live)
IGU (or DGU)	Abbreviation for double glazing, which is two or more panes of glass separated by trapped air. An Insulating Glass Panel is called an IGU and a Double Glazed Unit is a DGU, but they both mean the same thing.
Glazier	A person who installs glass
Glazing	Installing glass
Aluminium profiles	Special shapes of aluminium that is cut up to form the frames for windows and doors
Curtain walling	Big thick strong panes of glass on buildings that form a wall as well as a window. They are said to form a "curtain wall" on the building.
Regulations	Regulations are rules that tell companies how work should be done or what the finished product should be like.
ITO	Industry Training Organisation A tertiary education organisation which develops qualifications and arranges training for a specific industry.

Introduction

The glass industry is made up of many parts (sectors). These include:

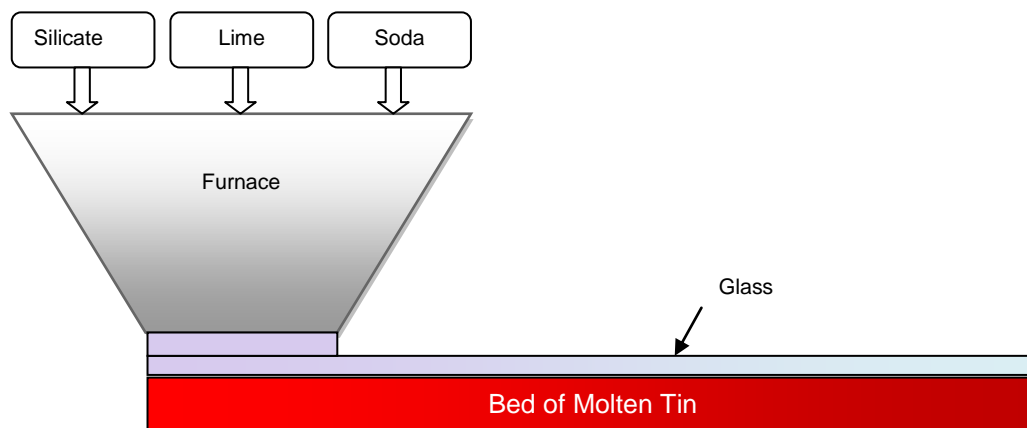
- Manufacturing
- Suppliers
- Installation

Each part of the industry does different work. The glass can be for either commercial or residential buildings.

Manufacturing

Most glass used in construction is made using a method called the “float glass process”. In the float glass method, glass is made from melting silicate (which is basically sand), lime and soda in a large furnace. The melted glass is then floated onto a bed of red hot (molten) tin.

The glass can be made as thin as 2mm and as thick as 19mm. Float glass is made overseas. It is shipped into New Zealand in large panels and then processed by companies like Metro Glass and Viridian. The mixture is slowly cooled and turns into a solid glass. It is then cut up into the size required.

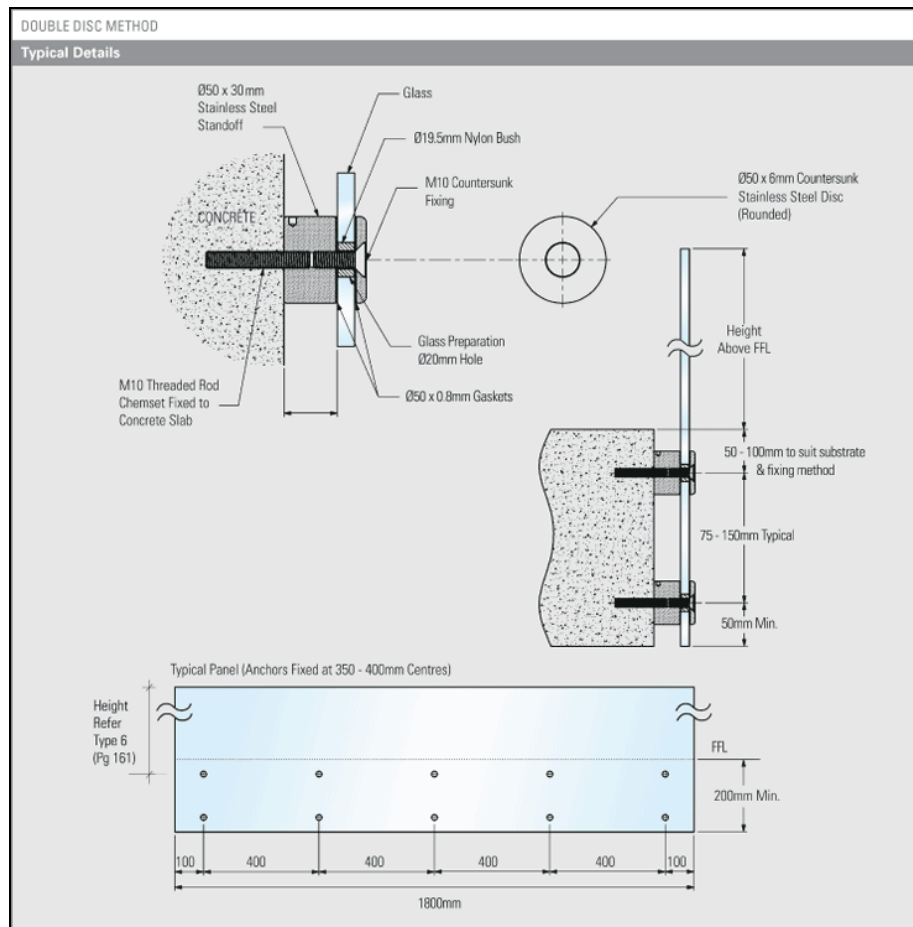


The float glass process

Installation

Glass must be installed correctly so that it can do the job it is meant to. There are a lot of glass standards in New Zealand that give information about how certain types of glass need to be installed. The supplier and/or manufacturer of the glass will also have some installation instructions.

No matter which standard is used, glass must be installed so that it complies with the New Zealand Building Code.



Example of installation details for balustrade

Commercial

Commercial glass installation is any glass that is made and installed in commercial premises.

Some commercial work can be very simple and similar to residential work. However, they can also be very large and difficult jobs.

More complex work will need to be designed by architects and engineers. This requires a good knowledge of waterproof installations, safety, wind loads, insulation properties etc.



Commercial projects can range in difficulty

Residential

Residential buildings include single or multi-storey dwellings, or multi-storey apartment blocks.

Residential glass and installation is any glass that is made and installed in residential dwellings. While residential work is usually fairly simple, some clients specify fairly complex glass and installations.

Summary

The glass industry is made up of manufacturers, suppliers, processors and installers.

Glass can be installed in either commercial or residential buildings.

Work Processes

Glass must be made and processed before being installed. An outline of the processes is below.

Glass processing

The float glass process can be changed to make many types of glass. Glass can also be processed after it has been made. This is normally done by glass suppliers in New Zealand.

Sometimes clients want things like:

- tints, reflective and coated glass;
- decorative glass;
- wired glass;
- mirrors;
- laminated;
- toughened;
- heat treated;
- screen printed;
- cladding; or
- insulating.

The manufacturer of the glass needs to be able to change the process to make each type of glass to the right specifications. Below are some common examples of types of glass and how the process can be changed to make them.

Tinted glass

Glass has a natural green tint to it caused by the iron in the sand. Manufacturers can add less iron to make the glass less green. They can also add metal oxides to the mixture to make grey, bronze, green or blue tints to the glass.

While tinted glass looks nice, it is usually used because it stops inside areas heating up too much and cuts down UV light and glare inside buildings.

Decorative glass

There are a number of types of ways of making decorative glass. Some is sandblasted once it is made, Etchlite glass is treated with an acid to make a fine grainy finish, or a film is added to the glass at the end of the process.

Laminated glass

Laminated glass is made by joining two or more sheets of glass together with a plastic or resin. The advantage of laminated glass is that when it breaks all of the bits of glass stick to the plastic or resin. This is why it is used in vehicle windscreens.

Toughened glass

Toughened glass is made by heating up float glass to about 650°C. It is then cooled down quickly with special air nozzles. This locks a lot of strength into the glass so makes it really strong and able to cope with very high temperatures.

It is harder to break than laminated glass, but does shatter when it is broken.



The client may specify several types of glass to be manufactured and installed in one building.

Insulating glass

Insulating glass is often called double glazing. Basically it is just two panes of glass with a layer of air trapped between them.

Double glazing is required on all new glass installations. This is because it stops buildings losing heat in the winter.

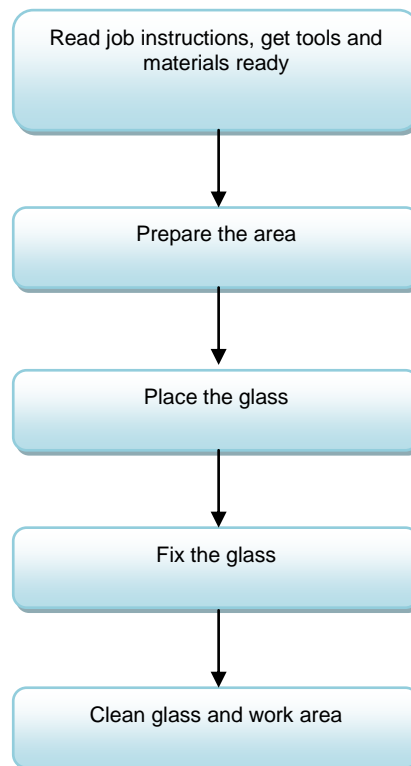
Double glazing is known as IGU (Insulating Glass Units) or DGU (Double Glazing Units). IGU and DGU mean the same thing though.

Glass Installation

Glass installers are called glaziers. They have to be very aware of health and safety hazards when they are installing glass. They need to use the right tools to make sure glass is installed safely and is weatherproof.

Glass installation either happens in a workshop, (such as a joinery shop making up windows and doors ready to install) or on site. Glass will be installed on site if it is a repair or replacement of a pane of glass. It will also be installed on site if it is not part of another unit, like a door or window.

The flowchart below summarises the basic process for installing glass.



The basic process for installing glass

Installation starts with reading the job instructions and making sure all the materials and tools for the job are correct and ready. The next step is preparing the area where the glass is being installed. This could involve cutting and preparing aluminium profiles, putting seals in place or attaching fixings. The glass must then be put into place.

Glass is often large, heavy and difficult to handle. Special suction handles called “glass suckers” are often used to handle large panels of glass. This reduces the risk of breaking the glass and makes it easier to install it correctly.

Once in place, the glass needs to be fixed correctly. Depending on what is specified, this may be by seals or mechanical fixings or both.



Mechanical fixing for glass

Glass installation is only finished after the glazier has cleaned up. This means they need to clean the glass as well as pick up and remove any rubbish that they have made during their work. It is really important to clean up all broken glass so no one is cut by it.

Summary

Glass processing is when float glass is worked on to make special sizes and types of glass for a client.

Glass installation is when glass is installed and fixed into place.

Glass installation is also called glazing and is done by a person called a Glazier.

Client Base

Manufacturers of float glass supply glass products to companies who process the glass in New Zealand. This is usually either Metro Glass or Viridian, although there may be others that you will come across.

From there, suppliers and glass process companies either supply:

- directly to the client, or
- to subcontractors needing glass like joinery companies, or
- by subcontracting to builders or building companies

Direct to the client

This occurs where the client approaches the glass supplier to price and manufacture glass products and fittings. These could be from drawings that are done by the client or their architect. Otherwise, the client may tell the supplier what they want and the supplier works with the client to advise them on the best products for their needs.



The client may work directly with the supplier

The client contracts the glass supplier to process and supply the items. The glass supplier may also install the items for the client or they may contract this out to a special installer.

The supplier has to work out when they will be able to process the glass and have it ready and installed for the client. They need to keep the client informed of when this will be.

The client pays the supplier direct for the items and installation.

To subcontractors like joinery companies

Clients can approach subcontractors for glass products like joinery. The subcontractor will then make up the joinery for the client.

Joinery companies that make products like aluminium and timber doors and windows still need to purchase their glass from a supplier. The supplier will cut the glass to size and do any processing that is required on the glass.

The subcontractor normally has their own glaziers who will install the glass into the joinery. However, with the requirement for double glazing (IGU), the supplier will have a glazier who makes the IGU unit. The IGU unit is then supplied to the joiner for further installation into joinery.

Subcontracting to builders

In this situation, a joinery company is invited to price item of joinery by a builder or building company. This usually occurs when there is a new building, or an alteration to an existing building. The building company will invite several joinery companies to provide quotations to supply (and possibly to install) a range of items.



A joiner would have won the contract to make this joinery in the Bethlehem Town Centre

The builder then chooses a joinery company, and offers them the work. If the work has some difficult glass products and/or fixing methods, the building company may choose to use both a joinery company and a supplier to supply and install the different glass products. For example, if a building has curtain walls as well as standard joinery, the building company may give the joinery work to a standard joinery company and contract the curtain walling to a specialist company.

Once the building company has chosen who will supply and process the items, the company then gives them a schedule detailing what items are required and when.

As with all construction work, the suppliers and installers of glass products need to make sure they can meet the client's requirements and deadlines.

Summary

Glass suppliers and glass process companies either supply:

- directly to the client, or
- to subcontractors like joinery companies, or
- by subcontracting to builders or building companies



Supply Relationships

There are a number of supply relationships in the glass industry. These are special relationships that are built up between suppliers, subcontractors and clients. They help to build up trust as well as make it easy for each group to work together efficiently and effectively.

Supply relationships could include:

- Trade accounts
- Trade discounts
- Manufacture guarantee systems
- Product training
- Accredited supply networks

Trade account

Suppliers and subcontractors buy the different glass materials they need from a range of manufacturers and suppliers. This generally involves glass suppliers, fittings and fixings suppliers, aluminium and timber suppliers, and suppliers of other materials such as seals and sealants.

In New Zealand, glass suppliers like Metro Glass or Viridian get their glass from overseas. Other products, like fittings, seals etc will come from a number of other suppliers.

Suppliers and subcontractors like joinery companies get glass from glass suppliers, and other products like aluminium, seals, fittings and fixings from other suppliers.

If a business wants to buy products on a regular basis from a supplier, they normally set up a trade credit account with the supplier. The trade account has an agreement on how payments will be made. The agreement is normally that the purchaser will pay for all the products they have brought on credit by the 20th of the month following the month.

Trade discounts

The supplier will normally offer the company with a trade account discounts for the glass materials. These are called trade discounts. These discounts vary, depending on the quantity and type of materials the account holder orders.

For example, a joinery company who purchases \$100,000 of glass per year would have a greater discount than a company who only spends \$10,000 per year.

Generally, materials that are bought in large quantities have larger discounts than materials that are bought in smaller quantities.

Manufacturer guarantee systems

Companies that provide glass materials give guarantees that the products they sell will be fit for the purpose they will be used for, and free from defects.

This does not mean that the glass will not break if it is hit or exposed to really high winds. It means that it will not break in normal conditions and will not have defects like fogging or internal scratches in IGU glass.

The joinery company will then provide their clients with a guarantee for the materials used and workmanship in the joinery they sell.

For large contracts, there is often a maintenance period of three months following the completion of the joinery and glass installation. This allows the glass installer to make adjustments to the glass that they have supplied or installed if there is a problem with it.

Product training

We have already talked about IGU glass being required on all joinery now. Suppliers of this glass product have done a lot of training of the companies they supply to and the people who will be using the product. Training sessions may involve the product manufacturer as well as the supplier.

These are very useful to ensure you understand what new products can and can not do.

Accredited supply networks

The glass that comes into New Zealand and that is used in New Zealand must meet certain requirements. One way to make sure that this happens is to have accredited supply networks.

This basically means that suppliers are accredited as being able to supply certain glass products to meet certain specifications. Companies like Metro Glass and Viridian will only import glass from overseas companies if the company's glass meets New Zealand requirements. They will have a network of suppliers that they use.

Joinery companies will only get glass from suppliers in New Zealand if they are accredited to supply glass of a certain standard. They will use certain suppliers, and these suppliers form a network or suppliers that a company will purchase glass from.

Relationships with other Trades

Relationships between trades in the construction industry are really important. Trades need to be able to work together so that the finished building meets the client's as well as legislative requirements.

The main trades that must work together in the glass industry include:

- building;
- joinery;
- gib fixers, stoppers and plasterers; and
- painters.

Before any glass products can be installed into a building, the framing will need to be made to hold the glass units. This is normally prepared by a builder.

When the framing and external cladding is ready for the new joinery, the joiner delivers the units to the site. In residential buildings, the glass joinery is normally installed by the builder. However, on larger commercial sites, or if the work is complicated, a specialist installer may be subcontracted to do the work.

Special work like curtain walling will be installed by a specialist. The builder will not do this work themselves.



The framing and building paper is ready for the external cladding. Then the glass joinery is installed.

Once the glass units have been installed on a new building, the internal lining can be finished by gib fixers. This is finished off by gib stoppers and plasterers, before the painters complete work. On the outside, painters may be needed to finish off the external cladding.

It is very important that each of these trades work together so that the client gets the job finished to a high standard and as quickly as possible. Usually subcontractors like joiners will not deal with other subcontractors like gib fixers. This will all be done through the builder.



The plasterer finishes off the external cladding once the joinery is installed.

Summary

The glass industry has to work in with other trades so that any glass products installed in a building meet both the client's requirements and the Building Code requirements.



Requirements of Industry Bodies

There are a lot of organisations that are involved with the glass industry. They make sure that the work done by the glass industry is safe and meets certain standards. Their job is to protect both the people in the glass industry and the people that they do work for.

These organisations are called “regulatory bodies” or “industry bodies”. These include:

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

Each of these regulatory bodies has a different job. Some look after safety, others look after quality, and others look after training.

WorkSafe New Zealand (WorkSafe)

WorkSafe is the work health and safety regulator and is responsible for implementing the Health and Safety at Work Act 2015.

WorkSafe’s functions include:

- Monitoring and enforcing compliance with work health and safety legislation
- Providing guidance, advice and information on work health and safety
- Fostering a co-operative and consultative relationship between the people who have health and safety duties and the persons to whom they owe those duties and their representatives.
- Collecting, analysing and publishing statistics and other information relating to work health and safety.

The main safety issues that Worksafe will look out for in the glazing industry include:

- manual material handling (safe lifting);
- safe use of plant, equipment and tools;
- working at heights (ie above ground level, ladders and scaffolds);
- chemical hazards (adhesives and sealants); and
- noise.

Ministry of Business, Innovation and Employment

There are lots of regulations in the building industry. The regulations are there to protect the client so that they have a safe and good quality building that will meet the client's requirements.

Regulations are rules that tell companies how work should be done or what the finished product should be like. They are written into a document called a Building Code.

The Ministry of Business, Innovation and Employment (MBIE) manages the regulations relating to all building. The regulations that affect the glass industry are contained within the Building Code. Examples of these include:

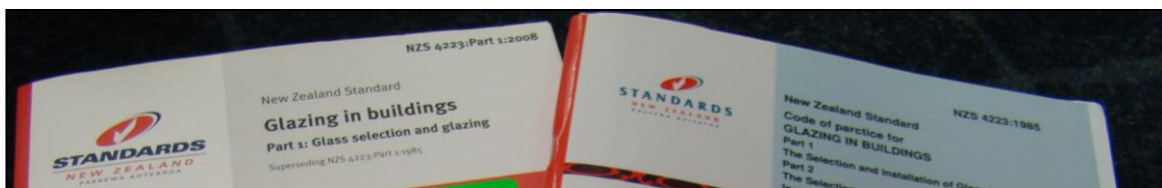
- Wind loadings that glass can cope with
- Glass life
- Weather tightness of windows and external glass doors
- Energy efficiency (using IGU units)

Standards New Zealand

Most people comply with the Building Code by following New Zealand Standards. These are written by Standards New Zealand. The standards have to be approved by MBIE to say that they comply with the Building Code.

Standards New Zealand develops, distributes, and administers standards and standards based solutions. They provide information, establish measurements, and set quality and safety levels across a range of sectors.

Glaziers have to know what these standards are. They also need to make sure they are the most up to date standards that they are using.



Standards for the glazing industry are given in NZS publications

Building Consent Authorities

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

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 Building Consent Authority 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 or professional associations

Trade and professional associations are also set up to protect clients. Examples of associations in the glass industry include:

- Window Association of New Zealand (WANZ)
- Glass Association of New Zealand (GANZ)

Normally glass businesses can only belong to an association if they provide products or services of a certain standard. For example, the Glass Association of New Zealand conducts examinations in the practical understanding of the New Zealand Standard for glazing in Buildings. Graduates must attain a 100% pass mark in written examinations on the practical interpretation of NZS4223:Part 3:1999.

Building Research Association of New Zealand (BRANZ)

BRANZ is an independent and impartial research, testing, consulting and information company providing services and resources for the building industry.

Their two main areas of activity are to:

- research and investigate the construction and design of buildings that impact the built environment in New Zealand
- enable the transfer of knowledge from the research community into the commercial building and construction industry.

Their core purpose is to improve people's lives through research and to inform, educate and motivate those who shape the built environment.

BRANZ produce a wide range of publications that translate building-related research into practical, useable information about trends and best practice, making it accessible to the wider construction industry.

Industry Training Organisations

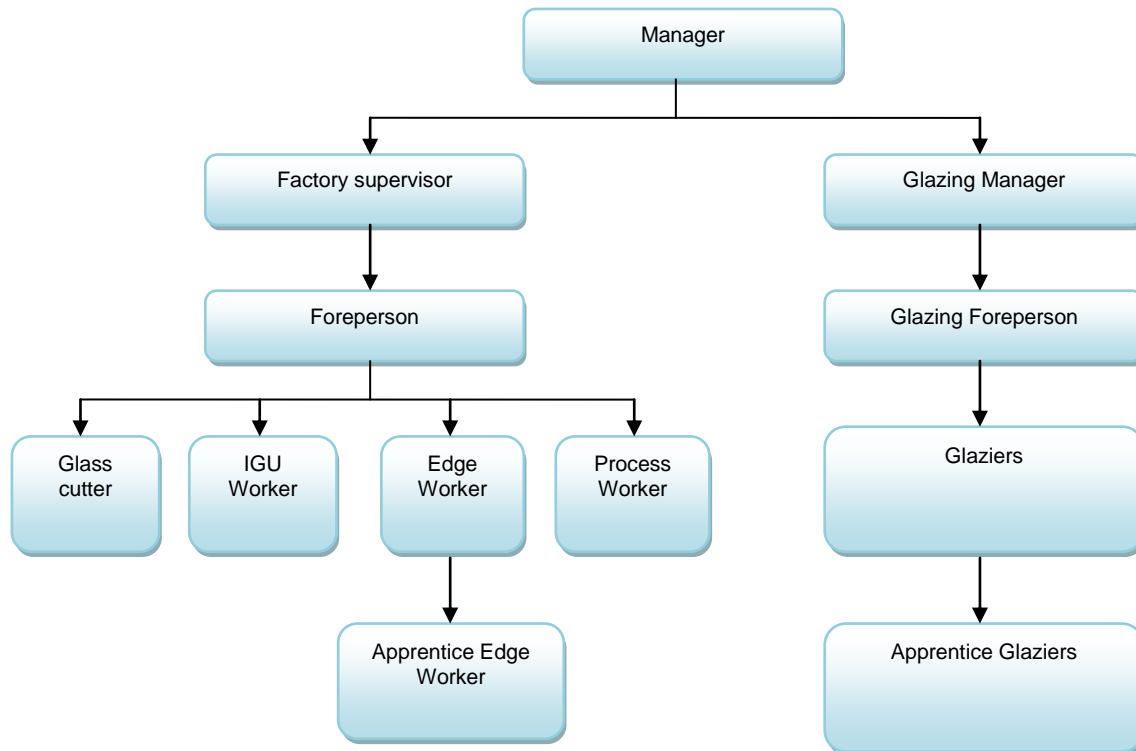
Industry training organisations (ITOs) set the skill standards and arrange training for people employed in the industries the ITO is responsible for. Almost all apprentices in New Zealand are enrolled with an ITO.

The ITO that serves the glass industry is the Building and Construction industry Training Organisation (**BCITO**).

Job Roles

There are a lot of different jobs in the glass industry

A simplified team structure of a glass processor and supplier is shown below.



Simplified team structure for a glass processor and supplier

In the glass processor and supplier industry, the main hands-on job roles are:

- Glass Cutters
- IGU Workers, who are trained how to use float glass to make IGU panels
- Edge Workers
- Process Workers, who use float glass to make special types of glass
- Glaziers, who install glass

There are other roles like specialist installers for glass products like curtain walling.

Glass sub-contractors are normally joinery companies. The team structure will be set up in a similar way to the diagram above but the roles will be slightly different. Roles in glass joinery companies include:

- Aluminium and/or timber and/or component fabricators
- Glass cutters
- Window and door assemblers
- Installers

Finally, there are companies like Smith and Smith glass who normally specialise in repairs or replacing glass units. In these companies, the main job role will be a glass installer.

Fabricators

A fabricator will start with raw materials like aluminium profiles or timber. They then measure and machine it so that they can be put together to make windows and door frames.

Fabricators learn how to use machines like saws, routers etc. They will be given practical training and may be doing an apprenticeship. This means they will also get time to learn more about how to do their job, and they will be assessed on each skill as they learn it.



Fabricator at work at NZWindows in Tauranga

Glass cutters

Glass cutters use special tools to cut glass panels to the right size. They need to be very accurate with their measurements. They also need to be careful that they do not damage the glass when they are working.

Most joinery companies do not tend to cut their own glass: they get it supplied cut to the right size. Now that IGUs are required, very little glass cutting is done by joinery companies as the IGUs are supplied ready made.



IGU panels made to size are ready to be assembled into joinery units.

Assemblers

An assembler takes the framing components that the fabricator has made, the glass cutter has cut, (and the IGU worker has made) and any seals and fittings and puts them together.

The assembler will need to use tools like drills to put the frame and glass together. They must make sure that they follow the plans carefully and work very accurately. It is very easy to put components on the wrong side or slightly out of shape if they are not careful with their work.

IGU workers are special assemblers. They make IGU panels. IGU workers have to be trained and follow assembly methods really closely. If they do not, the IGU panels may fail by allowing moisture in or having internal scratches on them.

In most joinery companies, a person will be employed as a fabricator, but they will do the fabrication and assembly of the glass joinery.

Installers

Installation work involves working on construction sites. The items are delivered to the site and installed into position by an installer.

Specialist installers will then fix the glass products in place using special fixings. They have to be careful that they follow the plans and put the correct fixings in the correct places.

Installers can also be people who repair or replace glass products on site. For example, an installer may remove an old glass pane from a frame and reinstall a new tinted glass pane in a window frame.

Installers need to know quite a bit about the assembly of glass joinery. This is so they can remove and reinstall glass correctly without damaging the frame or glass. They may also need to know how to cut glass.

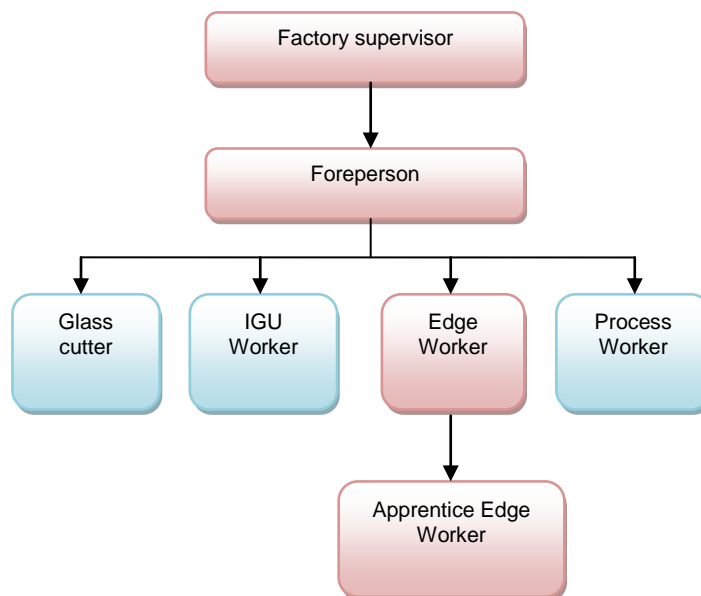
Career paths

Usually a person will start in the glass industry as an apprentice, factory hand or labourer. The career path that each person has will depend on things like:

- what training they have;
- where they work;
- what experience they have; and
- their keenness to learn and be promoted.

If you look at the team structure diagram for the glass processor and supplier industry you get an idea of the possible career path of a worker.

Imagine a worker starting with the company as an Apprentice Edge Worker.



Possible career path for an apprentice Edge Worker

The person will start off learning how to be an Edge Worker on the job and will also do theory training. When they have completed both the practical and theory part of their training, they will become an Edge Worker.

As they continue with that or another company, they may show the skills needed to manage people. They may then be promoted to a Foreperson.

Summary

There are a lot of different jobs in the glass industry.

Training Requirements

Many apprentices start their careers by working in a glass processors or joinery shop after school hours or in the holidays, helping out with the cleaning, and possibly assembly work. If the person shows they are keen to learn, the joinery company may offer them a job and even an apprenticeship.

Qualifications available for gaining through an apprenticeship include:

- National Certificate in Automotive Reglazing
- National Certificate in Glazing
- National Certificate in Architectural Aluminium Joinery: Assembly & Glazing With Cutting & Machining
- National Certificate in Architectural Aluminium Joinery: Installation
- National Certificate in Architectural Aluminium Joinery: Quotation & Special Aluminium Joinery

Industry Training Organisations

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 that serves the construction sector is the Building and Construction industry Training Organisation (**BCITO**). Aside from as the glass industry, the BCITO is the ITO that serves:

- Interior Systems
- Flooring
- Tiling
- Frame and Truss Manufacturing
- Cement and Concrete
- Proprietary Plaster and Cladding Systems
- Solid Plastering
- Joinery
- Painting and Decorating
- Kitchen and Bathroom Design
- Brick and Block Laying
- Carpentry

During the apprenticeship, a registered assessor will carry out periodic assessments on the apprentice. Both the employer's and apprentice's responsibilities are detailed in the Training Agreement and many of these will flow on to the Assessor - who is the person determining an Apprentice's/Trainee's competence.

The National Certificate, together with the knowledge and skills accumulated over the training period, will provide a person with a sound foundation for a successful career in one of the many areas of the construction industry.



Apprenticeship training will also include loading glass products into trucks for delivery.

Training enquiries

If you are interested in a career in the glass industry contact the BCITO:

Phone: 0800 4BCITO
0800 422 486

Web: www.bcito.org.nz
getacareer@bcito.org.nz

For more experience at school contact your school Gateway supervisor or careers advisor.