**NZQA**

**Approved**

Achievement standard: 91055 Version 3

Standard title: Demonstrate understanding of basic concepts used in manufacturing

Level: 1

Credits: 4

Resource title: Manufacturing aluminium joinery

Resource reference: Generic Technology VP-1.12 v2

Vocational pathway: Construction and Infrastructure

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| Quality assurance status | These materials have been quality assured by NZQA. NZQA Approved number A-A-02-2015-91055-02-7373 |
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Vocational Pathway Assessment Resource

Achievement standard: 91055

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Learner instructions

# Introduction

This assessment activity requires you to demonstrate your understanding of basic concepts used in the manufacturing of aluminium joinery.

You are going to be assessed on how comprehensive your understanding is of basic concepts used in the manufacturing of aluminium joinery.

The following instructions provide you with a way to structure your work so you can demonstrate what you have learnt and achieve success in this standard.

Assessor/educator note: It is expected that the assessor/educator will read the learner instructions and modify them if necessary to suit their learners.

# Task

Compare two different aluminium joinery manufacturing processes and two categories of aluminium joinery manufacturing techniques used in New Zealand, and explain why these different techniques are used. You need to show that you are able to process and interpret information and prepare a presentation that includes:

* the types of manufacturing systems used
* why the manufacturing systems are used in a manufacturing process
* how they determine yield
* how quality control is managed
* why these mechanisms may be affected by social and environmental change.

## Investigate

The following investigation is to ensure that you present relevant information.

Find out about how two or more different types of aluminium joinery are manufactured through different manufacturing systems and techniques (see Resource A).

Gather information about the techniques used for inspection, transport, storage, and operation in at least two different aluminium joinery manufacturing processes (see Resource B).

In particular, find out about:

* the operations used in a range of aluminium joinery manufacturing processes and the resources required for these operations
* the order in which the operations are carried out in different processes, and the reasons for this order (you could use flow diagrams to record this information)
* the quality control that is applied during the processing, when it is applied, and how it informs the processing (for example, by providing information to help with the next step or providing guidance on changes that need to be made, to ensure that the end product has the required qualities)
* the safety procedures that should be followed during production
* the legal requirements for manufacturing aluminium joinery (for example, relevant labour laws, safety regulations such as safety glass and environmental laws such as double glazing requirements)
* yield prediction, and how the manufacturer determines the yield prediction for a specific type of aluminium joinery manufacturing process such as for a window or door
* how yield prediction and quality control have been affected by social change (for example, the impacts that people’s changing expectations about price, quality, durability and performance have had on yield predictions and quality control mechanisms)
* how yield prediction and quality control have been affected by environmental change (for example, how the legislation intended to protect people and the environment has impacted on the usage and disposal of resources used in aluminium joinery manufacture and how this has affected yield prediction and quality control)
* how yield prediction and quality control have been affected by computerisation (for example Computer Numerical Controlled machinery - CNC or CAD/CAM).

## Present your findings

Your assessor/educator will provide you with the format for your presentation.

Present your final findings, which should include the following information:

* Identify and describe at least two different types of aluminium joinery manufacturing systems, and explain why at least two types of manufacturing systems are used in making different types of aluminium joinery.
* Describe at least two of the categories of manufacturing techniques used in making aluminium joinery, and explain why the key manufacturing techniques are used in this manufacturing process.
* Discuss why two or more specific manufacturing techniques are used in making different types of aluminium joinery, giving details of why different techniques are used in making aluminium joinery.
* Create a flow diagram that shows an aluminium joinery manufacturing process. Show how the various stages are linked using different symbols for the different technique categories.
* Describe the yield of a manufacturing process. Explain how the yield is determined within aluminium joinery manufacturing, and discuss how yield prediction and its determination may be affected by social and environmental change.
* Explain the role of quality control in aluminium joinery manufacturing. Identify possible defects in aluminium joinery and describe systems for identifying and responding to these quality issues.
* Discuss how quality control mechanisms may be affected by social and environmental change.

# Resource A

## Useful information

Types of manufacturing systems include but are not limited to:

* one-off custom manufacturing of a unique single product
* batch, intermittent, or short-run manufacturing – multiple copies of the same product or a single batch of a processed product
* continuous (often called ‘assembly line’) manufacture
* flexible manufacture and customisation.

The categories of manufacturing techniques may include but are not limited to inspection, transport, storage and operation.

Thenature of manufacturing may include but is not limited to consideration of product need; resource availability; political, social, and physical environments; and advances in manufacturing systems and techniques.

# Resource B

## Definitions relating specifically to the manufacture of aluminium joinery

Techniques used in aluminium joinery manufacture:

* Quality control inspections are used to detect failures (such as human and non-human factors) that cause defects and subsequently worsen product quality.
* Transport can include the transport of aluminium joinery or raw materials to another operator or the transport of aluminium joinery from storage area to manufacturing/ production to warehouse/distribution.
* Storage includes storage of materials, semi-finished and finished aluminium joinery, and waste.
* Operations can include preparing and cutting extruded aluminium, assembling windows, doors etc., packing and preparing for transportation.

Yield prediction means determining the number of aluminium joinery items that is possible from the resources available, taking into account the expected wastage resulting from defects, faulty workmanship, and inefficiency.

Resources used in the manufacture of aluminium joinerymay include extruded aluminium products, glass, rubber seals, handles, clips, machinery, floor space, storage, staffing and their skill levels.

Competitive manufacturing is a modern version of Japanese Kaizen ‘lean manufacturing’ that includes JIT (just in time) materials or parts coming from the suppliers for production.

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Assessor/Educator guidelines

# Introduction

The following guidelines are supplied to enable assessors/educators to carry out valid and consistent assessment using this internal assessment resource.

As with all assessment resources, education providers will need to follow their own quality control processes. Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material. Using this assessment resource without modification may mean that learners' work is not authentic. The assessor/educator may need to change figures, measurements or data sources or set a different context or topic. Assessors/educators need to consider the local context in which learning is taking place and its relevance for learners.

Assessors/educators need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing learners against it.

# Context/setting

This activity requires learners to investigate basic concepts used in manufacturing aluminium joinery, and create a presentation that demonstrates their comprehensive understanding.

# Conditions

Learners could gather and analyse their evidence independently or in groups, but they need to create their presentation independently, and will be assessed individually.

Decide on the format of the final presentation. You may wish to take learner preferences into account in deciding on the format.

# Resource requirements

Ensure that learners:

* know how to use a flow diagram to depict a process
* have access to information on:
	+ aluminium joinery manufacturing processes
	+ quality control in aluminium joinery manufacture
	+ yield prediction in aluminium joinery manufacture
	+ social and environmental change that have impacted on yield prediction and quality control in aluminium joinery manufacturing in New Zealand.

Learners will require access to the internet for research.

# Additional information

Visiting industrial aluminium joinery factories or talking to aluminium joinery manufacturers operating in different contexts may be helpful.

# Assessment schedule: Generic Technology 91055 – Manufacturing aluminium joinery

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner demonstrates understanding of basic concepts used in manufacturing aluminium joinery by:* describing different types of aluminium joinery manufacturing systems

For example:The learner describes the manufacturing processes for a range of systems (including at least two of the following: one-off custom manufacture, batch or short-run manufacture, continuous or ‘assembly line’ manufacture, flexible manufacture), and indicates what type of aluminium joinery each would suit.* describing categories of manufacturing techniques used in an aluminium joinery manufacturing process

For example:The learner describes at least two of the following categories:* + inspection (including quality control and quality assurance systems)
	+ transport (of raw/recycled materials within the process)
	+ storage (including the items to be stored and types of storage required)
	+ operation (the resources required to operate the manufacturing process).
* developing a process flow diagram to communicate a manufacturing process

For example:The learner creates a flow diagram of an aluminium joinery manufacturing process (using symbols to represent categories of techniques, such as storage and inspection), which illustrates the different stages of manufacture and indicates how they are linked.* describing the yield of an aluminium joinery manufacturing process and the role of quality control

For example, the learner describes:* + how manufacturers predict the yield of aluminium joinery products such as windows or doors
	+ the manufacturing process, taking into account the number of products that do not meet the required quality/specifications
	+ how quality control is used to meet manufacturing standards, and to ensure that aluminium joinery products with defects are not produced
	+ possible defects related to workmanship, consistency, and materials
	+ the quality control systems used to check aluminium joinery quality (e.g. from materials purchased through to final windows, doors)
	+ systems for responding to fault analysis.

*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner demonstrates in-depth understanding of basic concepts used in manufacturing aluminium joinery by:* explaining why particular types of aluminium joinery manufacturing systems are used in specific contexts

For example: The learner explains the manufacturing processes for at least two systems and the reasons for their use in particular situations. *Batch production is used when the manufacturer is required to make multiple windows and doors of custom and one-off sizes for a single house.**Continuous manufacture is used for mass production of fixed-sized windows which require an assembly line.** explaining key manufacturing techniques used in an aluminium joinery manufacturing process

For example: The learner explains the techniques of at least two of the following categories: inspection (including key quality control and quality assurance systems), transport (including techniques for transporting materials within the manufacturing process), storage (including the key items and the types of storage required for these in the manufacturing process), operation (including how the key resources are linked together to produce the aluminium joinery).*Continuous production would require larger storage areas for materials as there is more aluminium joinery being produced, and so greater quantities of materials and fittings may need to be held for a longer time in a storage area, until production begins. Some materials may need specific storage facilities to prevent damage (such as sheet glass). People are required to do one specific task such as fitting handles and locks in the manufacturing process rather than making a window from start to finish.* * explaining how yield is determined and how quality control is managed within an aluminium joinery manufacturing process

For example, the learner explains: * + how yield may be calculated. *At XYZ joinery factory (refer to my field trip notes) they calculate their yield in their computer system that shows...*
	+ that quality control may be managed as the responsibility of each joiner and production line worker*. There are incentives within teams and the goal is minimum defects and waste. There is a check before the final packaging and any defects and waste can be tracked down to the materials or worker responsible. The worker or suppliers are notified and extra training is offered if required, and suppliers are monitored more closely …*

*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner demonstrates comprehensive understanding of basic concepts used in manufacturing aluminium joinery by:* discussing why particular manufacturing techniques are used in aluminium joinery manufacturing

For example*:* The learner discusses the reasons for choosing particular manufacturing techniques in the context of specific processes for at least two systems. The learner compares and contrasts a factory that makes aluminium joinery for customers requiring one-off products with an aluminium joinery factory producing windows and doors en-masse to specific sizes only.* discussing how yield prediction and its determination, and quality control mechanisms, may be affected by social and environmental change

For example, the learner discusses:* + ways in which yield predictions can be determined by using inputs, processes, and outputs
	+ the role of computer systems, and how these have improved the efficiency of planning production lines and their yields
	+ the efforts that certain aluminium joinery manufacturers are making to reduce their environmental impact by reducing waste and energy consumption, and by increasing recycling, as well as the success (or not) of their strategies
	+ the impact of certain one-off size requirements and the effect that these choices have on waste
	+ the impact of the vulnerability of the product being scratched or damaged in the manufacturing process, and how this has impacted on yield determination and quality control mechanisms
	+ legislative requirements for social conditions, such as labour laws (e.g. in terms of hours of work, rates of pay, safety considerations) and how these impact on yield prediction and quality control (e.g. cost of aluminium joinery manufacture)
	+ legislative requirements that relate to environmental issues and how these impact on yield prediction and quality control (e.g. the impact of the Resource Management Act on waste management and disposal requirements).

*The above expected learner responses are indicative only and relate to just part of what is required.* |

Final grades will be decided using professional judgement based on an examination of the evidence provided against the criteria in the Achievement Standard. Judgements should be holistic, rather than based on a checklist approach.