**NZQA**

**Approved**

Achievement standard: 91056 Version 3

Standard title: Implement a multi-unit manufacturing process

Level: 1

Credits: 4

Resource title: Rain maker

Resource reference: Generic Technology VP-1.13 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-02-2015-91056-02-7374 |
| Authenticity of evidence | 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. Assessors/ educators may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

Vocational Pathway Assessment Resource

Achievement standard: 91056

Standard title: Implement a multi-unit manufacturing process

Level: 1

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Resource title: Rain maker

Resource reference: Generic Technology VP-1.13 v2

Vocational pathway: Construction and Infrastructure

Learner instructions

# Introduction

This assessment activity requires you to implement a multi-unit manufacturing process for rainwater harvesters.

You are going to be assessed on how you implement an effective multi-unit manufacturing process for rainwater harvesters. You will use feedback from quality control to review and modify the process, where necessary, to improve the proportion of rainwater harvesters meeting specifications.

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

Rainwater harvesters accumulate and store water by filtering rainwater into a tank, to be reused by households, as livestock drinking water or to water gardens or crops. They are generally installed by builders, with plumbers doing the internal pipe work.

You are to prepare a process for manufacturing multiple rainwater harvesters.

You will need to gather evidence to show your implementation process – for example, a mixture of written work and annotated photographs presented in a portfolio.

Ensure that you understand the specifications for the rainwater harvesters. You may determine these yourself or they may be provided by your assessor/educator. If determining your own specifications, check with your assessor/educator to ensure that these are sufficient to allow you to achieve the standard.

Identify a manufacturing system, for example one-off, batch, or continuous, that would enable your specifications to be met. You will be designing a manufacturing process that communicates the resources, techniques, and quality control procedures you will be using.

You need to identify:

* the resources available to you, for example labour force, equipment, materials, and floor space
* the skills of people in your labour force
* the manufacturing techniques that will meet accepted practices, and health and safety requirements
* the most efficient step-by-step process for producing the rain harvesters
* quality control procedures, how these procedures will be carried out, and how the process will allow for responses to feedback and identifying faults
* any laws or legal issues.

Decide on:

* the manufacturing process
* the resources needed to implement the process (including materials, space, equipment, and workforce) and when you will need them.

A flow diagram might help your planning.

Implement your manufacturing process to manufacture multiple rain harvesters. You need to show evidence of:

* the techniques followed (and information about how they reflected accepted codes and practices, including safety and legal requirements) and resources used for different stages in the manufacturing process
* quality control procedures and their results, to ensure only rain harvesters that met specifications were accepted
* feedback from quality control being used to review the manufacturing process and, if required, to modify the process to produce an improvement in the proportion of rain harvesters meeting specifications.

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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 identify and implement an effective multi-unit process for manufacturing rainwater harvester units to meet specifications, using feedback and modification to improve the acceptability of the end product.

Learners will be assessed on the effectiveness of their manufacturing process in terms of the proportion of units produced that meet specifications.

# Conditions

Learners need to complete all of their practical work in the presence of their assessor/educator to enable judgements about the techniques implemented as well as the quality of the outcome.

While learners need to determine the implementation process, they may use other people to help carry out the process.

# Resource requirements

Assessors/educators must either provide or check that learners have specifications, for example a job specification sheet detailing the type of construction, measurements, tolerances, and materials, that are suitable as a starting point.

Learners will also require access to:

* a space that allows for the manufacturing process to be carried out
* materials, for example downpipes, connectors, filter
* tools and equipment needed to carry out the process safely.

The following websites may be useful:

Consumerbuild <http://www.consumerbuild.org.nz/publish/> (information about stormwater building codes (EI) and local council requirements)

Ecobob <http://www.ecobob.co.nz/> (articles and case studies on rainwater collection and reuse, with links to products and suppliers)

[Local Government](http://www.localgovt.co.nz/) Online <http://www.localgovt.co.nz/> (local authority boundaries and links to council websites)

<http://www.smarterhomes.org.nz/water/collecting-and-using-rainwater/>

<http://www.gdc.govt.nz/assets/Files/EnvHealth/RainHarvestflyer.pdf>

# Additional information

Learners need to be familiar with:

* different types of manufacturing systems and processes, so that they can select and adapt an appropriate manufacturing process
* safe practices in manufacturing processes, for example safe machining practices and appropriate safety gear
* legal requirements for manufacturing rainwater harvesters (for example calculating the minimum fall required for the downpipe to the water tank, Stormwater Building Code Clause E1)
* quality control strategies that enable the product to be constructed accurately and meet specifications.

## Other possible contexts for this vocational pathway

Implementing a multi-unit manufacturing process for bricks, buildings, glass, or roofing tiles.

# Assessment schedule: Generic Technology 91056 – Rain maker

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner implements a multi-unit manufacturing process by:* identifying a manufacturing process suitable for multi-unit manufacture of rainwater harvesters

For example:The learner identifies possible manufacturing systems and explains why batch processing is most appropriate. The learner creates a flow diagram of the manufacturing process.* implementing the manufacturing process by using selected resources and carrying out techniques in keeping with accepted practices, including safety and legal requirements

For example:The learner uses the flow diagram of the manufacturing process to prepare multiple rainwater harvesters. The process is photographed and annotations describe tasks carried out and show accepted practices (e.g. safe use of machinery and best-practice positioning for workers operating machines for extended periods).Evidence includes:* + adherence to legal requirements (e.g. for installing spouting)
	+ a job specification sheet showing how adequate fall has been allowed, with suitable gutter outlets to ensure water does not pool
	+ how the rain harvesters were manufactured to accepted building codes (e.g. water supplies are protected from contamination).

Some manufacturing faults are not identified at an earlier stage, so some finished rainwater harvesters do not meet specifications and therefore are rejected.*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner implements a refined multi-unit manufacturing process by:* identifying a manufacturing process suitable for multi-unit manufacture of rainwater harvesters

For example:The learner identifies possible manufacturing systems and explains why batch processing is most appropriate. The learner creates a flow diagram of the manufacturing process.* implementing the manufacturing process by using selected resources and carrying out techniques in keeping with accepted practices, including safety and legal requirements
* implementing quality control procedures suitable for the manufacturing process and ensuring that only those units that met the specifications have been accepted

For example:The learner uses the flow diagram of the manufacturing process to prepare multiple rainwater harvesters. Photographs and annotations provide evidence of the process, tasks undertaken, and quality control checks (including results) during the manufacturing process, as identified in the flow diagram.Quality control includes:* + checking pipes are cut within the tolerances on the specifications sheet, enabling them to join to the connectors securely
	+ checking downpipes are correctly measured and cut (according to E1 of the building code) to allow for adequate fall
	+ installing the first flush diverter correctly to prevent sediment building-up and entering the rainwater tank, with no leaks
	+ ensuring the filters (screens) are securely joined to prevent contamination of the rainwater.

Rainwater harvesters that do not meet specifications and quality control checks are identified and either rectified or rejected.*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner implements an effective multi-unit manufacturing process by:* identifying a manufacturing process suitable for multi-unit manufacture of rainwater harvesters

For example:The learner identifies possible manufacturing systems and explains why batch processing is most appropriate. The learner creates a flow diagram of the manufacturing process.* implementing the manufacturing process by using selected resources and carrying out techniques in keeping with accepted practices, including safety and legal requirements
* implementing quality control procedures suitable for the manufacturing process and ensuring that only those units that met the specifications have been accepted
* using feedback from quality control to review and modify the manufacturing process, where necessary, leading to an improvement in the proportion of units meeting the specifications

For example:The learner uses the flow diagram of the manufacturing process to prepare multiple rainwater harvesters. Photographs and explanations provide evidence of the process, tasks undertaken, and quality control checks (including results) during the manufacturing process, as identified in the flow diagram.Evidence shows the learner used feedback from quality control to inform the manufacturing process; where specifications were not being met, the learner improved the process to produce more rainwater harvesters that were acceptable. It is difficult to cut the pipes at a consistent angle so the learner creates a template that results in a greater proportion of the pipes meeting this quality standard.The adhesive used to attach the filters results in some uneven joins, so the learner finds an alternative adhesive that is quicker drying and reduces the chance of the filters being moved. This results in an increased number of filters being attached, so that they meet joining specifications.Specific evidence of the learner’s response to quality control feedback includes:* + ‘before and after’ photos of rainwater harvesters, including annotations, to show how modifications have led to more acceptable results
	+ when a rainwater harvester meets the specifications without any change to the process, a photograph is provided with annotations describing the quality control checks.

*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.