**NZQA**

**Approved**

Achievement standard: 91352 Version 3

Standard title: Demonstrate understanding of advanced concepts used in processing

Level: 2

Credits: 4

Resource title: Hammering out the hot stuff

Resource reference: Processing Technologies VP-2.61 v2

Vocational pathway: Manufacturing and Technology

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| Quality assurance status | These materials have been quality assured by NZQA. NZQA Approved number A-A-02-2015-91352-02-8273 |
| 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: 91352

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Learner instructions

# Introduction

This assessment activity requires you to demonstrate your understanding of advanced concepts used in processing to make heat-treated engineering tools.

You are going to be assessed on how comprehensively you demonstrate your understanding of advanced concepts used in processing to make heat-treated engineering tools.

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

In this activity you need to show that you are able to process and interpret information, and prepare a presentation that includes:

* the processing operations used and their resulting outcomes
* the specific tests used, and how processing operations and tests can be combined in a processing sequence and visually explained
* the differences between processing in a classroom environment and in industry, and the differences between health and safety regulations used in a classroom environment and in industry.

Present your understanding of advanced concepts used in processing to make heat-treated engineering tools, for example chisels, centre punches, screw-drivers, hammers, scribers, vee blocks, and clamps.

Confirm the format of your presentation with your assessor/educator. This could be, for example, a brochure that includes diagrams and photos, a video, a PowerPoint presentation, or a combination. Whatever the chosen format, part of the presentation will need to include a visual explanation (for example a flow diagram).

Include the following in your presentation:

* Explain operations that combine or manipulate materials (i.e. process) to make engineering tools, and how they achieve the outcomes that are required. Ensure that you include at least one processing operation from each of the following categories:
	+ measuring/shaping/forming (for example forging the steel)
	+ contamination prevention/disposal (for example contamination and disposal of quenching liquid)
	+ mixing/extracting/separating/growing (for example mixing a brine solution for hardening steel)
	+ heating/cooling/reacting (for example changing the chemical composition of the steel)
	+ materials transfer (for example pumping quenching liquid to and from a storage tank).
* Describe tests, and explain why they are used in engineering tools, and their heat treatment processing operations.
* Explain visually, for example through a flow diagram, how processing operations and tests can be combined in a processing sequence.
* Compare and contrast processing operations and tests used when making tools, and their suitability for different materials and/or purposes.
* Discuss possible processing decisions that could arise as the result of carrying out testing.
* Explain the differences between engineering tools and heat treatment processing in a classroom environment and in industry.
* Explain the differences between health and safety regulations in a classroom environment and in industry.

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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 create a presentation demonstrating their comprehensive understanding of advanced concepts used in processing engineering tools through heat treatment.

# Conditions

The learners could work independently or in groups to develop their understanding, but they need to create their presentation independently and will be assessed individually.

Learners will need to confirm with you the format of their presentation.

# Resource requirements

To enable learners to achieve this standard, they should be given the opportunity to:

* Access information on processing operations and testing used to produce engineering tools in industry and in a classroom environment.
* Access facilities that enable processing operations and testing to be carried out.
* Examine different engineering tools, and discuss how they may have been made and tested during production.
* Practise processing and testing tools. Learners should consider the differences in equipment, volumes, testing and labour (noting specialised tasks) between a classroom environment and an industrial setting.
* Experience testing that would mimic that used in an industrial setting.
* Practise visually explaining processing operations and tests. Generally, flow diagrams would be used so learners will need an understanding of the symbols used, how to put them in the correct order, how to show where tests occur, and where they impact on the processing.
* Research and compare health and safety regulations followed in industry and in a classroom environment.

# Additional information

Learners should also have the opportunity to visit industries that use either heat treatment or similar processes. Videos and websites may provide a similar experience if this is not feasible.

## Other possible contexts for this vocational pathway

Demonstrate understanding of advanced concepts used in processing glass, plastics, paper or wood.

# Assessment schedule: Processing Technologies 91352 – Hammering out the hot stuff

|  |  |  |
| --- | --- | --- |
| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner demonstrates understanding of advanced concepts used in processing heat-treated engineering tools by:* describing processing operations and identifying the impact of these on resulting outcomes

For example:The learner’s description includes at least one processing operation from each of the following categories:* + measuring/shaping/forming e.g. how steel is forged to the required shape
	+ contamination prevention/disposal e.g. how quench liquid can be put through a reconditioning system
	+ mixing/extracting/separating/growing e.g. the effects of applying a mixture (enamelite) for local hardening
	+ heating/cooling/reacting e.g. the care needed when using a cooling bath (the right size and temperature) to ensure the tool is hardened
	+ materials transfer e.g. how brine is pumped to and from the storage tank to keep it at the right temperature.
* describing the nature of specific tests used in processing operations

For example:The learner describes what the tests were used for, e.g. a magnet is used to test the temperature is correct for hardening.* explaining visually how processing operations and tests can be combined in a processing sequence

For example:The learner draws a process flow diagram showing operations and testing, using accepted symbols and feedback loops.* explaining the differences between processing in a classroom environment and processing in industry

For example:The learner compares the same product, e.g. a heat-treated engineering tool made in a classroom environment with one made in industry. The explanation considers waste disposal, material transfer, product specifications, processing sequence and cleaning regimes.* explaining the differences between health and safety regulations in a classroom environment and in industry

For example:The learner’s explanation includes an account of OSH (occupational safety and health) information, health and safety regulations, and the role of the health and safety officer in the plant the learner visited. The learner compares these with the rules in their own learning environment.*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner demonstrates in-depth understanding of advanced concepts used in processing heat-treated engineering tools by:* explaining processing operations and how these achieve required outcomes

For example:The learner’s explanation includes at least one processing operation from each of the following categories:* + measuring/shaping/forming e.g. how steel is forged to the required shape
	+ contamination prevention/disposal e.g. how quench liquid can be put through a reconditioning system
	+ mixing/extracting/separating/growing e.g. the effects of applying a mixture (enamelite) for local hardening
	+ heating/cooling/reacting e.g. the care needed when using a cooling bath (the right size and temperature) to ensure the tool is hardened
	+ materials transfer e.g. how brine is pumped to and from the storage tank to keep it at the right temperature.
* explaining why specific tests are used in processing operations

For example:The learner describes what the tests were used for, e.g. a magnet is used to test the temperature is correct for hardening.The learner explains:* + what tempering colours are, and how the temper is gauged by the colours formed in relation to a colour chart
	+ how chisels can be tempered by heating the cutting end to a particular colour, and then quenching the part to be hardened
	+ how, when the tool is removed from the bath, the effect of the heat remains in the unquenched part.
* explaining visually how processing operations and tests can be combined in a processing sequence

For example:The learner draws a process flow diagram showing operations and testing, using accepted symbols and feedback loops.* explaining the differences between processing in a classroom environment and processing in industry

For example:The learner compares the same product*,* e.g. a heat-treated engineering tool made in a classroom environment with one made in industry. The explanation considers waste disposal, material transfer, product specifications, processing sequence and cleaning regimes.* explaining the differences between health and safety regulations in a classroom environment and in industry

For example:The learner’s explanation includes an account of OSH (occupational safety and health) information, health and safety regulations, and the role of the health and safety officer in the plant the learner visited. The learner compares these with the rules in their own learning environment.*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner demonstrates comprehensive understanding of advanced concepts used in processing heat-treated engineering tools by:* comparing and contrasting processing operations and tests, and their suitability for different materials and/or purposes

For example:The learner compares and contrasts at least one processing operation from each of the following categories: * + measuring/shaping/forming e.g. how steel is forged to the required shape
	+ contamination prevention/disposal e.g. how quench liquid can be put through a reconditioning system
	+ mixing/extracting/separating/growing e.g. the effects of applying a mixture (enamelite) for local hardening
	+ heating/cooling/reacting e.g. the care needed when using a cooling bath (the right size and temperature) to ensure the tool is hardened
	+ materials transfer e.g. how brine is pumped to and from the storage tank to keep it at the right temperature.

The learner compares processing operations, and how these address different types of property changes. The discussion includes:* + how the selection of a quenching medium is determined by the carbon content of the metal
	+ how the temperature steels are heated to during the tempering stage determines their hardness
	+ how case hardening is used when the surface of a metal needs to be hardened but the inside remain soft.
* discussing the implications of testing outcomes on processing decisions

For example:The learner describes what the tests were used for, e.g. a magnet is used to test the temperature is correct for hardening.The learner explains:* + what tempering colours are, and how the temper is gauged by the colours formed in relation to a colour chart
	+ how chisels can be tempered by heating the cutting end to a particular colour, and then quenching the part to be hardened
	+ how, when the tool is removed from the bath, the effect of the heat remains in the unquenched part.

The learner’s discussion covers how the results from a particular test will influence changes in processing, e.g. how hardness tests are applied and, if necessary, processes changed (e.g. the degree of annealing) to ensure products are suitable for their intended use.* explaining visually how processing operations and tests can be combined in a processing sequence

For example:The learner draws a process flow diagram showing operations and testing, using accepted symbols and feedback loops.* explaining the differences between processing in a classroom environment and processing in industry

For example:The learner compares the same product, e.g. a heat-treated engineering tool made in a classroom environment with one made in industry. The explanation considers waste disposal, material transfer, product specifications, processing sequence and cleaning regimes.* explaining the differences between health and safety regulations in a classroom environment and in industry

For example:The learner’s explanation includes an account of OSH (occupational safety and health) information, health and safety regulations, and the role of the health and safety officer in the plant the learner visited. The learner compares these with the rules in their own learning environment.*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.