**NZQA**

**Approved**

Achievement standard: 91169 Version 2

Standard title: Demonstrate understanding of physics relevant to a selected context

Level: 2

Credits: 3

Resource title: Wiring new homes

Resource reference: Physics VP-2.2 v2

Vocational pathway: Construction and Infrastructure

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| Date version published | February 2015 Version 2To support internal assessment from 2015 |
| Quality assurance status | These materials have been quality assured by NZQA. NZQA Approved number A-A-02-2015-91169-02-8212 |
| 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: 91169

Standard title: Demonstrate understanding of physics relevant to a selected context

Level: 2

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Resource reference: Physics VP-2.2 v2

Vocational pathway: Construction and Infrastructure

Learner instructions

# Introduction

This assessment activity requires you to demonstrate your understanding of how physics relates to electricity and electromagnetism relevant to the design of the electrical wiring system for a building.

You are going to be assessed on how you demonstrate comprehensive understanding of physics relevant to the design of the electrical wiring system for a building.

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

The rebuild of Christchurch in the aftermath of the 2011 earthquakes includes rebuilding the electrical infrastructure. You are required to demonstrate your understanding of physics as it would relate to designing a safe and efficient wiring system for new buildings in Christchurch.

Working independently, research the physics for the design of an electrical wiring system for buildings. You may like to look at the websites listed in Resources. Then use your research information to prepare a report in which you explain the relevant physics principles.

Your report could include these ideas:

* a comparison of series and parallel circuits for direct and alternating current
* the selection of appropriate cables, components and insulators
* a description and explanation of safety devices and features such as earth connections and current overload protection devices
* worked examples of voltage, current, and power that show the dangers of having too many devices connected on the same loop
* how the desired voltage is delivered for various lighting and component requirements.

All sources of information, images, diagrams, and data must be acknowledged and referenced in a format that allows them to be easily traced.

Agree on the format of your report with your assessor/educator. This could be:

* a written report (with illustrations, diagrams, and graphs, if appropriate)
* a poster (with annotations or supporting notes)
* an oral presentation (with written references)
* a project booklet
* multimedia (for example a video or web page with embedded video, graphics, and text).

You will be assessed on how well you describe the relevant physics and integrate it into the context of the design of electrical wiring systems. In your report you should aim to elaborate, justify, evaluate, compare and contrast, or analyse the physics underpinning how electrical wiring systems are designed.

# Resources

Useful websites:

<http://www.physicsclassroom.com/class/estatics/>

<http://science.howstuffworks.com/electricity7.htm>

<http://electronicsclub.info/power.htm>

<http://home.howstuffworks.com/induction-cooktops2.htm>

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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 undertake research and prepare a report demonstrating comprehensive understanding of the physics of electrical wiring systems in buildings.

# Conditions

Confirm the format of the report with learners, for example:

* a written report (with illustrations, diagrams, and graphs, if appropriate)
* a poster (with annotations or supporting notes)
* an oral presentation (with written references)
* a project booklet
* multimedia (for example a video or web page with embedded video, graphics, and text).

# Resource requirements

Learners will require access to the internet.

# Additional information

None.

# Assessment schedule: Physics 91169 – Wiring new homes

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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 physics relevant to a selected context by:* providing the characteristics of, or an account of, the physics related to the design of electrical wiring systems in buildings

For example, the learner:* + describes an advantage of using parallel circuits for house circuits
	+ describes the nature of loop circuits
	+ describes how circuit protection devices operate
	+ explains how and why each loop circuit is designed to ensure that safe levels of current operate in the circuits for each loop
	+ describes how voltages may require to be changed to provide lower voltages for some lighting systems.

*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner demonstrates in-depth understanding of physics relevant to a selected context by:* providing the characteristics of, or an account of, the physics related to the design of electrical wiring systems in buildings
* providing reasons as to how and/or why the physics applies to this context

For example, the learner:* + explains how wiring design ensures the desired voltage is available for each device
	+ provides a worked example showing current increases that happen in a circuit as each new light is switched on or an extra appliance is added to a loop
	+ explains why each cable has a maximum current rating by relating this to current, voltage and energy
	+ describes how the earth connection is made to the earth stake, the purpose of this and how this enhances safety at the appliance
	+ describes how voltages may be changed to provide lower voltages for some lighting systems.

*The above expected learner responses are indicative only and relate to just part of what is required.* | The learner demonstrates comprehensive understanding of physics relevant to a selected context by:* providing the characteristics of, or an account of, the physics related to the design of electrical wiring systems in buildings, linking ideas to integrate physics relevant to the context
* elaborating on how and/or why the physics applies to this context
* justifying and evaluating why the particular physics is well suited to this context, and/or comparing alternatives

For example, the learner:* + compares modern circuit protection devices with older methods
	+ provides a worked example for the total current and power output for a house circuit when several appliances such as television, entertainment system are connected at the same socket.

*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.