**NZQA**

**Approved**

Achievement standard: 91054 Version 3

Standard title: Demonstrate understanding of basic human factors in design

Level: 1

Credits: 4

Resource title: Facilitating a walkway solution

Resource reference: Generic Technology VP-1.11 v2

Vocational pathway: Primary Industries

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| Quality assurance status | These materials have been quality assured by NZQA.  NZQA Approved number A-A-02-2015-91054-02-7367 |
| 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

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Learner instructions

# Introduction

This assessment activity requires you to demonstrate your understanding of basic human factors used in in the design of a walkway system for a mining site.

You are going to be assessed on how comprehensively you demonstrate your understanding of basic human factors used in the design of walkway systems for a mining site.

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

Complete a report on basic human factors that need to be considered in the design of a walkway system for a mining site (i.e. what client requirements influence the use of a modular or customised solution?). Include all associated analysis to demonstrate your understanding.

Explore a range of walkway systems. You could look online for evidence that will enable you to analyse their function and record any results (see Resource B). For example consider the environment the walkway system will be used in including any access problems, the amount of use (long or short term), appropriate materials (i.e. lightweight, cost effective), the use of any distinctive styles and trends (i.e. adjustable components, new materials).

Gather and analyse the data you may need by:

* identifying basic human factors (ergonomic and aesthetic) to be considered in the design of walkway systems, this may include its fitness for purpose (i.e. client needs)
* identifying a range of techniques that can be used to gather data about human factors (i.e. how do anthropometric, psychological, and sensory data gathering inform design?)
* using these techniques to analyse your data. For example, in order to analyse factors affecting a walkway system’s layout and function, you could look at different mining environments (surface and sub-surface) and note materials and components used in the solution (performance expectations), and any safety considerations (handrails, non-slip surfaces)
* distinguishing between personal preferences of the mining company and any group preferences (i.e. government legislations). How might they impact on the design of a walkway system (for example, the health and safety regulations specific to a mining site)?
* identifying distinctive styles and trends underpinning the design of walkway systems (i.e. the use of new materials, re-design of existing components). Find out how they are used and how they may impact on walkway systems design.

Organise and document your evidence to support any decision-making. You may wish to include graphs, annotated drawings and/or photographs.

Your report will need to include:

* discussions of why human factors need to be considered in the design of walkway systems, for example ergonomic and aesthetic factors such as user-friendliness, functionality, slip resistance, sustainability over time and flexibility of component arrangement
* explanations of how personal preferences, group preferences, trends, and the local environment may impact on the design
* discussions about the suitability of data gathering and analysis techniques that may be used in the design of a walkway system. For example why measuring and analysing is a suitable anthropometric data gathering technique used in the design of walkway systems (i.e. resulting in standardised easily assembled components)
* comparing and contrasting the advantages of specific data gathering techniques (anthropometric, psychological and sensory) used in the design of walkway systems.

Find relevant information of how human factors are used in environmental design by:

* visiting your local library or museum
* researching websites and books (Resource A).

# Resource A

## Useful information

Woodson, W, Tillman, B and Tillman, P 1992, *Human Factors Design Handbook*, McGraw-Hill Education.

Visits to industry or from practicing technologists may be helpful.

Footpath construction and styles: <http://www.livingstreets.org.nz/node/2020>.

Ergonomics: <http://designmuseum.org/design/page75806>.

# Resource B

This is an example of where data has been collected from different sites (online, library) and compiled into a table in order to analyse the information in relation to the design of walkway systems for mining environments, to have a more complete understanding.

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| **Environment** | **Ergonomic** | **Aesthetic** | **Psychological** | **Technical** | **Data results** |
| A sub surface mine requires a walkway system installed in a corrosive, hard to access environment. | Requires easily assembled components and flexibility in arrangement to meet user demands, and expected longevity of use. | Standardised components (i.e. proportion and scale) required. Texture considered in material function.  E.g. Grating pattern is self-cleaning, allowing mud and water to easily flow through for safety. | Spatial dimensions, such as expected volume of materials needed (i.e. walkway handrails, stairs) required for the space. Considerations include safety, function, and amount of use. | How is the walkway going to be supported (i.e. side or below)? What skills and equipment are appropriate for the task? | A modular walkway system would be the best solution after considering the surrounding landscape and performance criteria (i.e. what materials and equipment can be safely used in this environment). |

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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 demonstrate comprehensive understanding of basic human factors used in the design of a walkway system for a mining site.

# Conditions

This is an individual activity. Learners could work individually or in groups to look at ergonomic and aesthetic factors to understand what is meant by the terms personal preference, group preference, style and trends and how these affect different design tasks. Decide on the format of the final presentation. You may wish to take learner preferences into account in deciding on the format.

# Resource requirements

Learners require access to the internet for research.

# Additional information

None.

## Other possible contexts for this vocational pathway

Environmental architecture: learners could consider and discuss spatial design or landscaping, for example BMX tracks, skate parks, drainage and roads.

Industrial design: learners could consider and discuss the design of an appliance or tool such as the clegg hammer.

# Assessment schedule: Generic Technology 91054 – Facilitating a walkway solution

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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 human factors used in the design of a walkway system by:   * describing human factors that need to be considered when designing walkway systems   For example:  The learner describes suitable surfaces that are slip resistant, self-cleaning and materials (aluminium, steel) that ensure long-term performance for the specified environment.   * explaining how personal preference, group preferences, style and trends may impact on a walkway system’s design   For example:  The learner explains the requirements for a sub-surface mine environment (i.e. corrosive, hard to access) and government legislation (Crown Minerals Act 2013) and how this would impact on the design. The learner also explains how styles and trends may be linked (e.g. the learner explains how including a popular new material such as FRP (reinforced thermoset resin) onto the walkway’s grating, can be coloured to suit client requirements and contributes towards its long term performance).   * describing data gathering and analysis techniques that may be used when designing a walkway system, and how it then informs walkway design   For example:  The learner describes online research as a useful data gathering technique and how relevant data could be compiled into a table (Resource B) and analysed in relation to walkway systems design. The description includes observations of different walkway systems available and how each environment would require different solutions. The learner noticed how the layouts are based on the environment, how the walkway can be safely supported, total dimensions and amount of different components (stairs) needed. By noticing the amount of use the walkway would require, if it needed to be easily transportable (lightweight) and how adaptive to change it needed to be, the learner was able to detail how a walkway system was designed to suit an environment. For example, in a sub-surface mine, modular designed walkway systems (i.e. standard components for easy adjustments fabricated to specific requirements) would be more advantageous.  *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 human factors used in the design of a walkway system by:   * explaining the human factors that need to be considered when designing walkway systems   For example:  The learner explains how/why suitable surfaces are slip resistant, self-cleaning and how/why certain materials (aluminium, steel) ensure long-term performance for the specified environment.   * explaining how personal preference, group preferences, style and trends may impact on a walkway system’s design   For example:  The learner explains the requirements for a sub-surface mine environment (i.e. corrosive, hard to access) and government legislation (Crown Minerals Act 2013) and how this would impact on the design. The learner also explains how styles and trends may be linked (e.g. the learner explains how including a popular new material such as FRP (reinforced thermoset resin) onto the walkway’s grating, can be coloured to suit client requirements and contributes towards its long term performance).   * explaining how data gathering and analysis techniques may be used in designing a walkway system, and how it then informs walkway design   For example:  The learner explains more than one data gathering technique and more than one analysis technique. The learner explains how data gathering and analysis techniques may be used in walkway systems design. For example, the learner explains online research as one useful data gathering technique and how relevant data could be compiled into a table and analysed to increase understanding when designing a suitable walkway system for an environment. The explanation includes the learner’s observations of different walkway systems, which notice the layout based on the environment, how the walkway can be safely supported, total dimensions and amount of different components (stairs) required. By noticing the amount of use the walkway would require, if it needed to be easily transportable (lightweight) and how adaptive to change it needed to be (maintenance), the learner was able to provide further analysis explaining which walkway system would best suit each environment. For example, in a sub-surface mine, modular designed walkway systems (i.e. standard components for easy adjustments fabricated to specific requirements) would be more advantageous.  *The above expected learner responses are indicative only and relate to just part of what is required.* | The learner demonstrates comprehensive understanding of basic human factors used in the design of a walkway system by:   * discussing why human factors identified for designing walkway systems need to be considered   For example:  The learner discusses a range of suitable surfaces and materials (aluminium, steel) by comparing properties that ensure long-term performance for the specified environment.   * explaining how personal preference, group preferences, style and trends may impact on a walkway system’s design   For example:  The learner explains the requirements for a sub-surface mine environment (i.e. corrosive, hard to access) and government legislation (Crown Minerals Act 2013) and how this would impact on the design. The learner also explains how styles and trends may be linked (e.g. the learner explains how including a popular new material such as FRP (reinforced thermoset resin) onto the walkway’s grating, can be coloured to suit client requirements and contributes towards its long term performance).   * discussing the suitability of data gathering and analysis techniques that may be used in designing a walkway system   For example:  The learner compares and contrasts the suitability of data gathering and analysis techniques that may be used in the design of walkway systems. The learner discusses the relevance of existing data with reference to the environment’s impact on a walkway system’s design. The learner identifies and compares the advantages and disadvantages of more than one data gathering technique and more than one analysis technique and gives examples of the useful information they may provide (i.e. standardised measurements used in modular design). The discussion includes:   * + the advantages and disadvantages of interviews and compares these with the advantages and disadvantages of observation in order to decide which of these techniques may provide better qualitative data for their specific purpose   + the key to creating the best walkway system in terms of its durability, safety, flexibility and maintenance of components, and cost effectiveness (human factors that need to be considered in a walkway system’s design)   + how combinations of the mining environment (corrosive, hard to access), understanding of performance expectations, local landscape, psychology of users and technical skills (engineering) contribute towards the many variables that can affect the structure and durability of walkway systems design.   *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.