



Australian Government

Department of Education, Employment and Workplace Relations

NWP560 Apply principles of strength of materials to engineering problems

Release: 1

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Modification History

NWP560 Release 1: Primary release.

Unit Descriptor

This unit of competency sets out the knowledge and skills required to apply principles of strength of materials to standard engineering problems. This includes stress strain, deformation, and properties of sections, shear force and testing.

Application of the Unit

This unit applies to engineering para-professionals who are delegated the responsibility to assess the strength of materials required used in engineering applications in the water industry.

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the tasks you need to be able to perform, to demonstrate that you can achieve the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

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| 1 Identify the requirements for determining material strength | <ul style="list-style-type: none">1.1 Determine <i>strength of materials task</i> through requests, design briefs or equivalent and clarified with <i>appropriate personnel</i>.1.2 Seek appropriate expert advice with respect to the strength of materials task and according to enterprise procedures.1.3 Obtain <i>resources</i> needed for the task in accordance with <i>enterprise procedures</i> and check for correct operation and safety.1.4 Consult appropriate personnel to ensure the work is co-ordinated effectively with others involved at the work site. |
| 2 Select the appropriate testing regime | <ul style="list-style-type: none">2.1 Interpret and apply industry codes, regulations and technical documentation relevant to the engineering problem.2.2 Identify and use sources of computational data.2.3 Make and record appropriate assumptions underlying the strength of materials task.2.4 Select the most appropriate computational methodology. |
| 3 Undertake materials testing | <ul style="list-style-type: none">3.1 Perform strength of materials test and record results.3.2 Select methods for dealing with unexpected situations on the basis of discussions with appropriate personnel, job specifications and enterprise procedures. |
| 4 Verify, document and interpret outcomes | <ul style="list-style-type: none">4.1 Discuss and verify results of testing with appropriate personnel.4.2 Present results as required from initial request or brief. |

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills:

- read and understand codes and regulations relevant to engineering design in the water industry
- destructive and non-destructive material strength tests
- report writing and presentation

Required knowledge:

- stress and strain in a material engineering context, including torsional and thermal stress
- centrally loaded connections
- thin walled pressure vessels
- properties of plane figures
- simple beams (point and distribute loads)
- classification of materials
- properties of materials for engineering design, including physical, mechanical, and chemical properties
- materials testing methods including both destructive and non-destructive testing (NDT), and corrosion testing
- engineering applications of ferrous and non-ferrous metals, and polymers
- effects of mechanical and thermal processes on the properties of materials

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to:

- Apply concepts of strength of materials to problems of strength and stability of structures and mechanical components on five different occasions. This includes stress, strain, deformation, properties of sections and shear force.

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- workplace specific equipment and technology
- supervision and experienced team members to provide observations, feedback and third party reports
- enterprise operating procedures and work allocation
- relevant codes, standards, and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and/or assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence require that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity

and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the candidate, any cultural issues that may affect responses to the questions, and reflecting the requirements of the competency and the work being performed.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Strength of materials task may include:

- materials analysis
- materials selection
- non-destructive testing (NDT)
- destructive testing

Appropriate personnel may include:

- supervisor
- leading hand
- foreman
- manager
- site engineer
- trainer
- mentor
- teacher
- team member

Resources and equipment may include:

- computer software
- library files
- stationery
- drawing standards
- software reference documentation
- equipment
- computer hardware
- printers
- plotter
- digitisers

Enterprise procedures may include:

- the use of tools and equipment
- instructions, including job sheets, cutting lists, plans, drawings and designs
- reporting and communication
- manufacturers' specifications and operational procedures

Unit Sector(s)

Not applicable.

Competency Field

General Engineering.