



Australian Government

Department of Education, Employment and Workplace Relations

NWP404A Apply principles of chemistry to water systems and processes

Revision Number: 2

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Modification History

NWP404A Release 2: Layout adjusted. No changes to content.
NWP404A Release 1: Primary release.

Unit Descriptor

This unit of competency describes the knowledge required to identify and apply the principles of chemistry to water systems and processes, and to select the relevant and effective chemicals required for specific processes.

Application of the Unit

This unit is relevant to a wide range of job roles within the water industry and is fundamental to all quality monitoring and treatment processes.

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 performance needed to demonstrate achievement of 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

ELEMENT	PERFORMANCE CRITERIA
1 Apply chemistry to water processes.	<p>1.1 Identify and apply <i>concepts of chemistry</i> to the performance of water processes according to <i>relevant legislation</i> and <i>workplace policies and procedures</i>.</p> <p>1.2 Identify and explain <i>chemical reactions</i> specific to water processes.</p>
2 Identify the use of chemicals in water industry processes.	<p>2.1 Assess the <i>functions</i> of the range of industry <i>chemicals</i> in relation to their use in water processes.</p> <p>2.2 Identify and explain <i>factors influencing the effectiveness of chemical use</i>.</p> <p>2.3 Store, handle and prepare chemicals according to workplace policies and procedures and manufacturers' specifications.</p>
3 Select chemicals for specific water industry processes.	<p>3.1 Identify the range of chemicals available for specific water industry processes.</p> <p>3.2 Evaluate the <i>factors affecting the selection of chemicals</i> for particular water industry applications.</p> <p>3.3 Select suitable chemicals and calculate correct usage for a range of specific water industry processes.</p>

Required Skills and Knowledge

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

Required skills:

- interpret a range of complex and technical documents including relevant:
 - regulatory, legislative, licensing and organisational requirements
 - codes and standards
 - specifications
 - organisational policies
- communicate effectively with a range of relevant parties
- articulate complex ideas clearly
- analyse and evaluate reports and reference materials
- work collaboratively with relevant stakeholders
- analyse problems and apply effective remedial solutions
- perform various calculations to provide data for the analysis and development of options and solutions
- identify risks and hazards
- identify opportunities for improved water management
- participate in the provision of information to inform workplace processes
- manage work priorities
- use information effectively to improve work performance

Required knowledge:

- standards and workplace policies and procedures determining the use and management of chemical processes
- chemical concepts relevant to water industry processes
- chemical reactions
- the range and characteristics of chemicals used in various water industry processes
- the functions of various chemicals in water industry processes
- factors influencing the effectiveness of chemicals
- the factors affecting the selection of chemicals

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.

Overview of assessment

The candidate should:

- perform each task outlined in the elements consistently and in a representative range of contexts required by the enterprise and worksite
- meet the performance criteria associated with each element by employing the techniques, procedures, information and resources available in the workplace from those listed in the range statement
- demonstrate an understanding of the underpinning knowledge and the application of skills as described in the required skills and knowledge section

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

The candidate should demonstrate the ability to:

- understand and apply a knowledge of chemical concepts and reactions relevant to water industry processes
- describe the range, characteristics and functions of chemicals used in various water industry processes
- identify and evaluate the factors influencing the effectiveness of chemicals in specific water industry processes
- select appropriate chemicals for specific water industry processes

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
- 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 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 requires 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 only taken at the point 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 operator and cultural issues that may affect responses to the questions, and will reflect 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.

Concepts of chemistry may include:

- atoms, ions, molecules and compounds
- chemical bonding
- chemical reactions
- acids and bases
- oxidation reduction potential (ORP)

Workplace policies and procedures may include:

- organisational policies
- standard operating procedures
- communication and reporting protocols
- quality assurance

Relevant legislation may include:

- federal, state and local environmental and water quality legislation
- occupational health and safety legislation
- hazardous chemicals and dangerous goods legislation

Chemical reactions may include:

- neutralization and pH buffering
- pH correction
- calcium carbonate precipitation
- coagulation
- chemical P removal
- iron and manganese removal
- sequestering

Functions may include:

- disinfectant
- oxidant
- reductant
- sequestering agent
- pH correction and buffering
- coagulant
- flocculant
- surfactant
- adsorbent
- precipitant
- catalyst

Chemicals used in the water industry may include:

- chlorine
- ozone
- sodium thiosulphate

Factors influencing the effectiveness of chemical use may include:

- sodium hexametaphosphate
- activated carbon
- hydrated lime
- aluminium and iron salts
- potassium permanganate
- sulphuric acid
- pH
- ageing
- mixing
- temperature
- concentration

Factors affecting the selection of chemicals may include:

- cost
- purity
- availability
- by-product generation
- storage and handling requirements
- safety requirements
- efficiency and effectiveness

Unit Sector(s)

Not applicable.

Competency field

Treatment.