



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **PMAOPS512B Determine mass transfer loads**

**Revision Number: 1**

## PMAOPS512B Determine mass transfer loads

### Modification History

Not applicable.

### Unit Descriptor

<b>Unit descriptor</b>	This competency covers the application of a knowledge of mass transfer and mass balance principles to the design and use of processing equipment.
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### Application of the Unit

<b>Application of the unit</b>	<p>In a typical scenario, the mass transfer loads for process equipment or a process is required to be determined. Calculations are performed to determine the mass transfer loads, to help in the diagnosis of plant performance problems, to identify materials efficiencies or losses or for the specification of new or modified equipment.</p> <p>This competency is typically performed by senior technicians.</p> <p>It includes:</p> <ul style="list-style-type: none"> <li>• calculating mass flow rates</li> <li>• density variations with changes in temperature (and pressure where appropriate)</li> <li>• mass changes resulting from a chemical reaction</li> <li>• mass flow of components of a mixed stream</li> <li>• mass balances.</li> </ul> <p>Note that this unit uses the term 'flow rate' and similar terms. This may be the flow rate in terms of kg/h, or kg/batch or similar conceptual flows.</p>
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### Licensing/Regulatory Information

Not applicable.

## Pre-Requisites

<b>Prerequisite units</b>	
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## Employability Skills Information

<b>Employability skills</b>	This unit contains employability skills.
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## 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 required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for work.	1.1. Identify work requirements 1.2. Identify and control hazards 1.3. Coordinate with appropriate personnel
2. Calculate mass flow rates of streams.	2.1. Calculate mass flow rate of plant streams from volumetric data, correcting for changes in density 2.2. Calculate mass flow rate of individual components of plant streams from their concentrations 2.3. Calculate mass accumulation (+ or -) within a plant item.
3. Calculate mass change due to a chemical reaction.	3.1. Determine yield from reaction of all significant products 3.2. Determine mass output of all significant products arising from the reaction for specified reactant inputs.
4. Conduct mass balance over process components.	4.1. Determine desired boundaries for mass balance calculation 4.2. Determine possible sources of data required from the plant 4.3. Match and adjust sources of data to desired boundary for mass balance 4.4. Determine overall mass balance 4.5. Determine mass balance for each significant component/ reactant and product 4.6. Determine the adequacy (or otherwise) of the process/plant heating/cooling system to meet production requirements.

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

#### Required skills

Competence includes the ability to:

- determine the boundaries of the system to be studied
- collect the required plant data from measurements, readings or calculated quantities
- calculate the mass transfer loads
- report the results.

Competence also includes the ability, for the practical completion of the job, to apply and/or explain:

- changes in density with temperature (and pressure where appropriate)
- stoichiometry of chemical reactions
- mass balances.

#### Required knowledge

Knowledge and understanding of mass transfer principles and calculations sufficient to determine the mass transfer loads of an existing or a new process.

## Evidence Guide

### EVIDENCE GUIDE

The Evidence Guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for the Training Package.

#### Overview of assessment

Assessment of this unit should include demonstrated competence on actual plant and equipment in a work environment. The unit will be assessed in as holistic a manner as is practical and may be integrated with the assessment of other relevant units of competency.

Assessment will typically be by a mass balance project(s).

This unit of competency requires a significant body of knowledge which will be assessed through questioning and the use of what-if scenarios both on the plant and off the plant.

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

Competence must be demonstrated in the ability to complete a mass balance in a structured way, taking real data from an operating plant.

Consistent performance should be demonstrated. In particular look to see that:

- realistic boundaries are drawn for the mass balance which align with practical sources of data from the plant
- data is collected from the plant with minimum disruption to production
- theoretical and practical requirements for the mass balance are consistent
- the mass balance data is used to identify and contribute to solutions for plant problems.

This will typically be assessed by one or more mass balance projects on an operating plant. One complex mass balance, or a number of simple mass balances, are required to demonstrate competence.

#### Context of and specific resources for assessment

Assessment will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating ability over a range of situations. A bank of scenarios/case studies/what-ifs will be required as will a bank of questions which will be used to probe the reasoning

<b>EVIDENCE GUIDE</b>	
	behind the observable actions.
<b>Method of assessment</b>	In all plants it may be appropriate to assess this unit concurrently with relevant teamwork and communication units.
<b>Guidance information for assessment</b>	Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.

## Range Statement

<b>RANGE STATEMENT</b>	
<p>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. Add any 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.</p>	
<b>Codes of practice/ standards</b>	Where reference is made to industry codes of practice, and/or Australian/international standards, the latest version must be used.
<b>Context</b>	<p>This competency unit includes the mass transfer into and out of all processing equipment and requires the quantitative determination of mass transfer loads. This competency applies to all sectors within the chemical, hydrocarbons and oil refining industry.</p> <p>Mass transfer modes include:</p> <ul style="list-style-type: none"> <li>• simple (physical) mixing</li> <li>• simple (physical) separation</li> <li>• changes in component mass flow rates due to chemical reaction (including mixing and separation using chemical reaction).</li> </ul>
<b>Health, safety and environment (HSE)</b>	All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between Performance Criteria and HSE requirements, the HSE requirements take precedence.

## Unit Sector(s)

<b>Unit sector</b>	Operational/technical
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## Competency field

<b>Competency field</b>	
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## Co-requisite units

Co-requisite units		
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