



Australian Government

MEM234005 Design hydrodynamic pumping systems

Release: 1

MEM234005 Design hydrodynamic pumping systems

Modification History

Release 1. Supersedes and is equivalent to MEM234005A Design hydrodynamic pumping systems.

Application

This unit of competency defines the skills and knowledge required to design new or modified hydrodynamic pumping systems across all forms of manufacturing and engineering. Designs consist of the layout, choice of motor and pumps, pipes and valves; the fluid source and delivery requirements of the system and incorporate sustainability implications, work health and safety (WHS) and regulatory requirements.

Design activities can be reverse engineering, design rectification or modifications of an existing design. It applies to pumping system designers and maintenance personnel, and those pursuing engineering or related qualifications and careers.

The client may be internal or external to the designer's organisation.

Individuals completing this work either already have or are developing skills and experience in scientific principles, evaluation of hydrodynamic systems, mathematics and computer software and file handling.

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

Pre-requisite Unit

Nil

Competency Field

Engineering science

Elements and Performance Criteria

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Clarify the design brief and elaborate the specification	1.1 Establish required features and performance parameters of hydrodynamic pumping system 1.2 Confirm technical, commercial and environmental parameters of the brief or contract

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	1.3 Determine stakeholders to be consulted in design process 1.4 Assess WHS, regulatory, sustainability or environmental issues relevant to the design task 1.5 Confirm design brief, including budget and schedule, and provide preliminary advice on feasibility
2. Evaluate design analysis and prepare concept proposals	2.1 Appraise initial qualitative and quantitative analysis of the design task 2.2 Carry out required detailed modelling and calculations using appropriate software and validation techniques 2.3 Generate solutions to the design brief, including choice of equipment, layout, fluid source and delivery 2.4 Check feasibility and evaluate solutions against design criteria, ensuring conformity to standards and codes, technical, economic and WHS requirements 2.5 Determine social and sustainability implications of solutions 2.6 Present concept proposals to client
3. Design hydrodynamic pumping system	3.1 Evaluate concept proposals with client and select preferred solution 3.2 Ensure that design solution is optimised with respect to the system specifications 3.3 Finalise selected design, comprising equipment, layout, fluid source and delivery, and other features desired by client 3.4 Ensure preparation of all required documentation, drawings, specifications and instructions 3.5 Consult with client and stakeholders to obtain sign-off on design 3.6 Monitor installation and commissioning with stakeholders and make any necessary adjustments to design

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.	
Parameters of the design brief include:	• design of new equipment or fault analysis, rectification or modification to an existing design • determination of the degree of innovation and creativity expected by the client • design process limits and budgets • product cost limits and budgets • performance specification • equipment availability, capacities and restrictions • specified administrative, communication and approval procedures • other special features and limits in the design brief.
WHS, regulatory, sustainability and environmental issues include:	• WHS acts, regulations and relevant standards • industry codes of practice • risk assessments • registration requirements • safe work practices • minimising ecological and environmental footprint of process, plant and product • maximising economic benefit of process plant and product to the organisation and the community • minimising the negative WHS impact on employees, community and customer • state and territory regulatory requirements.
Solutions include those which:	• satisfy the technical requirements of the design brief • are within budget • are able to be manufactured • meet any regulatory requirements • minimise environmental and sustainability impacts.
Pumping system specifications include:	• pump types • system head requirements, pump performance requirements • duty point, flow rates • cavitation issues and control • power and efficiency • energy cost of pumping • valves for flow control

	• component layout.
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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM234005A Design hydrodynamic pumping systems.

Links

Companion Volume Implementation Guides are available on VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>

Assessment Requirements for MEM234005 Design hydrodynamic pumping systems

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include:

- interpreting features of plant and equipment and parameters of the brief or contract
- advising the client based on discipline knowledge and work health and safety (WHS) and regulatory standards
- researching sustainability implications and current industrial design techniques
- determining WHS, regulatory and risk management requirements
- modelling and calculating using appropriate software and validation techniques
- generating and evaluating solutions for feasibility against design criteria
- designing hydrodynamic pumping solution on at least two occasions
- communicating, negotiating and reviewing with stakeholders and client throughout the process to obtain agreement on proposal and sign-off on design
- documenting design with drawings, specifications and instructions.

Note: Where a volume and/or frequency is not specified, demonstration must be provided at least once.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- research and investigation methods
- design brief parameters
- techniques for:
 - continuous improvement
 - problem-solving and decision-making
 - root cause analysis (RCA) or failure mode and effects analysis (FMEA) or design review based on failure mode (DRBFM), and Pareto analysis
- contemporary engineering design methods
- relevant engineering design software
- design, research, modelling and computational methodologies applied to hydrodynamic pumping systems

- documentation, drawings, specifications and instructions
- WHS and regulatory requirements, codes of practice, standards, risk minimisation and registration requirements
- fundamentals of hydrodynamics including properties of substances and conservation of energy principles
- types of pumps including centrifugal, rotary and reciprocating
- pumping systems specifications including head equations, performance curves, valves, flow rates and efficiency
- pump placements
- cavitations
- rotodynamic pump performance parameters and specifications
- series and parallel pumps
- practical pump installations and operation problems
- pumping special fluids including viscous fluids, slurries, Newtonian and non-Newtonian fluids.
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Assessment Conditions

- Assessors must:
 - have vocational competency in designing hydrodynamic pumping systems at least to the level being assessed with relevant industry knowledge and experience
 - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
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