



Australian Government

PMC554090 Undertake simple refractory design

Release: 1

PMC554090 Undertake simple refractory design

Modification History

Release 1. Supersedes and is equivalent to PMC554090B Undertake simple refractory design.

Application

This unit of competency covers the skills and knowledge required to undertake simple refractory design. It applies to refractory design that can be achieved by the application of standard products/components in a standard manner and that is not required to be done by a registered engineer.

This unit of competency applies to operators who are required to confirm technical requirements for the refractory and determine the materials and installation methods to meet those requirements.

This unit of competency applies to technician applying specialised theoretical and technical knowledge and well developed skills in situations that require autonomy, discretion and judgement. The person may work alone or as a member of a team or group and will work in liaison with customers, installers, engineers and technical experts, as appropriate.

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

Pre-requisite Unit

Nil

Competency Field

Technical

Unit Sector

Not applicable

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

1	Establish the suitability of resources	1.1	Check all information conforms with resources
		1.2	Record discrepancies in information
		1.3	Report any inaccuracies in information to the person in charge

		1.4	Identify and select materials, components, tools and equipment
2	Undertake mechanical design	2.1	Determine strength requirements
		2.2	Determine operating temperature range
		2.3	Select materials/mix with appropriate mechanical strength
		2.4	Identify hazards of materials and processes to be used and apply hierarchy of control to control hazards
		2.5	Determine expansion which will occur for this material
		2.6	Adjust material/mix to be suitable for temperatures
3	Undertake thermal design	3.1	Determine heat flow through the refractory
		3.2	Determine interface temperatures for multi-component linings
		3.3	Use simple software
		3.4	Determine interface bonding/anchor issues
4	Specify refractory design	4.1	Specify materials to be used
		4.2	Specify installation method to be used
		4.3	Confirm specification meets customer needs and installer requirements

Foundation Skills

This section describes those required skills (language, literacy and numeracy) 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.

Regulatory framework The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used.

Applicable legislation, regulations, standards and codes of practice include:

- health, safety and environmental (HSE) legislation, regulations and codes of practice relevant to the workplace, equipment and production processes and hazardous materials
- Australian/international standards relevant to the materials being used and products being made
- any relevant licence and certification requirements.

All operations to which this unit applies are subject to stringent HSE requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and such requirements the legislative requirements take precedence.

Procedures All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, and include one or any combination of:

- manufacturer's technical information
- job cards
- drawings
- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

Hazards Hazards must be identified and controlled. Identifying hazards requires consideration of:

- health and safety risks
- sustainability risks
- regulatory risks.

Unit Mapping Information

Release 1. Supersedes and is equivalent to PMC554090B Undertake simple refractory design.

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=45a7f1d5-61a5-447a-9688-7abbd7e1a5c7>

Assessment Requirements for PMC554090 Undertake simple refractory design

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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 demonstrate the ability to:

- read and interpret technical reports, technical specifications and data
- confirm technical requirements for refractory
- determine and specify materials and installation to meet mechanical and thermal requirements
- communicate technical information verbally and in writing/drawings
- communicate with internal and external stakeholders, including one or more of:
 - customer representatives
 - technical experts
 - engineers
 - refractory installer
- apply complex and/or theoretical mathematical calculations
- identify hazards and apply relevant hazard controls.

Knowledge Evidence

Must provide evidence that demonstrates knowledge relevant to their job sufficient to fulfil their job role, including knowledge of:

- properties of all common refractory materials
- application and limitations of installation techniques, including:
 - bricks, blocks
 - mouldables
 - castable
 - spray/gunned application
- heat flow calculations
- key factors in refractory design, including:
 - heat transfer
 - thermal expansion
 - abrasion
 - structural strength
 - methods of tying refractories

- heat transfer calculations (resistances in series and parallel)
- regulatory framework
- hierarchy of control
- hazards that may arise in the job/work environment and:
 - their possible causes
 - potential consequences
 - appropriate risk controls.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence shall be based on a holistic assessment of the evidence.
- The collection of performance evidence is best done from a report and/or folio of evidence drawn from:
 - a single project which provides sufficient evidence of the requirements of all the elements and performance criteria
 - multiple smaller projects which together provide sufficient evidence of the requirements of all the elements and performance criteria.
- A third-party report, or similar, may be needed to testify to the work done by the individual, particularly when the project has been done as part of a project team.
- Assessment should use a real project in an operational workplace. Where this is not possible or where personal safety or environmental damage are limiting factors assessment must occur using a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from demonstration of skills and one or more of:
 - walk-throughs
 - pilot plant operation
 - industry-based case studies/scenarios
 - ‘what ifs’.
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process, such as workbooks, written assessments or interviews.
- 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.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.

- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- In addition the assessor or anyone acting in subject matter expert role in assessment shall demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they shall assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
 - relevant VET or other qualification/Statement of Attainment
 - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
 - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions
- Currency can be demonstrated through one or more of:
 - being currently employed undertaking the type of work being assessed
 - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation's policies and procedures
 - having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
 - conducting on the job training/assessments of the type of work being assessed
 - being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

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