Australian Government

Department of Education, Employment and Workplace Relations

PMC554090B Undertake simple refractory design

Revision Number: 1

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Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers applying design principles and undertaking simple design tasks. The technical requirements of the design are paramount and the application of an understanding of refractories, heat transfer and refractory wear and failure mechanisms are primary. The aesthetics of the design are of little if any significance.

Application of the Unit

Application of the unit	This unit of competency applies to technicians who are responsible for designing simple or small refractory installations or repairs. They apply the principles of heat transfer, thermal expansion, abrasion and structures along with a knowledge of refractory materials and installation techniques to the design to yield a product which will meet a rigid technical specification. This unit covers a refractory design for a situation which can be achieved by the application of standard products/components in a standard manner. It does not cover innovative products/ applications nor those situations where the design must be done by a registered engineer, although it may involve working with an engineer on a design This will typically be done by an individual technician working in liaison with customers, installers and technical experts.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	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 required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
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

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills include:

- adjusting/correcting/responding to work requirements
- identifying and resolving problems
- using simple software for calculations
- working in a team or individually, as required
- reading and numeracy to interpret workplace documents and technical information

Required knowledge

Required knowledge includes:

- heat flow calculations
- awareness of other relationships involved with these calculations
- refractory materials and their properties
- refractory installation techniques
- structural strength of refractories
- thermal expansion of refractories
- methods of tying refractories

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, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	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.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Competence must be demonstrated in the operation of all ancillary equipment to the level required for this unit of competency. Competence must be demonstrated in the ability to recognise and analyse potential situations requiring action and then in implementing appropriate corrective action. Consistent performance should be demonstrated. In particular look to see that: • the technical aspects of the design are identified and an appropriate solution is proposed.
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. Assessment will occur over a range of situations which will include disruptions to normal, smooth operation. Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency. Simulation should be based on the actual plant and will include 'walk-throughs' of the relevant competency components. A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.
Method of assessment	It may be appropriate to assess this unit concurrently with relevant teamwork and communication units. It may be appropriate to assess this unit concurrently with other relevant units.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.

Range Statement

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.	
Procedures	All operations are performed in accordance with standard procedures and work instructions
Refractory materials	Refractory materials are those materials that have a resistance to temperature and include: • alumina silicate materials (clay) • silliminites • bauxite • synthetic aggregates • silica • magnesite • dolomite • chrome ores
Refractory installation techniques	Refractory installation techniques include: • bricks, blocks • mouldables • castable • spray/gunned application
Occupational health and safety (**OHS**)	All operations are subject to stringent OHS requirements and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and OHS requirements, the OHS requirements take precedence

Unit Sector(s)

Unit sector	Operational/technical

Competency field

Competency field	

Co-requisite units

Co-requisite units		