



Australian Government

Department of Education, Employment and Workplace Relations

PMC557097A Specify and monitor repairs to refractory installations

Revision Number: 1

PMC557097A Specify and monitor repairs to refractory installations

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers developing the specification for a refractory repair and then monitoring that repair to ensure it complies with the specification. It is intended for refractory experts who will most likely also have some management responsibility.
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Application of the Unit

Application of the unit	<p>This unit of competency requires the application of knowledge of refractory materials, installation and failure modes to determine an appropriate repair method. It covers repairs to all types of refractories. This unit does NOT cover the investigation of refractory failures, refer to <i>PMC557094A Investigate refractory failures</i>. The units are obviously related and it may be appropriate to consider both concurrently.</p> <p>This unit applies to individuals who may design a refractory installation and may also monitor the installation of refractory, or they may be repair specialists. They may be working in liaison with other refractory specialists or they may be the sole refractory specialist for this job/in their organisation. They will typically be liaising with a range of other technical experts as well as management and maybe accounts.</p> <p>This unit may apply to individuals working for an organisation which supplies and installs refractories, is a refractory consulting organisation or a client organisation which buys and uses the refractory.</p>
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	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. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Confirm repair specification	1.1. Check repair specification against agreed set of requirements for the repair 1.2. Identify discrepancies or conflicts in requirements 1.3. Confirm repair requirements and specifications
2. Design installation process	2.1. Determine refractory materials to be repaired 2.2. Determine refractory material to be used in making the repair 2.3. Determine repair installation/application requirements 2.4. Determine installation equipment requirements 2.5. Determine anchor/keying/adhesion requirements 2.6. Determine repair method 2.7. Determine post repair application requirements 2.8. Determine temporary support or shores required 2.9. Design formwork if required 2.10. Design scaffolding or other internal access needs if required 2.11. Design external access/egress means if required 2.12. Identify installation health, safety and environment (HSE) hazards 2.13. Determine appropriate hazard controls 2.14. Check for discrepancies or conflicts in the designs and take appropriate action
3. Prepare for installation	3.1. Specify repair procedure 3.2. Liaise with relevant stakeholders 3.3. Modify specification if needed 3.4. Ensure correct ordering of requirements 3.5. Identify time critical items for the installation 3.6. Identify other items critical to the success of the project 3.7. Identify or develop measures to monitor all critical items 3.8. Prepare repair specification
4. Monitor installation	4.1. Ensure requirements meet specification/contract 4.2. Ensure hazard controls are in place and effective 4.3. Monitor work to installation specification

ELEMENT	PERFORMANCE CRITERIA
	4.4. Take appropriate action on non-conformances as required 4.5. Report during project as required 4.6. Complete end of project documentation on completion

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills include:

- solving problems
- communicating at all levels
- using organisation knowledge system
- investigating
- analysing
- interpreting data
- negotiating
- technical reporting

Required knowledge

Required knowledge includes:

- properties of all common refractory materials
- common installation methods and ways of repairing them
- common modes of refractory failure and their implications for repair
- anchors and anchoring systems used in repairs
- keying and adhesion methods used in repairs
- installation equipment such as lifting and placement aids and gunning equipment
- post placement requirements for different repairs
- formwork design and construction
- scaffolding design and construction
- relevant terms
- relevant calculations
- project planning and management

Evidence Guide

EVIDENCE GUIDE	
<p>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.</p>	
<p>Overview of assessment</p>	<p>Assessment of this unit should include demonstrated competence in a workplace based project or a simulated workplace project.</p> <p>Access should be available to all normally accessed tables, data etc which would be available to and used by a competent refractory specialist performing this assignment.</p>
<p>Critical aspects for assessment and evidence required to demonstrate competency in this unit</p>	<p>Competence must be demonstrated in the ability to select an appropriate material and write the required specification.</p>
<p>Context of and specific resources for assessment</p>	<p>Assessment may occur on the job or in an appropriately simulated environment. Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p> <p>Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.</p> <p>Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.</p>
<p>Method of assessment</p>	<ul style="list-style-type: none"> • Assessment must satisfy the endorsed assessment guidelines of the Manufactured Mineral Products Training Package. • Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge. • Assessment methods which include direct observation of tasks should also include questioning on underpinning knowledge to ensure its correct interpretation and application. • Assessment may be applied under project related conditions (real or simulated) and require evidence of

EVIDENCE GUIDE	
	<p>process.</p> <ul style="list-style-type: none">• Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.• Assessment may be in conjunction with assessment of other units of competency where required.
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	
<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. 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.</p>	
Refractory materials	<p>Refractory materials may include one or more of:</p> <ul style="list-style-type: none"> • cementitious refractories • clay refractories • ceramic fibre • other refractories
Repair methods	<p>Repair methods include:</p> <ul style="list-style-type: none"> • cold repair • hot repair • direct repair • controlled repair (e.g. through controlled gunning) • repair from inside the vessel • repair by injection through the vessel wall
Shores	<p>Shores may include:</p> <ul style="list-style-type: none"> • dead shores • raking shores • flying shores
Installation equipment	<p>Installation equipment may include one or more of:</p> <ul style="list-style-type: none"> • vibrators • compactors • rams • gunning systems • equipment for lifting and placing precast blocks • temporary support for roofs and arches • spreader jacks
Anchors and keys	<p>Types of anchors may include:</p> <ul style="list-style-type: none"> • anchor bolts • through anchors • retention clips

RANGE STATEMENT	
	<p>Keys include cut mechanical keys</p> <p>Adhesion may include:</p> <ul style="list-style-type: none"> • chemical and other means of ensuring a bond between the repair and the refractory substrate
Post repair requirements	<p>Post repair requirements may include:</p> <ul style="list-style-type: none"> • drying • curing • control of moisture and/or temperature • striking of formwork • removal of scaffolding or other access/egress provisions
HSE hazards	<p>HSE hazards may include:</p> <ul style="list-style-type: none"> • exposure to heat • exposure to dust • exposure to refractory materials • confined space entry • working with equipment • working at heights • ultra-violet (UV) and other welding hazards • disposal of waste, scrap and excess materials • manual handling hazards
Hazard control	<p>Appropriate hazard control should be determined by:</p> <ul style="list-style-type: none"> • applying the hierarchy of control
Stakeholders	<p>Stakeholders may include:</p> <ul style="list-style-type: none"> • customer representatives • technical experts • regulators • refractory designer • materials and equipment suppliers • contractors
Requirements	<p>Requirements include:</p> <ul style="list-style-type: none"> • materials • equipment • contractors
Time critical items	<p>Time critical items are those items which if not</p>

RANGE STATEMENT	
	<p>completed on time will cause the project to run overtime and may be determined from:</p> <ul style="list-style-type: none"> • critical path analysis • long lead time items • other techniques
Repair specification	<p>Repair specification should include:</p> <ul style="list-style-type: none"> • technical specification • hazard controls and residual hazards • installation schedule • measures monitoring critical items
End of project documentation	<p>End of project documentation may include:</p> <ul style="list-style-type: none"> • operating and/or maintenance procedures • technical specification • routine monitoring requirements • project review report: <ul style="list-style-type: none"> • what was intended • what was achieved • achieved costs • achieved timing • significant project issues • possible improvements

Unit Sector(s)

Unit sector	Operational/technical
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Competency field

Competency field	
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Co-requisite units

Co-requisite units		