



**Australian Government**

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

# **RIIBLA302A Conduct shotfiring operations in underground coal mines**

**Release: 1**

## RIIBLA302A Conduct shotfiring operations in underground coal mines

### Modification History

Not applicable.

### Unit Descriptor

This unit covers the conduct of shotfiring operations in underground coal mines. It includes planning and preparing for shotfiring operations; supervising the storage and transport of explosives and accessories; preparing for charging and charge holes; conducting the blast; completing post-blast activities; and carrying out equipment maintenance.

### Application of the Unit

This unit is appropriate for those working in shotfirer roles, at worksites within:

- Coal mining

### Licensing/Regulatory Information

Refer to Unit Descriptor.

### Pre-Requisites

Not applicable.

### Employability Skills Information

This unit contains employability skills.

### Elements and Performance Criteria Pre-Content

<p>Elements describe the essential outcomes of a unit of competency.</p>	<p>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.</p>
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## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan and prepare for shotfiring operations	1.1. Access, interpret and apply <b>compliance documentation</b> relevant to the conduct of shotfiring operations in underground coal mines 1.2. Obtain, confirm and apply <b>shotfiring requirements</b> 1.3. <b>Inspect worksite</b> and identify, manage and report all potential <b>hazards</b> and ensure work area is safe 1.4. Coordinate vehicle, <b>equipment</b> and personnel <b>support requirements</b> for the work 1.5. Access, interpret and apply environmental, <b>geological and survey data</b> required to complete the allocated work 1.6. Carry out <b>calculations</b> to enable pattern design, loading and tying in of shots 1.7. Complete <b>pattern design</b> , including loading, hole spacing and depth, stemming and wiring requirements 1.8. Carry out briefings 1.9. Identify and confirm the <b>explosives and accessories</b> required for the work
2. Supervise the store and transport explosives and accessories	2.1. Order and receive explosives and accessories 2.2. Ensure explosives and accessories are safely and correctly stored in appropriate facilities 2.3. Ensure <b>inventory control</b> systems are accurately and correctly maintained 2.4. Ensure explosives and accessories are transported to blast area and segregate correctly 2.5. Ensure that explosives are not left unattended 2.6. Identify and <b>dispose</b> of any deteriorated or out of date explosives and accessories correctly
3. Prepare for charging	3.1. Identify, manage and report potential hazards and risks

	<p>3.2. <b>Secure blast area</b> in accordance with procedures and blast plan</p> <p>3.3. Establish and communicate access routes to shot area for authorised persons and vehicle</p> <p>3.4. Identify hole locations and any non-conforming conditions in preparation for charging</p> <p>3.5. Set up charging equipment in accordance with site procedures</p> <p>3.6. Prepare holes for charging in accordance with blast plan</p>
4. Charge holes	<p>4.1. Supervise blast personnel during loading operations</p> <p>4.2. Prime and charge holes in accordance with the blast plan</p> <p>4.3. Ensure blast holes are charged in accordance with loading plan and identify <b>non-conforming conditions</b></p> <p>4.4. Apply <b>explosion inhibitor</b></p> <p>4.5. Ensure blast holes are stemmed in accordance with blast plan</p> <p>4.6. Clear the area of equipment, personnel and isolate/barricade the blast area, including warning signs</p> <p>4.7. <b>Test</b> equipment and accessories</p> <p>4.8. Maintain <b>records</b></p> <p>4.9. Conduct <b>blast monitoring</b></p>
5. Conduct the blast	<p>5.1. Carry out <b>pre blasting procedures</b> and establish exclusion zone</p> <p>5.2. Carry out tying in, in accordance with the blast plan</p> <p>5.3. Supervise all personnel within the blast area during tie-in and initiation</p> <p>5.4. <b>Initiate the blast</b></p> <p>5.5. Carry out and record activities in accordance with the blast plan</p>
6. Complete post blast activities	<p>6.1. Carry out post blast inspection</p> <p>6.2. Secure firing circuits and <b>initiation</b> device</p> <p>6.3. Report blasting has been completed to relevant personnel</p> <p>6.4. Carry out <b>post-blast coordination</b> and declare area safe for re-entry</p>

	<p>6.5. Inspect site and deal with non-conformities including <i>misfires</i></p> <p>6.6. Identify and dispose of surplus, <i>damaged and deteriorated explosives</i> and detonators</p> <p>6.7. Ensure that emergency services are advised of the disposal activities in accordance with site procedures</p> <p>6.8. Complete <i>reports</i></p>
7. Carry out equipment maintenance	<p>7.1. Carry out inspection and required maintenance during and after shotfiring operations</p> <p>7.2. Maintain maintenance records</p>

## Required Skills and Knowledge

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

### Required skills

Specific skills are required to achieve the performance criteria in this unit, particularly for the application in the various circumstances in which this unit may be applied. This includes the ability to carry out the following as required to conduct shotfiring operations in underground coal mines operations:

- apply legislative, organisation and site requirements and procedures
- apply personal safety requirements
- apply operational safety requirements
- read, interpret and apply technical and environmental information
- apply shot planning processes
- apply operational planning skills
- apply work coordination skills
- apply mathematical calculations using addition, subtraction, multiplication and division
- apply workplace communication techniques
- apply blasting preparation techniques
- apply diagnostic techniques
- apply explosives storage, handling and transport procedures
- apply damaged/deteriorated explosives disposal procedures
- apply charging equipment operating procedures
- apply hazard identify procedures
- apply procedures for identifying non-conformities
- apply records and reports maintenance procedures
- apply environmental compliance requirements
- apply procedures to drill to pattern
- apply hole cleaning and testing procedures
- apply hazards identification
- apply misfire identification procedures
- apply risk management procedures
- use relevant and specialist hand tools

### Required knowledge

Specific knowledge is required to achieve the Performance Criteria of this unit, particularly its application in a variety of circumstances in which the unit may be used. This includes knowledge of the following, as required to conduct shotfiring operations in underground coal mines operations:

- Australian standards and code of practice
- explosives and safety and health legislation

- risk management including application of appropriate controls to identified risks
- site and equipment safety procedures
- personal safety procedures
- site emergency procedures
- environmental requirements and procedures, including vibration, noise, dust and chemicals
- site environmental requirements and constraints
- site geological and survey information
- types, physical and technical characteristics, uses and limitations of explosives and protection measures associated with their use
- initiation systems
- delayed blasts
- cause and management of misfires
- non-conforming conditions
- non-conformities
- explosives disposal methods
- blasting management plan requirements
- site security plan requirements
- site operational procedures
- shotfiring techniques and procedures
- planning processes
- explosive handling, transportation and storage requirements
- equipment characteristics, technical capabilities and limitations
- start-up and shutdown procedures
- equipment maintenance procedures
- isolation and lock out procedures
- analysis of site geological and survey data
- selection of appropriate explosives to meet site/ground conditions
- monitoring and review processes and techniques

## 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><b>Overview of assessment</b></p>	
<p><b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b></p>	<p>The evidence required to demonstrate competency in this unit must be relevant to worksite operations and satisfy all of the requirements of the performance criteria, required skills and knowledge and the range statement of this unit and include evidence of the following:</p> <ul style="list-style-type: none"> <li>• knowledge of the requirements, procedures and instructions for conducting shotfiring operations in underground coal mines</li> <li>• implementation of requirements, procedures and techniques for the safe, effective and efficient completion of shotfiring operations in underground coal mines</li> <li>• working with others to undertake and complete shotfiring operations in underground coal mines that meet all of the required outcomes</li> <li>• consistent timely completion of shotfiring operations in underground coal mines that safely, effectively and efficiently meet the required outcomes</li> </ul>
<p><b>Context of and specific resources for assessment</b></p>	<ul style="list-style-type: none"> <li>• This unit must be assessed in the context of the work environment. Where personal safety or environmental damage are limiting factors, assessment may occur in a simulated environment provided it is realistic and sufficiently rigorous to cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills.</li> <li>• The assessment environment should not disadvantage the participant. For example, language, literacy and numeracy demands of assessment should not be greater than those required on the job.</li> <li>• Customisation of assessment and delivery environment to sensitively accommodate cultural diversity.</li> <li>• Aboriginal people and other people from a non</li> </ul>



	<p>English speaking background may have second language issues</p> <ul style="list-style-type: none"> <li>• Assessment of this competency requires typical resources normally used in the work environment. Selection and use of resources for particular worksites may differ due to site circumstances.</li> <li>• Where applicable, physical resources should include equipment modified for people with disabilities.</li> <li>• Access must be provided to appropriate learning and/or assessment support when required.</li> </ul>
<b>Method of assessment</b>	<p>This unit may be assessed in a holistic way with other units of competency. The assessment strategy for this unit must verify required knowledge and skill and practical application using more than one of the following assessment methods:</p> <ul style="list-style-type: none"> <li>• written and/or oral assessment of the candidate's required knowledge</li> <li>• observed, documented and/or first hand testimonial evidence of the candidate's: <ul style="list-style-type: none"> <li>• implementation of appropriate requirement, procedures and techniques for the safe, effective and efficient achievement of required outcomes</li> <li>• consistently achieving the required outcomes</li> </ul> </li> <li>• first hand testimonial evidence of the candidate's: <ul style="list-style-type: none"> <li>• working with others to undertake and complete shotfiring operations in underground coal mines</li> </ul> </li> </ul>
<b>Guidance information for assessment</b>	<p>Consult the SkillsDMC User Guide for further information on assessment including access and equity issues.</p>

## 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. 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.</p>	
<p><b>Relevant compliance documentation</b> may include:</p>	<ul style="list-style-type: none"> <li>• legislative, organisation and site requirements and procedures</li> <li>• manufacturer's guidelines and specifications</li> <li>• Australian standards</li> <li>• code of practice</li> <li>• Employment and workplace relations legislation</li> <li>• Equal Employment Opportunity and Disability Discrimination legislation</li> </ul>
<p><b>Shotfiring requirements</b> may shift briefings, handover details or work orders include:</p>	<ul style="list-style-type: none"> <li>• nature and scope of tasks and achievement targets</li> <li>• site location and layout</li> <li>• location and direction of blast holes</li> <li>• essential geological information</li> <li>• essential survey information</li> <li>• site environmental conditions</li> <li>• detailed timings for the blast</li> <li>• detailed responsibilities</li> <li>• coordination requirements/issues</li> <li>• identification of areas of influence</li> <li>• sleeping charges</li> <li>• equipment required</li> <li>• security measures and procedures</li> <li>• monitoring requirements</li> <li>• type and quantity of explosives and wet or dry holes</li> <li>• stemming material</li> <li>• type and quantity of explosives and accessories</li> <li>• initiation methods</li> <li>• out of bounds areas</li> <li>• operational conditions</li> <li>• coordination requirements or issues</li> <li>• hazards and potential hazards</li> <li>• waste management requirements</li> <li>• environmental control requirements worksite</li> </ul>

	<ul style="list-style-type: none"> <li>inspection requirements</li> <li>• barricade and signage requirements</li> <li>• obtaining of permits required</li> <li>• equipment availability and/or requirements</li> <li>• plant or equipment defects</li> <li>• transport arrangements and/or requirements</li> <li>• safe storage requirements</li> <li>• public relations requirements</li> </ul>
<b>Site inspections</b> may include:	<ul style="list-style-type: none"> <li>• positioning stemming</li> <li>• cleaning up</li> <li>• weather check</li> <li>• fencing/signage and access routes</li> <li>• marking/hole identification</li> <li>• inspection</li> <li>• measuring holes</li> <li>• dewatering holes</li> </ul>
<b>Hazards</b> may include:	<ul style="list-style-type: none"> <li>• chemical energy, including: <ul style="list-style-type: none"> <li>• premature explosion</li> <li>• deterioration of explosives</li> <li>• stored energy</li> </ul> </li> <li>• working environment, including: <ul style="list-style-type: none"> <li>• rock stability and ventilation</li> <li>• weather conditions</li> <li>• insufficient illumination</li> <li>• methane</li> <li>• coal dust</li> <li>• NO<sub>x</sub> gases</li> <li>• poor road or rail conditions</li> <li>• strata conditions</li> <li>• fire/flames/ignition sources</li> <li>• atmospheric contaminants</li> <li>• dust and fumes</li> <li>• noise</li> <li>• ground conditions, including: <ul style="list-style-type: none"> <li>• hot ground</li> <li>• scaling</li> </ul> </li> <li>• lack of ventilation</li> <li>• extraneous electricity e.g. static electricity, lightning</li> </ul> </li> <li>• tipping hazards</li> </ul>

	<ul style="list-style-type: none"> <li>• debris <ul style="list-style-type: none"> <li>• air blast and fly</li> <li>• lost holes</li> <li>• radioactivity</li> <li>• water</li> </ul> </li> <li>• equipment and materials, including: <ul style="list-style-type: none"> <li>• faulty explosives</li> <li>• misfires</li> <li>• drilling into misfires</li> <li>• premature explosion</li> <li>• faulty vehicle</li> <li>• faulty equipment</li> <li>• broken detonation leads</li> <li>• high voltage electricity</li> <li>• radio frequencies and transmitters</li> <li>• hot exhaust system</li> <li>• high air and water pressures</li> <li>• hydraulic oil pressure</li> </ul> </li> <li>• people, including: <ul style="list-style-type: none"> <li>• speeding</li> <li>• unauthorised persons</li> <li>• theft</li> <li>• trespassers</li> </ul> </li> <li>• processes and procedures, including: <ul style="list-style-type: none"> <li>• back injuries</li> <li>• drilling in butts</li> <li>• lost holes</li> </ul> </li> </ul>
<b>Equipment</b> may include:	<ul style="list-style-type: none"> <li>• siren</li> <li>• radios</li> <li>• signs</li> <li>• vehicles approved for carrying dangerous goods and explosives</li> <li>• explosives mixers</li> <li>• pumps</li> <li>• plugs (to seal finished holes prior to loading)</li> <li>• measuring tape</li> <li>• cutting implements</li> <li>• blast monitoring systems</li> <li>• video camera</li> </ul>
<b>Support requirements</b> may	<ul style="list-style-type: none"> <li>• other equipment and their operators</li> </ul>

include	<ul style="list-style-type: none"> <li>• vehicles</li> <li>• public and site notification</li> </ul>
<b>Geological and survey data</b> may include:	<ul style="list-style-type: none"> <li>• wet or dry holes</li> <li>• strength of material to be shot</li> <li>• strength of surrounding strata</li> <li>• blast pattern plan</li> <li>• ventilation/gas data</li> <li>• deputies reports</li> <li>• details of cracking in holes.</li> </ul>
<b>Survey of blast area</b> includes:	<ul style="list-style-type: none"> <li>• locate position, direction and incline of blast holes</li> <li>• survey reports</li> </ul>
<b>Geological data</b> may include:	<ul style="list-style-type: none"> <li>• rock type</li> <li>• structures</li> <li>• faults</li> <li>• intrusions</li> <li>• weathering</li> <li>• wet and dry holes</li> <li>• hot ground</li> <li>• reactive ground</li> <li>• hot and reactive ground</li> </ul>
<b>Calculations</b> may include:	<ul style="list-style-type: none"> <li>• measurement of depth of holes, temperature of holes, distances, spacings</li> <li>• burdens, resistances, and other relevant blasting parameters</li> <li>• addition, subtraction, multiplication, division</li> <li>• determinations of areas and volumes</li> <li>• calculations of delay timings in pattern designs</li> <li>• density of explosives</li> <li>• weight of explosives per hole</li> <li>• maximum delay of the shot</li> <li>• Maximum Instantaneous Charge (MIC)</li> <li>• stemming requirements</li> <li>• estimation and/or calculation of resistance of circuits, powder factors, hole</li> <li>• loadings, exclusion zones, and other relevant factors</li> </ul>
<b>Pattern design</b> may include:	<ul style="list-style-type: none"> <li>• loading and wiring requirements</li> <li>• reference to and consideration of geology, hazards</li> <li>• safety distances and margins</li> <li>• environmental licence conditions</li> </ul>

	<ul style="list-style-type: none"> <li>• gas content of seam</li> <li>• strength of surrounding strata</li> <li>• other legislative requirements</li> </ul>
<b>Explosives</b> may include:	<ul style="list-style-type: none"> <li>• high explosives</li> <li>• low explosives</li> <li>• bulk and packaged free flowing explosives</li> <li>• deflagrating explosives</li> <li>• permitted explosives</li> <li>• wet or dry</li> <li>• variable density</li> </ul>
<b>Accessories</b> may include:	<ul style="list-style-type: none"> <li>• primers</li> <li>• delays</li> <li>• down lines</li> <li>• trunk lines</li> <li>• lead-in lines</li> <li>• detonators and detonator assemblies</li> <li>• detonation mechanisms including:</li> <li>• bell wire and firing lines</li> <li>• delay mechanisms</li> <li>• blasting machines or mains firing equipment</li> <li>• explosives tester</li> <li>• binding tape</li> <li>• fuses and igniter cords</li> <li>• detonators and detonating cord</li> <li>• gas bags</li> <li>• decking</li> <li>• stemming</li> <li>• stemming equipment</li> <li>• crack detector</li> <li>• flushing wand</li> <li>• hole liner</li> <li>• blast monitoring equipment</li> <li>• firing cables / bell wire</li> <li>• exploders and testers</li> <li>• electronic firing equipment</li> <li>• specialist tools</li> <li>• initiators</li> </ul>
<b>Inventory control</b> systems may include:	<ul style="list-style-type: none"> <li>• types of explosives</li> <li>• quantities of explosives</li> <li>• shelf life</li> <li>• distribution records and detail</li> </ul>

	<ul style="list-style-type: none"> <li>reconciliation reports</li> </ul>
<b>Dispose of explosives</b> may include:	<ul style="list-style-type: none"> <li>burning by the shotfirers on site</li> <li>detonation in a production drill hole</li> <li>detonation in a controlled manner</li> <li>return to supplier or delivery or surrender to an Explosives Inspector for destruction</li> </ul>
<b>Secure blast area</b> sometimes referred to as 'exclusion zones', may be marked or delineated by one or more of the following:	<ul style="list-style-type: none"> <li>signage</li> <li>windrow</li> <li>bund wall</li> <li>ribbon</li> <li>tape</li> <li>witches hats</li> <li>ropes</li> <li>flags or pegs</li> <li>sentries</li> <li>gates</li> </ul>
<b>Non-conforming conditions</b> may include:	<ul style="list-style-type: none"> <li>misfires</li> <li>blockages</li> <li>break through</li> <li>deviation</li> <li>undercut</li> <li>ground conditions</li> <li>ventilation</li> <li>water/wet holes</li> <li>hot ground</li> </ul>
<b>Explosion inhibitors</b> may include:	<ul style="list-style-type: none"> <li>stone dust</li> </ul>
<b>Testing</b> includes	<ul style="list-style-type: none"> <li>the use of approved testing equipment</li> </ul>
<b>Records and reports</b> may include:	<ul style="list-style-type: none"> <li>explosive transportation</li> <li>records of consumption and disposal of explosives</li> <li>magazine records</li> <li>blast designs</li> <li>blast plans</li> <li>blast monitoring</li> <li>incident reports</li> </ul>
<b>Blast monitoring</b> systems may include:	<ul style="list-style-type: none"> <li>vibration monitors</li> <li>noise monitors</li> <li>gas detection</li> <li>visibility</li> </ul>

	<ul style="list-style-type: none"> <li>• strata movement.</li> </ul>
<b>Pre-blasting procedures</b> may include:	<ul style="list-style-type: none"> <li>• warnings</li> <li>• sentries</li> <li>• area clearance/isolation/barricading</li> <li>• inspection and testing for gas</li> <li>• other legislative requirements</li> <li>• safety distances and control/responsibilities</li> </ul>
<b>Blast initiation</b> systems may include:	<ul style="list-style-type: none"> <li>• safety fuse</li> <li>• detonating cord</li> <li>• non-electric detonator</li> <li>• electric detonator</li> <li>• electronic detonator</li> <li>• remote firing</li> </ul>
<b>Misfires</b> may be caused by:	<ul style="list-style-type: none"> <li>• faulty explosives or accessories</li> <li>• damaged or deteriorated explosives or accessories</li> <li>• improperly assembled explosives components</li> <li>• inappropriate or incomplete combinations of components</li> <li>• operator error or inexperience</li> <li>• inattention to detail or ignorance</li> <li>• environmental influences, e.g. wet weather or poor visibility</li> </ul>
<b>Post-blast coordination</b> may include:	<ul style="list-style-type: none"> <li>• the return of unused explosives</li> <li>• the return of other equipment</li> <li>• the withdrawing sentries</li> <li>• removal of signs</li> <li>• turning off safety devices</li> <li>• ventilation of area</li> <li>• clearance of noxious gases</li> <li>• collection of environmental monitoring equipment</li> <li>• recording of environmental monitoring data</li> <li>• maintenance may include: <ul style="list-style-type: none"> <li>• testing of exploders</li> <li>• servicing of mixing equipment</li> <li>• maintenance of hand tools</li> <li>• operational maintenance of bulk delivery equipment</li> </ul> </li> </ul>
<b>Damaged and deteriorated explosives</b> may be identified by:	<ul style="list-style-type: none"> <li>• exudation</li> <li>• efflorescence</li> </ul>



	<ul style="list-style-type: none"><li>• sweating</li><li>• liquefaction</li><li>• hardening</li><li>• softening</li><li>• discolouration</li><li>• crystallisation</li><li>• staining</li><li>• damage to wrappers and carcasses</li><li>• damage to containers</li><li>• physical wear and tear</li><li>• kinking</li><li>• abrasions and cuts</li><li>• crushing</li><li>• loss of identification labels and markings</li><li>• exposure to the elements</li></ul>
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## **Unit Sector(s)**

Blasting

## **Competency field**

Refer to Unit Sector(s).

## **Co-requisite units**

Not applicable.