



Australian Government

Department of Education, Employment and Workplace Relations

RIINHB304B Conduct air drilling

Release: 1

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Modification History

Not applicable.

Unit Descriptor

This unit covers the conduct of air drilling in resources and infrastructure industries. It includes planning and preparing for conduct of air drilling; inspecting and maintaining air drilling equipment; drilling; selecting and using drilling additives; taking samples; maintaining equipment; and responding to problems.

Application of the Unit

Air drilling is used for environmental, geotechnical, mineral exploration, mineral production, blast hole, seismic and water well drilling. Air drilling methods may include: rotary air blast, aircore, down the hole hammer, open hole, reverse circulation or combinations of the above. This unit is appropriate for those working in driller roles, at worksites within:

- Civil construction
- Coal mining
- Drilling
- Extractive industries
- Metalliferous 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 to conduct air drilling	1.1. Access, interpret and apply <i>compliance documentation</i> relevant to the work activity 1.2. Obtain, confirm and apply <i>work instructions</i> for the allocated task 1.3. Identify, manage and report all potential <i>hazards</i> 1.4. Resolve <i>coordination requirements</i> with others at the site prior to commencing and during work activities
2. Inspect and maintain air drilling equipment	2.1. Ensure <i>restraining devices</i> are not damaged or worn and are correctly fitted 2.2. Fit or replace restraining devices in accordance with procedures 2.3. Inspect and maintain the cyclone in <i>safe and serviceable condition</i> 2.4. Ensure mounting and security of cyclone is adequate for safe operation, particularly when down hole water may result in release of energy 2.5. Maintain dust suppression systems to ensure minimal emission of airborne dust and integrity of sample quality 2.6. Inspect pressure relief valves to ensure they have not been tampered with
3. Drill using air drilling methods	3.1. Select and use appropriate drill rod and drill string components given hole specification and anticipated ground conditions 3.2. Operate <i>make-up and break-out equipment</i> 3.3. Select and use appropriate type and size of <i>in-hole</i> tools given hole specification and anticipated ground conditions 3.4. Drill/open-up hole collar as required to suit given ground conditions and hole specification 3.5. Install <i>drill hole collar casing</i> and seal at the hole collar 3.6. Install <i>outside hole return collar device</i> , if required, given hole specification of open

	<p>or reverse circulation drill hole</p> <p>3.7. Operate and/or supervise the safe operation of <i>drill rod and pipe handling equipment</i></p> <p>3.8. Add and remove drill rods or casing and other in-hole equipment</p> <p>3.9. Monitor and adjust air pressure and other <i>drilling parameters</i> to achieve maximum performance</p> <p>3.10. Monitor and control down hole water conditions to ensure integrity of the hole, drill cuttings and sample quality</p> <p>3.11. Monitor and safely control discharge from outside hole return collar device as required</p> <p>3.12. Calculate depth of hole</p>
4. Select and use drilling additives	<p>4.1. Identify ground conditions requiring the use of <i>drilling additives</i></p> <p>4.2. Select appropriate drilling additives to suit ground conditions</p> <p>4.3. Prepare and/or supervise the preparation of required drilling additives</p> <p>4.4. Use drilling additives to achieve required results</p>
5. Take samples	<p>5.1. Select and check sample devices to ensure client sample quantity and quality specifications are met</p> <p>5.2. Clean or supervise the cleaning of sample devices</p> <p>5.3. Monitor splitting, bagging, presentation, and marking of samples to ensure client specifications are met</p> <p>5.4. Identify and promptly rectify sample blockages affecting or having the potential to affect sample quality</p> <p>5.5. Clear sample delivery hose blockages safely</p> <p>5.6. Clear outside return hole blockages of collared holes as required</p> <p>5.7. Supervise drill crew to ensure all sampling tasks are carried out correctly and safely</p>
6. Maintain equipment	<p>6.1. Supervise the use of specified <i>personal protective equipment</i> when using grinders or bit sharpening equipment</p>

	<p>6.2. Supervise the selection and correct fitting grinding disks, wheels and stones in accordance with site specifications</p> <p>6.3. Monitor wear of in-hole tools</p> <p>6.4. Check, maintain, and/or replace compressed air hoses and hose fittings or clamps</p> <p>6.5. Supervise the correct sharpening and maintenance of in-hole tools</p> <p>6.6. Inspect, dismantle, replace worn or damaged components and reassemble in-hole equipment</p>
<p>7. Respond to problems</p>	<p>7.1. Monitor drill cuttings or sample quality, quantity and air return</p> <p>7.2. Identify possible problems in equipment or process</p> <p>7.3. Determine possible cause(s) of problems</p> <p>7.4. Rectify problem(s) using appropriate solution within area of responsibility</p> <p>7.5. Follow through items initiated until final resolution has occurred</p> <p>7.6. Report problems outside area of responsibility to designated person</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 air drilling:

- apply legislative, organisation and site requirements and procedures
- apply prescribed thread form torque parameters during make-up of down hole equipment and consumables
- apply correct internal and external callipers, vernier, rule and or tape measure for identification of drill pipe/rod diameter wear limits, measurement of bits/shrouds and other down hole equipment
- apply correct measurement of drill string length
- apply methods for calculating hole depth

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 air drilling:

- the importance to match like threads with like threads on all threaded components and make up torque requirements applicable to thread form in use
- the relationship between pressure, volume, hole diameter, pipe diameter and calculation of up hole velocity
- drill pipe and rod and thread form wear limit parameters
- the need for correct hole collaring, use of casing and collar sealing techniques
- TC bit sharpening procedures
- potential problems related to inaccurate measurement and usage sequence of ground engaging consumables and related down hole components
- hazard control measures to enable safe use of compressed air
- the importance of monitoring sample quantity
- the role that drill cuttings blockages play in affecting sample quality
- safe procedures to clear down and up hole drill cuttings blockages within the outside hole return, down hole equipment and up hole sample system and/or hose
- the critical need for correct fitting inspection and maintenance replacement of restraining devices
- the hazards associated with the collection of high velocity drilling cuttings
- the reason for checking inner tubes and inner tube sealing devices in RC drill pipe
- hazards associated with wire-line operations and applicable control measures
- identification of various thread forms used in air drilling
- identification of various in-hole tools and correct application given ground conditions

- the need for uncontaminated samples

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>Critical aspects for assessment and evidence required to demonstrate competency in this unit</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"> • knowledge of the requirements, procedures and instructions for conducting air drilling • implementation of requirements, procedures and techniques for the safe, effective and efficient completion of air drilling • working with others to undertake and complete air drilling tasks that meets all of the required outcomes • consistent timely completion of air drilling tasks that safely, effectively and efficiently meets the required outcomes
<p>Context of and specific resources for assessment</p>	<ul style="list-style-type: none"> • 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. • 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. • Customisation of assessment and delivery environment to sensitively accommodate cultural diversity. • Aboriginal people and other people from a non English speaking background may have second language issues.

	<ul style="list-style-type: none"> • 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. • Where applicable, physical resources should include equipment modified for people with disabilities. • Access must be provided to appropriate learning and/or assessment support when required.
Method of assessment	<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"> • written and/or oral assessment of the candidate's required knowledge • observed, documented and/or first hand testimonial evidence of the candidate's: <ul style="list-style-type: none"> • implementation of appropriate requirement, procedures and techniques for the safe, effective and efficient achievement of required outcomes • consistently achieving the required outcomes • first hand testimonial evidence of the candidate's: <ul style="list-style-type: none"> • working with others to undertake and complete air drilling tasks
Guidance information for assessment	Consult the SkillsDMC User Guide for further information on assessment including access and equity issues.

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>Relevant compliance documentation may include:</p>	<ul style="list-style-type: none"> • legislative, organisational and site requirements and procedures • manufacturer's guidelines and specifications • Australian standards • code of practice • Employment and Workplace Relations legislation • Equal Employment Opportunity and Disability Discrimination legislation
<p>Work instructions may come from:</p>	<ul style="list-style-type: none"> • briefings, handovers, plans and work orders and may be written or verbal, formal or informal and may include: <ul style="list-style-type: none"> • nature and scope of tasks • specifications • quality of finished works • achievement targets • operational conditions • obtaining of permits required • site layout • out of bounds areas • worksite inspection requirements • lighting conditions • plant or equipment defects • hazards and potential hazards • coordination requirements or issues • contamination control requirements • environmental control requirements • barricade and signage requirements
<p>Hazards may include:</p>	<ul style="list-style-type: none"> • lack of preventative maintenance causing rupture of air delivery and sample delivery hoses • damaged/worn clean air and sample hoses • inadequate airborne dust prevention control measures

	<ul style="list-style-type: none">• incorrect match of hose size to hose tails/clamps and fittings• incorrect fitting of clean air or sample hoses• high abrasive wear rates to drill cutting receival equipment• incorrectly fitted hose restraint devices• incorrect hose restraints in use• incorrect or inadequately secured cyclones and cyclone lids• incorrectly fitted grinding wheels, stones and disks• inappropriate methods/procedures for clearing sample hose blockages• insecure sample deflection devices fitted to the drill head• incorrect fitting of wire to wire-line winch drum• wireline snags and overruns• lack of provision of restraint devices to clean air, sample hoses and drill head sample deflection devices• incorrectly fitted stuffing boxes and T pieces• excessive drill pipe and drill string component wear• unguarded or uncontrolled access to pinch points, i.e. hydraulic make-up and break-out devices• poor triangulation configuration of rod/pipe hoisting equipment for angle of hole• excessive wear to hook and clamshell assemblies• lack of provision of handling equipment for movement of sample bags and heavy up and down hole equipment• poor ergonomic equipment design for tasks such as sample splitting, bagging and movement• inappropriate storage/racking of drill pipe• incorrect use of stilsons• incorrect mixing procedure and application of urethane forms• inadequate security of outside hole collar devices• drill cuttings blockages (down and up hole)
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Coordination requirements may include:	<ul style="list-style-type: none"> • drill team • other equipment operators • maintenance personnel • supervisors • worksite personnel
Restraining devices shall include:	<ul style="list-style-type: none"> • two leg stocking type whipchecks • correctly rated shackles • correctly rated and fitted whipcheck anchor points
Restraining devices may also include:	<ul style="list-style-type: none"> • wire rope sling type whipchecks • internal hose wire type whipchecks • hose restraint brackets and clamps
Safe and serviceable condition will be:	<ul style="list-style-type: none"> • free from excessive leaks and excessive wear to internal wear resistant materials • chimney correctly positioned in the cyclone vortex zone to best eliminate dust emission
Make up and break out equipment may include:	<ul style="list-style-type: none"> • stilsons • hydraulic pipe tongs • hydraulic pipe wrenches • hydraulic pipe/rod spinners • hydraulic make/break devices • make up torque requirements • bit break out plates
In-hole equipment may include:	<ul style="list-style-type: none"> • drill rods and drill pipe including: <ul style="list-style-type: none"> • aircore rods with inner-tubes (may use IF or API threads) • conventional drill pipe (API Reg or API IF threads) • reverse circulation drill pipe (e.g. Remet, Metzke, Drillstar) • drill pipe thread type subs, saver subs, blow up/down subs, dig-out subs and cross-overs (API and IF threads) • floating/fixed inner tubes • inner-tube sealing devices such as aircore inner tube ferrules or RC inner-tube 'O' rings • aircore trumpets and trumpet subs
Drill hole collar casing may include:	<ul style="list-style-type: none"> • steel casing • PVC casing • poly pipe (to maintain open blast hole collar)

<p>Outside hole return collar devices may include:</p>	<ul style="list-style-type: none"> • stuffing boxes and T pieces for conventional open hole drilling, including RAB, hammer or combined RAB hammer • stuffing boxes and T pieces for reverse circulation drilling • discharge restraint devices as required • stuffing boxes and T pieces for discharge directed to sump or cyclone
<p>Drill rod and pipe handling equipment may include:</p>	<ul style="list-style-type: none"> • manual handling • hook and clamshell • hoist plug • automated and semi-automated rod handlers • hydraulic pipe/rod/casing clamps • hydraulic pipe/rod/casing spinner • drill rod/pipe clamps • rod/pipe spanner • slips • slips basket
<p>Drill bits may include:</p>	<ul style="list-style-type: none"> • blade bits • PCD bits • tri-cone bits • button bits (conventional and RC) • aircore bits
<p>Drilling parameters may include:</p>	<ul style="list-style-type: none"> • rotation speed • weight on bit • penetration rate
<p>Drilling additives may include:</p>	<ul style="list-style-type: none"> • drilling mud (e.g. polymers) • foams • cement and cement additives • hole collar sealants: • 2 part urethane foam, and/or • gypsum cement
<p>Personal protective equipment includes:</p>	<ul style="list-style-type: none"> • steel-capped boots and hardhat • gloves • dust mask • eye and hearing protection • general protective and reflective clothing

Unit Sector(s)

Drilling (General)

Competency field

Refer to Unit Sector(s).

Co-requisite units

Not applicable.