Australian Government

RIINHB304X Conduct reverse circulation drilling

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Release: 1

RIINHB304X Conduct reverse circulation drilling

Modification History

Release	Comments
1	This unit of competency was first released in RII Resources and Infrastructure Industry Training Package Release 13.0.

Application

This unit describes the skills and knowledge required to conduct reverse circulation drilling. It prepares individuals to inspect and maintain reverse circulation drilling equipment, drill using reverse circulation drilling methods, select and use drilling additives, take samples, respond to problems and complete equipment maintenance and housekeeping procedures.

The unit applies to drillers responsible for controlling reverse circulation drilling and coordinating drill-crew activities in surface, underground or other environments where reverse circulation methods are used. Drillers work with limited supervision and exercise discretion and judgement in selecting equipment and controls, interpreting drilling and sample response, and applying contingency measures within their competence and authority.

Licensing/Regulatory Information

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

Pre-requisite unit(s)

No pre-requisite units

Competency field(s)

N/A

Unit sector(s)

Drilling

Elements and Performance Criteria

Element	**Performance criteria**
Elements describe the essential outcomes.	*Performance criteria describe the performance needed to demonstrate achievement of the element.*

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1. Plan and prepare for reverse circulation drilling	1.1 Access and interpret the drill plan, work instructions, geological information, safety data sheets, manufacturer requirements and workplace procedures, and confirm required outcomes 1.2 Confirm permits, services, access conditions, emergency arrangements and work-area readiness 1.3 Identify hazards, assess risks and confirm controls for the work, including environmental, heritage and community requirements 1.4 Select, inspect and wear personal protective equipment according to site requirements 1.5 Select the rig, drilling, sampling and ancillary equipment required for the work 1.6 Confirm personnel roles, competencies, authorisations, communication and coordination requirements 1.7 Confirm contingency and escalation arrangements for changes in ground, groundwater and operating conditions, within scope of own authority
2. Inspect and prepare reverse circulation drilling equipment and systems	2.1 Carry out prestart and start-up procedures according to manufacturer specifications and workplace procedures 2.2 Inspect and prepare the drill string, in-hole tools, compressed-air, sample-return and dust-control components, and confirm compatibility, condition and correct fitting 2.3 Position and protect hoses, cables, pipelines and equipment to control damage, unauthorised access and line-of-fire exposure 2.4 Carry out functional checks, confirm safety systems are in place and operational, and identify defects and arrange rectification
3. Establish the hole collar and circulation system	3.1 Position and align drilling equipment to the specified collar location, azimuth and inclination 3.2 Select and install collaring equipment, casing and seals to suit the hole requirements 3.3 Drill and stabilise the hole collar while maintaining alignment and controlling all forms of discharge 3.4 Install and secure outside-hole return equipment where required and establish a controlled discharge path 3.5 Connect the compressed-air, sample-return and dust-control systems and establish circulation progressively,

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	verifying system integrity, air return and safe operating pressures 3.6 Confirm the collar, casing, seals, return path and exclusion controls are suitable before continuing the hole
4. Conduct and control reverse circulation drilling	4.1 Select and configure drill string components and in-hole tools to suit hole specifications and anticipated conditions, confirming thread compatibility and applying specified make-up torque 4.2 Operate rod-handling, make-up and break-out equipment to add and remove rods, casing and in-hole equipment 4.3 Operate the rig, compressor, booster and circulation system within equipment and workplace operating limits 4.4 Monitor and interpret drilling parameters, equipment and sample response, and adjust operating parameters within authorised limits to maintain performance, hole integrity and sample recovery 4.5 Manage downhole water, wet samples and changing formation conditions, applying drilling fluids, additives or other hole-conditioning measures where required 4.6 Measure and calculate drill string length and hole depth and compare progress with the drill plan
5. Collect and manage reverse circulation samples	5.1 Confirm sampling requirements, and configure and check the cyclone, splitter and collection equipment to meet them 5.2 Direct and monitor sample collection, splitting, bagging, labelling and sequence control 5.3 Monitor sample quality, recovery and representativity, identify departures from requirements, and clean or confirm cleaning of sample equipment to prevent contamination and carryover 5.4 Identify, depressurise and clear sample-system restrictions or blockages using workplace procedures 5.5 Protect samples from loss, damage, deterioration and contamination and maintain required security and custody 5.6 Complete sample records and report issues

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6. Respond to changing conditions and operational problems	6.1 Monitor drilling, air-return, sample and equipment indicators and identify abnormal or changing conditions 6.2 Isolate and depressurise equipment before rectifying within scope of own role or reporting according to workplace procedures 6.3 Conduct controlled recommissioning and verify drilling, circulation, pressure control and sample performance before resuming normal operation 6.4 Record and communicate the condition, actions, restrictions and outcome
7. Carry out post-operational procedures	7.1 Complete controlled shutdown of the drilling, compressed-air, sample and ancillary systems according to manufacturer requirements 7.2 Isolate, depressurise, secure and verify equipment in accordance with authorised procedures 7.3 Inspect drill string, in-hole tools, air-delivery and sampling components and identify wear, damage or contamination 7.4 Clean and adjust operator-maintainable components according to scope of own role 7.5 Tag, quarantine and report defective or unserviceable equipment and arrange specialist maintenance where required 7.6 Complete housekeeping, spill response, waste management and environmental control activities 7.7 Complete and process drilling, sample, maintenance, fault and handover records

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Assessment Requirements for RIINHB304X Conduct reverse circulation drilling

Performance Evidence

The candidate must demonstrate the ability to complete the tasks outlined in the elements and performance criteria of this unit, including evidence of the ability to:

- Conduct reverse circulation drilling on at least two occasions under materially different formation, groundwater or operating conditions, one of which must require the candidate to adjust operating parameters in response to changing drilling or sample conditions, including:
    - establishing the hole collar and circulation system and drilling each hole to the drill plan
    - collecting and managing samples across the required sample intervals, meeting recovery, quality-control, identification and custody requirements
    - isolating and depressurising equipment, and verifying the system is safe and serviceable before resuming
    - completing one full operating cycle, from pre-start and start-up through to controlled shutdown.

During the above, the candidate must:

- obtain, interpret and apply the drill plan, geological information, manufacturer requirements, safety data sheets and workplace procedures, and confirm work activity is compliant
- identify hazards and confirm controls, including environmental, heritage, permit and site-access requirements, and confirm contingency and escalation arrangements for changes in ground, groundwater and operating conditions
- work within authorised operating limits and scope of own role, escalating to appropriate personnel where required
- work effectively with others and use a range of communication techniques and equipment to undertake and complete drilling operations to meet required outcomes
- complete drilling, sample, maintenance, fault and handover records, report non-conforming samples and outcomes
- complete housekeeping, waste management and environmental control activities according to site requirements.

Knowledge Evidence

The candidate must be able to demonstrate knowledge to complete the tasks outlined in the elements and performance criteria of this unit, including knowledge of:

- key policies, procedures and established requirements for conducting reverse circulation drilling, including:

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  - drilling plans and work instructions
  - drill manufacturer specifications
  - emergency procedures
  - hazards, risks and control measures used for the drilling context, including environmental hazards and controls
  - personal protective equipment appropriate to job activities and site requirements
  - work health and safety
- workplace, safety, environmental and heritage requirements that apply to reverse circulation drilling, and the limits of own authority
- reverse circulation drilling principles, including:
  - how compressed air carries cuttings and samples to the surface
  - the relationship between air pressure, air volume, hole and rod diameter and uphole velocity, and its effect on cuttings return and sample recovery
  - how worn or damaged inner tubes, seals and other components affect air return, pressure and sample performance
- ground and groundwater conditions, including:
  - how formation and groundwater conditions affect drilling, hole stability, sample quality and the selection of in-hole tools
  - surface indications that downhole conditions are changing
  - purposes and limitations of hole-conditioning measures
- thread forms used in reverse circulation drilling, and consequences of mismatched threads, incorrect make-up torque and exceeding wear limits
- sample quality principles, including:
  - factors that affect sample quantity, representativity and contamination, including blockages and carryover
  - why sample identity, sequence and custody must be maintained
- hazards and controls for compressed air, stored energy, high-velocity cuttings, pressurised blockages, rotating equipment and respirable crystalline silica dust, including the purpose of restraining devices and why isolation and depressurisation are critical before intervening
- indicators and likely causes of common problems, including poor air return, blockages, air leaks and unstable ground
- calculations for drill string length, hole depth and uphole velocity
- purpose of communication and records in coordinating the work, maintaining sample integrity and handing over

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Assessment Conditions

The assessment must:

- include access to:
    - personal protective equipment
    - equipment required to conduct reverse circulation drilling
    - workplace documentation such as, drill plans, site plans and procedures, manufacturer instructions and safety data sheets
- that accurately represents the reverse circulation drilling context relevant to the candidate's occupational outcome; and,
- be assessed in the context of this sector's work environment; and,
- be assessed in compliance with relevant legislation/regulation and using policies, procedures and processes directly related to the industry sector for which it is being assessed; and,
- confirm consistent performance across the two required occasions and under materially different operating conditions.

Where personal safety or environmental damage are limiting factors, assessment may occur in a simulated work environment* provided it is realistic and sufficiently rigorous to cover all aspects of this sector's workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.

*Guidance on simulated environments has been stipulated in the RII Companion Volume Implementation Guide.

Industry Experts

An industry expert engaged by an RTO to wholly or partially conduct assessment, independently or together with another assessor, or be involved in an assessment judgement, must also satisfy the assessor requirements in applicable vocational education and training legislation, frameworks and/or standards.

Assessors and industry experts delivering training in the drilling industry sector must also have a minimum of three (3) years industry experience, directly relevant to the training and assessment being provided.

Mandatory Workplace Requirements

Assessment of performance evidence may be in a workplace setting or an environment that accurately represents a real workplace. The reverse circulation system configuration, rig type, compressor and booster arrangement, sampling system, formation and groundwater conditions, and operating environment used for assessment must be recorded. Assessment undertaken in one reverse circulation context does not, by itself, establish competence to work in another context where materially different hazards, equipment or regulatory requirements apply.

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Unit Mapping Information

Previous Code and Title	Equivalence	Comments
RIINHB304X Conduct reverse circulation drilling	Equivalent	Updates to application, elements and performance criteria, performance and knowledge evidence, and assessment conditions

Links

Companion volumes, including implementation guides, are found on the national training register - https://training.gov.au/training/details/RII.

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