



**Australian Government**

# **RIINHB322D Construct multiple aquifer production bores**

**Release: 2**

# RIINHB322D Construct multiple aquifer production bores

## Modification History

| Release | Comment                                                                                                                                                                                                                                                                                                         |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | This unit replaces RIINHB322A Construct multiple aquifer production bores                                                                                                                                                                                                                                       |
| 2       | Required frequency and volume of evidence amended in Performance evidence.<br>Substantial amendments made in Assessment Conditions field, including: references to Industry Sectors, assessor and subject matter expert experience requirements, how assessment should be conducted and what it should confirm. |

## Application

This unit describes a participant's skills and knowledge required to construct multiple aquifer production bores within Drilling.

This unit is appropriate for those working in operational roles.

Licensing, legislative, regulatory and certification requirements that apply to this unit can vary between states, territories, and industry sectors. Relevant information must be sourced prior to application of this unit

## Unit Sector

Drilling

## Elements and Performance Criteria

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Plan and prepare for multiple aquifer production bores | 1.1 Access, interpret and apply construct multiple aquifer production bores documentation and ensure the work activity is compliant<br>1.2 Obtain, read, interpret, clarify and confirm work requirements<br>1.3 Identify and address potential risks, hazards and environmental issues and implement control measures<br>1.4 Select and wear personal protective equipment appropriate for work activities<br>1.5 Discuss scope of work with client to gain general agreement on drilling plan<br>1.6 Obtain or sight any licences or permits required under the |
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|                                                           | <p>relevant State/Territory legislation or regulation.</p> <p>1.7 Communicate and coordinate activities with others throughout the work activity</p> <p>1.8 Obtain and interpret emergency procedures, and be prepared for fire/accident/emergency</p> <p>1.9 Provide detailed strata logs, pump and development test results conducted during bore development and water and strata samples to the appropriate authorities</p> <p>1.10 Complete all requirements for bore completion reports, decommissioning or abandonment and send to regulatory authorities within the time specified on bore licence</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2. Design production bores for multiple aquifer systems   | <p>2.1 Determine most appropriate construction methods from the reading and interpretation of all available documented information and ensure relevant procedures and standards are adhered to</p> <p>2.2 Design the bore to ensure the exclusion of unsuitable waters and to prevent the inter-mixing of aquifers with different water quality or Standing Water Levels</p> <p>2.3 Select a bore site that will prevent contamination and minimise interference with other bores and that is safe with respect to potential occupational health and safety hazards</p> <p>2.4 Select likely water entry mechanism from the formation to the bore such as open hole, slotted casing screens, gravel packs</p> <p>2.5 Calculate appropriate artificial pack design parameters and recommended annular thicknesses required</p> <p>2.6 Undertake calculations to determine appropriate screen design parameters (e.g. diameter, length, aperture size)</p> <p>2.7 Plot and interpret sieve analysis results onto graphs</p> <p>2.8 Select appropriate bore/surface casing for the anticipated ground/water quality and pressure conditions and any construction requirements</p> <p>2.9 Ensure all necessary materials anticipated for the job are available and on site prior to commencement of construction phase</p> |
| 3. Construct production bores in multiple aquifer systems | <p>3.1 Carry out any pre-start and start up procedures on plant or ancillary equipment</p> <p>3.2 Identify, select and apply rig operational controls</p> <p>3.3 Assemble and insert casing and screens</p> <p>3.4 Grout or otherwise seal surface casing</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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|                                              | <p>3.5 Conduct grouting operations to seal intermediate and/or production casing strings or to seal selected zones</p> <p>3.6 Construct bore in accordance with any applicable regulations, minimum construction and organisational requirements</p> <p>3.7 Maintain plumbness and alignment of the hole within the required limitations</p> <p>3.8 Collect, record and label formation and water samples</p> <p>3.9 Maintain records accurately and legibly</p> <p>3.10 Calculate hole, annular, fill or pack materials and mud pit volumes in cubic metres or litres</p> <p>3.11 Select and place stabilising gravel fill as required</p> <p>3.12 Determine appropriate artificial pack material grain size</p> <p>3.13 Place artificial pack material in a manner that will ensure uniform distribution in the annular space without bridging</p> <p>3.14 Maintain tool string inventories</p> <p>3.15 Identify and protect headworks of the bore</p> <p>3.16 Construct headworks to seal and cap the bore from surface water pollutants, environmental concerns and damage</p> <p>3.17 Incorporate methods for measuring static and pumping water levels in headworks and for adequate sealing when not in use</p> <p>3.18 Dispose of wastewater or hazardous materials from site and complete restoration of the bore site</p> |
| 4. Develop bore                              | <p>4.1 Use development techniques with care to prevent collapsing of casing or screens</p> <p>4.2 Use development techniques to improve hydraulic transmissivity around the bore</p> <p>4.3 Undertake development until a continuous, clean supply of water is obtained, in accordance with site, contractual or regulatory requirements</p> <p>4.4 Measure/calculate and record standing and drawdown water levels</p> <p>4.5 Perform tests to estimate the sustainable yield of the bore</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 5. Disinfect/decontaminate bore and drilling | <p>5.1 Disinfect/decontaminate to comply with relevant standards or regulatory requirements</p> <p>5.2 Handle hazardous chemicals in accordance with safety</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| equipment                                        | data sheets (SDS)                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6. Carry out bore maintenance and rehabilitation | 6.1 Carry out and shutdown procedures and secure equipment<br>6.2 Research all aspects of the bore construction and history<br>6.3 Undertake a process of diagnosis by testing and measurement to determine likely cause of bore deterioration<br>6.4 Devise a program of rehabilitation to ensure that the bore is restored to a reasonable condition                                                                         |
| 7. Decommission test/bore holes                  | 7.1 Determine suitable decommissioning procedures and select appropriate sealing materials and placement methods<br>7.2 Carry out the decommissioning (abandonment) of test holes or bore holes in single and multiple aquifer systems<br>7.3 Seal bore with surface caps and cover borecap with 300mm local soil<br>7.4 Verify position/location of hole for future reference<br>7.5 Dispose of drill and other fluids safely |

## Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit. Further information is available in the Resources and Infrastructure Industry Training Package Companion Volume.

## Unit Mapping Information

RIINHB322A Construct multiple aquifer production bores

## Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=88a61002-9a21-4386-aaf8-69c76e675272>

# Assessment Requirements for RIINHB322D Construct multiple aquifer production bores

## Modification History

| Release | Comment                                                                                                                                                                                                                                                                                                         |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | This unit replaces RIINHB322A Construct multiple aquifer production bores                                                                                                                                                                                                                                       |
| 2       | Required frequency and volume of evidence amended in Performance evidence.<br>Substantial amendments made in Assessment Conditions field, including: references to Industry Sectors, assessor and subject matter expert experience requirements, how assessment should be conducted and what it should confirm. |

## Performance Evidence

Evidence is required to be collected that demonstrates a candidate's competency in this unit. Evidence must be relevant to the roles within this sector's work operations and satisfy all of the requirements of the performance criteria of this unit and include evidence that the candidate:

- locates and applies relevant legislation, documentation, policies and procedures
- implements the requirements, procedures and techniques for the safe, effective and efficient completion of multiple aquifer production bore construction including:
  - performing aquifer sand sieve analysis tests
  - calculating the specific capacity of a bore
  - calculating grout component quantities, i.e. cement powder, water and other additives as required
  - calculating hole and annular volumes
  - calculating grout/mud specific gravity
  - determining grain size and selection of appropriate artificial pack material
- works effectively with others to undertake and complete the construction of multiple aquifer production bores that meets all of the required outcomes including:
  - complying with written and verbal reporting requirements and procedures
  - communicating clearly and concisely with others to receive and clarify work instructions
  - communicating clearly and concisely with others to resolve coordination requirements prior to commencing and during work activities
- demonstrates completion of the construction of multiple aquifer production bores that safely, effectively and efficiently meets all of the required outcomes on more than one (1) occasion including:

- designing the bore to ensure the exclusion of unsuitable waters and to prevent the inter-mixing of aquifers with different water quality or Standing Water Levels
- selecting a bore site that will prevent contamination and minimise interference with other bores and that is safe with respect to potential occupational health and safety hazards
- selecting likely water entry mechanism from the formation to the bore such as open hole, slotted casing screens, gravel packs
- assembling and inserting casing and screens
- completing grouting operations to seal intermediate and/or production casing strings or to seal selected zones
- maintaining plumbness and alignment of the hole within the required limitations
- continuing development until a continuous, clean supply of water is obtained, in accordance with site, contractual or regulatory requirements
- performing tests to estimate the sustainable yield of the bore

## Knowledge Evidence

The candidate must demonstrate knowledge in constructing multiple aquifer production bores through:

- work, health and safety
- environmental issues
- operating drill rig
- housekeeping
- identifying with the equipment characteristics, technical capabilities and limitations
- testing for alignment and plumbness of bores
- hole preparation for cementing (grouting) operations
- effects of various cement (grout) additives
- pressure cementing methods
- casing collapse characteristics
- applications for wire-wound screens
- screen design parameters to ensure appropriate entrance velocities
- interpreting the sieve analysis results
- observing the objectives of bore development
- types of drilling fluids
- grout placement methods and procedures
- range of numerical calculations to calculate:
  - volume (e.g. mud pits, drums, tanks or bore holes of given dimensions, annulus)
  - up hole velocity
  - cement/water/additives quantities
  - screen design parameters
  - flow rates (e.g. L/sec, GPM)

- conversion from imperial to metric and vice versa
- conducting a sieve analysis
- understanding the appropriate fishing operations for the type(s) of drilling being undertaken
- reading, interpreting and applying the required safety data sheets (SDS)
- being prepared for fire/accident/emergency

## Assessment Conditions

- An assessor of this unit must satisfy the requirements of the NVR/AQTF or their successors; and Industry regulations for certification and licensing; and,
- this unit must be assessed in the context of this sector's work environment; and,
- this unit must be assessed in compliance with relevant legislation/regulation and using policies, procedures, processes and operational manuals directly related to the industry sector for which it is being assessed; and,
- assessment may be conducted in conjunction with the assessment of other Units of Competency; and,
- assessment must confirm consistent performance can be applied in a range of relevant workplace circumstances; and,
- assessors must demonstrate the performance evidence, and knowledge evidence as outlined in this Unit of Competency, and through the minimum years of current\* work experience specified below in an Industry sector relevant to the outcomes of the unit; or,
- where the assessor does not meet experience requirements a co-assessment or partnership arrangement must exist between the qualified assessor and an Industry subject matter expert. The Industry subject matter expert should hold the unit being assessed (or an equivalent unit) and/or demonstrate equivalence of skills and knowledge at the unit level. An Industry technical expert must also demonstrate skills and knowledge from the minimum years of current work experience specified below in the Industry sector, including time spent in roles related to the unit being assessed; and,
- assessor and Industry subject matter expert requirements differ depending on the Australian Qualifications Framework Level (AQF) of the qualification being assessed and/or Industry Sector as follows:

| Industry sector                                                                            | AQF** Level | Required assessor or Industry subject matter expert experience |
|--------------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------|
| Drilling, Metalliferous Mining, Coal Mining, Extractive (Quarrying) and Civil Construction | 1           | 1 Year                                                         |
|                                                                                            | 2           | 2 Years                                                        |
| Drilling, Coal Mining and Extractive (Quarrying)                                           | 3-6         | 3 Years                                                        |
| Metalliferous Mining and Civil Construction                                                | 3-6         | 5 Years                                                        |

|               |                                                                                                                                                                                                                                                                                                                                |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Other sectors | Where this Unit is being assessed outside of the Resources and Infrastructure Sectors assessor and/or Industry subject matter expert experience should be in-line with industry standards for the sector in which it is being assessed and where no Industry standard is specified should comply with any relevant regulation. |
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\*Assessors can demonstrate current work experience through employment within Industry in a role relevant to the outcomes of the Unit; or, for external assessors this can be demonstrated through exposure to Industry by conducting frequent site assessments across various locations.

\*\*Where a unit is being delivered outside of a Qualification the first numeric character in the Unit code should be considered to indicate the AQF level

## Links

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