



Australian Government

RIINHB411D Construct artesian (flowing) aquifer production bores

Release: 2

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Modification History

Release	Comment
1	This unit replaces RIINHB411A Construct artesian (flowing) aquifer production bores
2	Required frequency and volume of evidence amended in Performance evidence. 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 artesian (flowing) aquifer production bores in Drilling.

This unit is appropriate for those working in operational, supervisory or technical specialist 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 the construction of artesian (flowing) aquifer production bores	1.1 Access, interpret and apply artesian (flowing) aquifer production bores construction documentation and ensure the work activity is compliant 1.2 Obtain, read, interpret, clarify and confirm work requirements 1.3 Identify and address potential risks, hazards and environmental issues and implement control measures 1.4 Select and wear personal protective equipment appropriate for work activities
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	1.5 Communicate and coordinate activities with others throughout the work activity 1.6 Discuss scope of work with client and give technical advice, cost structure, workmanship warranty, quantity and quality of materials, construction standards and methods to be used and gain general agreement on drilling plan 1.7 Provide detailed strata logs, pump and development test results conducted during bore development and water and strata samples to the appropriate authorities as required by the relevant State/Territory legislation/licensing agency 1.8 Complete all requirements for bore completion reports, decommissioning or abandonment and send to regulatory authorities within the time specified on bore licence 1.9 Obtain and interpret emergency procedures, and be prepared for fire/accident/emergency
2. Design production bores for artesian aquifer systems	2.1 Determine most appropriate construction methods from the reading and interpretation of all available documented information 2.2 Design the bore to ensure the exclusion of unsuitable waters and to prevent the inter-mixing of aquifers with different water quality and/or Standing Water Levels 2.3 Determine a drilling fluid program to suit the expected down-hole conditions and anticipated pressures 2.4 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 2.5 Select likely water entry mechanism from the formation to the bore such as open hole, slotted casing screens, gravel packs 2.6 Calculate appropriate artificial pack design parameters, and recommended annular thicknesses required 2.7 Undertake calculations to determine appropriate screen/slot design parameters (e.g. diameter, length, aperture size) 2.8 Plot and interpret sieve analysis results onto graphs 2.9 Select appropriate bore/surface casing types, size, strength and wall thicknesses for the anticipated ground/water quality and pressure conditions and any construction requirements 2.10 Ensure all necessary materials anticipated for the job are available and on site prior to commencement of construction phase
3. Construct production bores in artesian	3.1 Carry out any pre-start and start up procedures

aquifer systems	3.2 Identify, select and apply rig operational controls 3.3 Select, slot, assemble and insert casing and screens suitable for the formations in which they are deployed 3.4 Select, mix and place grout or otherwise seal surface casing from 10 m into competent impermeable strata and back to the surface with a minimum sheath thickness of 20mm above maximum shoe of coupling joint diameter size 3.5 Conduct grouting operations to seal intermediate and/or inner production casing strings with a 15mm minimum thickness grout sheath or to seal selected zones so that the water from the production bore is drawn from one primary formation only, (unless otherwise allowed by the permit) 3.6 Construct bore in accordance with any applicable regulations, minimum construction requirements and the organisation's internal procedures 3.7 Use and maintain drilling fluids and additives within the manufacturer's recommendations and that are non toxic and capable of complete removal from the bore upon completion 3.8 Maintain, test and record fluid properties such as viscosity, mud weight, filtration and sand content so that the potential capacity, efficiency or quality of the bore is not affected 3.9 Maintain plumbness and alignment of the hole within the required limitations and carry out a plumbness test where required 3.10 Prepare for and recognise symptoms of a formation kick and take action to control the bore 3.11 Collect, store, record, label and transport formation samples in accordance with licensing requirements 3.12 Collect, test, store, record, label and transport water samples for chemical analysis in accordance with licensing requirements 3.13 Maintain all records accurately and legibly 3.14 Arrange for geophysical logging tools to be run in bore if required 3.15 Accurately calculate hole, annular fill or pack materials and mud pit volumes in cubic metres or litres 3.16 Determine aquifer formation grain size distribution from sieve analysis and interpret appropriate gravel pack and screen slot aperture dimensions for gravel packed wells 3.17 Select appropriate gravel pack materials 3.18 Place artificial pack material in a manner that will ensure
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	uniform distribution in the annular space without bridging 3.19 Comply with relevant workplace occupational health and safety requirements for both the drilling equipment and construction materials 3.20 Remove drilling fluids from the bore to allow subsequent development 3.21 Maintain tool string inventories 3.22 Construct headworks for the bore including isolation valves to retain/control artesian flow and to permit independent testing of both pressure and flow without interference to reticulation system 3.23 Identify and protect headworks of the bore 3.24 Construct headworks to seal and cap the bore from surface water pollutants, environmental concerns and damage 3.25 Dispose of/neutralise wastewater or hazardous materials from site and complete restoration of the bore site camp facilities
4. Develop bore	4.1 Use development techniques with care to prevent collapsing of casing or screens 4.2 Use development techniques with care to prevent collapsing of casing or screens 4.3 Undertake development until a continuous, clean supply of water is obtained, in accordance with acceptable and practical limits set by site, contractual or regulatory requirements 4.4 Measure/ calculate and record standing and drawdown water levels 4.5 platform pump and or development tests to estimate the sand content and sustainable yield of the bore
5. Disinfect/decontaminate bore and drilling equipment	5.1 Disinfect/decontaminate to comply with relevant standards or regulatory requirements 5.2 Handle hazardous chemicals in accordance with safety data sheets (SDS)
6. Carry out bore maintenance and rehabilitation	6.1 Carry out and shutdown procedures and secure 6.2 Undertake a process of diagnosis to determine likely cause of bore deterioration 6.3 Devise a program of rehabilitation to ensure that the bore is restored to a reasonable condition

7. Decommission artesian wells with flowing and/or non-flowing elements	7.1 Determine suitable decommissioning procedures and select appropriate materials 7.2 Carry out the decommissioning (abandonment) of artesian aquifer bores, using min 20m long cement plugs sufficient to stem the flow between aquifers both from inside and outside the casing, (slot casing as necessary) or to separate aquifers of differing water quality from each other 7.3 Place cement bridges at the top of the surface casing and at the surface casing shoe 7.4 Verify position/location of hole for future reference 7.5 Dispose of drill and other fluids safely 7.6 Record entire decommissioning procedure and details of bore cementing 7.7 Complete bore completion report and submit to State/Territory Water Authority 7.8 Carry out housekeeping requirements
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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

RIINHB411A Construct artesian (flowing) 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 RIINHB411D Construct artesian (flowing) aquifer production bores

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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
- works effectively with others to plan, prepare and conduct the construction of artesian (flowing) aquifer production bores including:
 - communicating clear and timely instructions to those involved
 - preparing for and conducting briefings, toolbox and site meetings
 - maintaining clear and legible written records and the reports
- demonstrates completion of the construction of artesian (flowing) 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
 - selecting a bore site that will prevent contamination and minimise interference with other bores and adhere to occupational health and safety requirements
 - 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 inner production casing strings with a 15mm minimum thickness grout sheath or to seal selected zones so that the water from the production bore is drawn from one primary formation only, (unless otherwise allowed by the permit)
 - 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 pump and development tests to estimate the sand content and sustainable yield of the bore

Knowledge Evidence

The candidate must demonstrate knowledge in constructing artesian (flowing) aquifer production bores through:

- accessing, interpreting and applying legislative, organization and site requirement and procedures for:
 - work, health and safety
 - environmental issues
 - operating drill rig
 - housekeeping
- the equipment characteristics, technical capabilities and limitations
- the basic geological formations, i.e. basic knowledge of both soil and rock classifications and various formations which permit groundwater movement and factors affecting groundwater quality for aquifer systems, including drillability and stability
- potential safety hazards and sources of contamination when siting a bore
- the necessity of having a signed agreement/contract with the client
- testing for alignment and plumbness of bores
- the appropriate casing materials for various applications
- the applications for wire-wound screens
- screen design parameters to ensure appropriate entrance velocities
- interpretation of sieve analysis results
- applications for natural pack, stabilising fill and artificial pack completion techniques
- objectives of bore development
- identifying and applying appropriate headworks design for class 3 bore applications
- characteristics of 'good samples' required for water well construction
- ways in which sampling errors can occur
- types of drilling fluids, their selection, use, testing and conditioning
- grout placement methods and procedures including pressure grouting
- using a range of numerical calculations
- appropriate fishing operations for the type(s) of drilling being undertaken
- materials safety data sheets (MSDS)
- 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.	

*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

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