



Australian Government

AHCLPW307 Perform restricted diving for scientific purposes

Release: 1

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Modification History

Release	Comments
Release 1	This version released with AHC Agriculture, Horticulture and Conservation and Land Management Training Package Version 6.0.

Application

This unit of competency describes the skills and knowledge required to support a diving expedition for scientific research, monitoring and inspection using self-contained underwater breathing apparatus (SCUBA) for both air and enriched air nitrox (EAN) breathing gases.

The unit applies to individuals who work under broad direction and use discretion and judgement in the selection and use of available resources.

Dive certificates and licensing apply for this unit and specific determination should be sought from the relevant state or territory authorities. This unit also requires compliance with the current version of the Australian Standard for training and certification of occupational divers for restricted occupational self-contained underwater breathing apparatus (SCUBA).

Pre-requisite Unit

SISOSCB001 SCUBA dive in open water to a maximum depth of 18 metres

SISOSCB006 Perform diver rescues

HLTAID011 Provide First Aid

HLTAID015 Provide advanced resuscitation and oxygen therapy

Unit Sector

Lands, Parks and Wildlife (LPW)

Elements and Performance Criteria

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Plan diving operations	1.1 Receive and interpret dive objectives and activities from instructions

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	1.2 Assess number and type of dives required to meet dive objectives 1.3 Plan and organise a dive program 1.4 Determine equipment and dive team required for dive operations 1.5 Source and secure equipment and dive team for dive operations 1.6 Ensure dive team are competent and possess current medical clearances according to industry standards 1.7 Source and secure first aid equipment and pure oxygen administration equipment 1.8 Obtain and secure permits required for dive plan
2. Prepare for diving operations	2.1 Check serviceability and condition of equipment and resolve defective equipment according to workplace procedures 2.2 Select and prepare dive breathing gas and cylinders according to workplace procedures and industry standards 2.3 Identify and source materials and consumables required for dive 2.4 Develop operational safety and emergency procedures for dive program 2.5 Identify hazards, assess risk and implement controls according to safe diving operations, dive plan and workplace procedures 2.6 Establish communications procedures with dive team 2.7 Develop emergency procedures for dive according to industry standards and codes of practice and emergency management plan 2.8 Communicate emergency procedures and rescue plan to dive team at a pre-dive briefing 2.9 Stow and transport dive equipment and resources to dive site
3. Conduct dives for scientific purposes with SCUBA compressed air, or (EAN) systems	3.1 Perform pre-dive checks according to workplace and standard operating procedures 3.2 Prepare equipment and resources required for compressed air and EAN diving 3.3 Assess environmental factors before entering the water and apply workplace safety procedures 3.4 Conduct dives for scientific purposes to achieve objectives of dive plan according to industry standards and codes of practice 3.5 Operate dive equipment during dive according to manufacturer

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	instructions 3.6 Monitor dive conditions and amend dive procedures according to enterprise requirements, codes of practice and safety procedures 3.7 Monitor and suspend dive according to no-decompression requirements 3.8 Exit water and assist others to exit water safely without damage to equipment 3.9 Update records of dive and activity according to workplace procedures
4. Respond to emergency diving incidents	4.1 Monitor dive operations and identify emergency incidents 4.2 Activate emergency management plan for identified incidents 4.3 Suspend or cancel dive operations according to emergency management plan 4.4 Implement actions according to type and nature of emergency incident 4.5 Apply diver first aid to personnel involved in emergency incident 4.6 Notify authorities where emergency assistance is required according to workplace procedures 4.7 Review emergency incident and modify procedures and dive plan to prevent reoccurrence 4.8 Record emergency incident according to workplace and industry practices
5. Check and store equipment	5.1 Remove and assist others to remove dive attire and equipment according to workplace procedures 5.2 Disassemble and remove equipment from dive site on completion of dive 5.3 Check and test dive equipment for condition and correct operation 5.4 Arrange for repair or replacement of faulty equipment according to workplace procedures 5.5 Store equipment according to manufacturer instructions and workplace procedures 5.6 Maintain records of equipment use according to workplace procedures

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
6. Debrief diving team	6.1 Review and assess procedures and outcomes of dive plan with dive team 6.2 Identify recommendations to amend procedures and dive plan 6.3 Record dive team debriefing session according to workplace procedures
7. Review diving program	7.1 Compile recommendations for amendments to procedures and dive plans 7.2 Review dive plan and amend as appropriate 7.3 Record and report review conclusions

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential for performance in this unit of competency but are not explicit in the performance criteria.

Skill	Description
Reading	Interpret dive plans and instructions and consolidates information to determine requirements for dive
Writing	Accurately complete organisational records and programs using clear language and industry terminology
Oral Communication	Effectively participate in verbal exchanges with dive team using collaborative and inclusive techniques including active listening and questioning and reading of verbal and non-verbal signals to convey and clarify information
Numeracy	Interpret numeric information to determine pressures and to assess and calculate dive times based on depth, pressure and no-decompression tables

Unit Mapping Information

Code and title current version	Code and title previous version	Comments	Equivalence status
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Code and title current version	Code and title previous version	Comments	Equivalence status
AHCLPW307 Perform restricted diving for scientific purposes	AHCLPW305 Perform diving for scientific purposes	Redesigned unit to align with Australian training standards for occupational divers	Not equivalent

Links

Companion Volumes, including Implementation Guides, are available at VETNet: -
<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=c6399549-9c62-4a5e-bf1a-524b2322cf72>

Assessment Requirements for AHCLPW307 Perform restricted diving for scientific purposes

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Performance Evidence

An individual demonstrating competency must satisfy all of the elements and performance criteria in this unit.

There must be evidence that the individual has prepared for scientific dives and has:

- interpreted dive objectives and planned the equipment, resources, and consumables required to carry out a dive
- prepared resources, equipment and dive team for dive: including:
 - inspected equipment for signs of deterioration, damage or corrosion and tested for proper operation
 - selected equipment for dive and ensured correct storage during transport
- used decompression tables, including Defence and Civil Institute of Environmental Medicine tables (DCIEM) to calculate safe diving profiles, including:
 - depth increments
 - time increments
 - stop time
 - ascent rates
 - total decompression time
 - bottom time
 - total dive time
 - surface interval
- used decompression tables to calculate the following without error:
 - 'No stop' bottom time for a given depth
 - decompression depth/time increments
 - repetitive dive time increments
- prepared compressed air and enriched air nitrox cylinders (EAN) for diving operations according to legislative requirements, including:
 - inspected and maintained compressors
 - determined cylinder pressure for dive

- charged air cylinders using high pressure air compressor according legislative requirements, and workplace health and safety procedures
- charged air cylinders by decanting according legislative requirements, and workplace health and safety procedures
- tested the quality of gas
- analysed oxygen content of dive mix for EAN
- used approved cylinder types for compressed air and EAN according to Industry standards and workplace health and safety procedures
- maintained positive pressure in EAN cylinders to prevent ingress of atmospheric air
- carried out pre-dive checks and performed a safety risk assessments for dive site
- ensured availability of first aid equipment, and oxygen administration kit
- monitored dive conditions, responded to incidents and amended dive procedures according to identified issues.

There must also be evidence that the individual has undertaken dives using compressed air and EAN in open water to a maximum depth of 30 metres which must include the following dives:

- one dive between 27 metres and 30 metres
- two dives with zero visibility in two to nine metres depth of water with a minimum of 20 minutes per dive
- one night dive
- four boat dives
- four dives at depths greater than 20 metres, simulating decompression stops during ascent
- at least three dives must be undertaken using EAN procedures including:
 - selected the blend and equipment to meet industry and safety criteria for EAN operations
 - conducted dive preparation for EAN dives according to industry standards, workplace health and safety policies and equipment manufacturer operating procedures
 - completed EAN dive according to dive plan and EAN procedures

Dives must be undertaken in conformance with statutory work health and safety, Australian Standards and codes of practices, with evidence the individual has:

- fitted and removed dive equipment and assisted other divers to fit and remove dive equipment in correct sequence
- selected water entry and exit methods appropriate to the situation and water conditions
- entered and exited water safely with no damage to equipment and assisted other divers to enter and exit water
- checked and reported dive equipment for leaks on entering water
- conducted dive in open water safety according to dive plan, including:
 - adapted operational techniques according to prevailing conditions
 - used buoyancy control techniques and equipment appropriate to diving conditions
 - demonstrated correct breathing techniques
 - demonstrated decent and ascent techniques appropriate to the dive conditions
- demonstrated safety-critical underwater skills during dive, including:

- monitored gas consumption and gas supply and ascended when predetermined level of gas remained to prevent exhaustion of gas supply
- changed over to reserve gas supply and notified surface
- managed life line to minimise entanglement and facilitate line signals
- followed life line to surface
- monitored depth and time throughout the dive
- conducted dive practices for compressed air and EAN within diving maximum limits to meet industry technical standards and workplace health and safety policies and procedures
- conducted specified dive operations according to objectives of operational dive plan
- used basic non-powered hand tools to complete objectives according to planned dive operations
- checked, cleaned maintained and stored hand tools according to workplace procedures
- communicated with others in the dive team underwater, diver to diver and diver to surface using each of the following:
 - hand signals
 - line signals
 - voice communications
- demonstrated decompression procedures according to dive profile using each of the following:
 - lazy shot rope
 - fixed shot rope
 - lazy shot rope during drift dives
 - lazy shot using a life line
 - float line
 - ascent rate control and depth control at water stops
- performed at least two of the following search techniques during the dive:
 - circular
 - jackstay grid
 - snag line
 - grid mesh
 - semi-circular
 - parallel
- performed at least two of the following survey techniques during the dive:
 - line transect
 - quadrat search
 - photographic quadrat
 - video transect
 - timed swim
 - measured time swim

- used basic rope work and rigging techniques during dive operations using the following knots:
 - reef knot
 - bowline
 - clove hitch
 - rolling hitch
 - round turn and two half hitches
 - sheet bend
 - figure of eight
 - figure of eight on the bite
- established effective working relationships with dive team, including:
 - established communications under water
 - monitored dive team members for compliance with 'no-decompression' requirements
 - debriefed dive team after dive activity
- communicated and activated an emergency management plan and taken action in an emergency situation including:
 - used emergency drills, procedures and methods
 - acted as a surface standby diver
 - acted as an in-water standby diver when divers are near enough to communicate and act as standby diver for each other
 - performed an effective in-water rescue of an unconscious diver to boat or shore
 - acted in a self-rescue emergency situation
- performed first aid on diving casualty which must include:
 - recognised and assessed diver for adverse health conditions
 - determined if emergency services are required and obtain and provide support
 - administer first aid to diving casualty promptly according to workplace procedures
 - used an oxygen administration kit
- performed post dive personnel and equipment checks, including:
 - check and report supporting diver condition
 - read and record cylinder pressure
- reviewed dive plans following debriefing and risk analysis
- disassembled, cleaned, inspected, maintained and stored compressed air and EAN diving equipment according to manufacturer instructions including:
 - ensured EAN compatible parts and processes for elevated oxygen mixture according to industry standards and workplace health and safety procedures
 - reported equipment faults according to workplace procedures following dive
- maintained records according to industry standards and workplace requirements.

Knowledge Evidence

An individual must be able to demonstrate the knowledge required to perform the tasks outlined in the elements and performance criteria of this unit. This includes knowledge of:

- industries associated with underwater work and the type of work performed
- qualifications, legislative and regulatory requirements for occupational divers including restricted occupational SCUBA diving and occupational health and safety legislation as it relates to divers and their employers.
- dive planning processes, including risk assessment, hazard identification and control
- additional planning required for EAN diving, including:
 - requirements of EAN use and associated hazards
 - aspects of dive plan where EAN specific considerations are needed
- use of industry recognised decompression tables and dive computers to plan and carry out safe diving practices
- anatomy, physiology and physics of underwater diving, including:
 - anatomical and physiological systems of the human body including respiratory, circulatory and nervous systems, musculoskeletal, cardiovascular, ears, sinuses, vestibular organs, gastrointestinal, endocrine and immune systems
 - common units of measurement and the relationship between pressure, volume and temperature in the context of diving
 - definitions of atmospheric pressure, hydrostatic pressure, absolute pressure, ambient pressure and gauge pressure
 - Boyles Law and relationship between pressure and volume and the calculations relevant to depth and pressure
 - barotrauma and typical barotrauma injuries
 - use of decompression tables to determine safe diving profiles
 - partial pressure and gas solubility and their effect on the human body including Daltons Law
 - basic relationship between pressure and temperature including Charles Law, and calculating pressure changes with temperature
 - effect of buoyancy and effect on divers and underwater objects including Archimedes Principle including, diffusion, saturation, desaturation, equilibrium
 - behaviour of light and sound underwater and impact on divers, including equipment used to compensate
 - impact of temperature on cylinder pressure
 - heat loss and impact on diver
 - decompression as it relates to partial pressure and solubility of gasses (Henry's Law)
 - inert gas narcosis
- diving equipment, testing, operation and maintenance including:
 - selecting diving equipment for operational activities
 - assembly and disassembly of equipment used in dive operations
 - pre and post dive checks and maintenance

- selection of appropriate diving equipment for required tasks such as masks, fins, cylinders, regulators, buoyancy compensation devices, harnesses, weights and safety devices
- compressors for air and EAN cylinder charging
- safety procedures
- inspecting equipment and signs of disrepair
- gas quality and gas testing standards used in Australia
- record keeping practices for equipment
- correct fitting and removal of dive equipment on divers including assisting others on fitting and removal
- types of ropes used in diving operations their purpose, application, including:
 - care and maintenance
 - basic rigging techniques
 - knots and other rigging devices used in diving operations their purpose and application
- tools and equipment for scientific diving operations, their use and maintenance
- navigation, search and recovery techniques and their application in scientific diving
- survey techniques and their application in scientific diving
- health and safety risks associated with diving, including:
 - statutory health and safety requirements
 - standards and codes of practice
 - roles and responsibilities
 - risk assessment and developing control measures
- emergency procedures and their implementation, including:
 - dive rescue procedures
 - oxygen administration procedures
 - agency standing orders for notification
 - emergency service procedures
 - recognising the need for decompression chamber and support
- first aid for divers, including:
 - recognising signs and symptoms of diving related ill health including, decompression illness, mask and suit squeeze, ear and sinus problems, near drowning, vomiting under water, gas embolism and pulmonary barotrauma, breathing gas contamination, carbon monoxide poisoning, carbon dioxide poisoning, oxygen toxicity, anoxia and hypoxia, hypothermia and hyperthermia, injury/illness from marine organisms
 - assessing when first aid is required
 - administering first aid to divers
 - use of defibrillators in a wet environment
- compression chamber theory
- specialised diving modes including but not limited to zero and low visibility diving, tethered, night and deep diving.
- effective teamwork and team communications, including

- underwater communication procedures and equipment
- statutory and workplace record keeping procedures.

Assessment Conditions

Assessment of the skills in this unit of competency must take place under the following conditions:

- physical conditions:
 - skills must be demonstrated in open water to a depth of no greater than 30 metres
 - conditions must comply with the current version of the Australian Standard for training and certification of occupational divers - restricted occupational SCUBA diver
- resources, equipment and materials:
 - SCUBA equipment
 - safety equipment
 - compressors for filling cylinders with air and enriched air nitrox
 - cylinders for filling and use
 - tools and equipment for conducting dives, searches and surveys
- specifications:
 - workplace documents such as policies, procedures, processes, forms
 - manufacturer's operating instructions for equipment
 - workplace instructions and job specifications including risk assessment requirements
 - legislation, codes of practice and standards for occupational diving
- relationships:
 - dive team member
- timeframes:
 - dives must comply with times specified in no-decompression tables and calculations.

Assessors of this unit must satisfy the requirements for assessors in applicable vocational education and training legislation, frameworks and/or standards.

In addition, the following specific assessor requirements apply to this unit:

- assessors must be qualified as occupational SCUBA diving instructor through a recognised diver training organisation.
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