



TARONG ENERGY CORPORATION LIMITED
OCCUPATIONAL HEALTH & SAFETY PROCEDURE FOR

Underwater Diving Work

OHS-PROC-121

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1.0 Purpose

The purpose of this procedure is to ensure that all diving activities undertaken at a TEC owned or controlled workplace are safe and meet legal requirements.

This procedure aims to ensure that diving operations are:

- Conducted safely and that all foreseeable risks have been assessed and minimised.
- Compliant with Queensland Workplace Health and Safety Legislation and relevant Australian Standards.

2.0 Scope

This procedure applies to TEC employees, contractors and all others performing work on behalf of or in cooperation with TEC.

3.0 Responsibilities

Manager Generation Operations	To allocate responsibilities and resources to ensure effective site-specific implementation of this procedure.
Health and Safety Manager	To maintain the currency and accuracy of this procedure reflective of legislative and corporate change. To provide support to Line Managers and Supervisors where required in the assessment of contractor diving company diving risk management systems.
Line Managers and Supervisors	To ensure that divers are qualified and their diving operations are conducted under safety systems that meet the requirements of this procedure and legislative requirements.
Generation Operations employees	Generation Operations staff shall ensure all necessary isolations are carried out in accordance with Tarong Energy PTW Procedures.
Contractor diving company employees	Diving contractor shall be responsible for all aspects of diving safety in accordance with legislative and TEC requirements (as per this procedure).

4.0 Types of Diving Conducted

Underwater diving work is infrequently conducted at Tarong Power Station, Tarong North Power Station and Wivenhoe Power Stations and involves contractor diving company workers performing underwater diving work operations under the supervision of a diving supervisor.

The main types of diving work/tasks expected to be performed at TE includes:

- Inspections,
- Filming / recording, or
- Maintenance work

A TEC Permit to Work (PTW) Officer In Charge (OIC) is responsible for ensuring safe access to diving areas through the isolation of plant in accordance with the TEC PTW Procedure CORP-PTW-01. Refer to section 6 for plant status / isolation requirements.

5.0 Diving Restrictions

The following activities are NOT permitted, without explicit written permission from the Manager Operations following special consideration and implementation of appropriate control measures:

- Diving to depths of greater than 30 meters;
- Any dive activities being carried out by anyone under the age of 18.

The below activities are prohibited:

- Work below depths of 50m using SSBA supplying compressed air (this is a provision under the *Queensland Workplace Health and Safety Regulation 2008*).

6.0 Plant Status / Isolation Requirements

Diving work is not to be undertaken unless it has been authorised under the TEC Permit to Work System. Isolations required shall be assessed by Generations Operations staff prior to each dive. The following minimum isolations shall apply:

6.1 Wivenhoe Power Station:

Access to within suction conduit or draft tube

- Unit to be accessed drained to tailbay level and isolated to prevent pumping or generation.
- Other unit disabled by isolation of guide vanes and discharge valve.
- Cooling water pumps on both units isolated.

Access external to suction conduit or draft tube.

- Both units disabled by isolation of guide vanes and discharge valve.
- Cooling water pumps on both units isolated.

Access to Cooling Water Pump intake strainer on one unit

- Both units disabled by isolation of guide vanes and discharge valve.
- Cooling water pumps on unit to be accessed isolated

Access to Splityard control structure intakes.

- Unit to be accessed guard gate closed and isolated.
- Other unit disabled by isolation of guide vanes and discharge valve.

6.2 Tarong & Tarong North Power Station:

Access to perform any underwater work in any dam, watercourse, reservoir or cooling tower will be under a PTW with adequate isolations to ensure no damaging energies are present. Depending on the location, this may result in pumps being isolated, isolation baulks installed and units running at reduced loads.

7.0 Underwater Diving Work Vs Construction Diving work

The *Workplace Health and Safety Regulation 2008* has divided occupational diving work into two categories: “underwater diving work” and “construction diving work”. (refer to Section 16 for their definitions). Construction diving work has additional requirements under the *Regulation* based on the increased level of risk this type of work involves.

8.0 Occupational diver competency

Sections 151 to 158 of the *Workplace Health and Safety Regulation 2008* apply to all occupational diving work. These sections of the regulation define different ways in which competence must be demonstrated for a diver to undertake occupational diving work and to undertake the risk assessment process in Section 160. Only the option in Section 152 may be used for construction diving work.

To determine the most appropriate competency option, the following issues are to be considered:

- the type of diving work to be undertaken
- the diving environment
- the diving equipment and breathing gas to be used
- the decompression schedule to be used
- the tasks to be undertaken
- any tools to be used
- any other hazards associated with the task.

TEC must ensure that the contractor diving company holds proof of competency for any person undertaking underwater diving work.

9.0 Risk Management

9.1 Risk description

Underwater diving operations expose workers to physical, physiological and psychological demands not normally placed on persons in other activities in the workplace. Diving is a high-risk activity due to the potential for exposure to hazards that could result in serious bodily injury or death if appropriate controls are not implemented.

9.2 Obligations for risk management

TEC must ensure that any contractor diving company undertaking work on behalf of TEC can demonstrate that the risk management approach as detailed in *Section 160* of the *Queensland Workplace Health and Safety Regulation 2008* has been followed and applied for any diving activities carried out

The contractor diving company's risk assessment tool (JSEA / Work Method Statement or equivalent) shall consider each of the hazards mentioned in *AS/NZS 2299, part 1, appendix D2.4* that may or may not be present. Each factor should be considered, and an assessment made of the risk. All other hazards not otherwise identified should also be considered in the risk assessment.

A competent TEC representative (e.g. a member of the Health and Safety team) shall review the contractor diving company's systems for ensuring health and safety during diving activities prior to any such activities being undertaken at a TEC owned or operated site. Preferably this review shall be undertaken as part of the procurement process, and completed prior to the engagement of any contractor diving company.

For details of what is required under the Queensland Workplace Health and Safety legislation refer to **Appendix 1 - Checklist for Reviewing a Contractor's Diving Safety Systems**.

10.0 Equipment

The appropriate standard for equipment for diving work (construction and other) is *AS/NZS 2299 Occupational Diving Operations - Part 1 Standard Operational Practice (various sections)*.

11.0 Breathing Gas

The appropriate standard for breathing gas quality for occupational diving work is *AS/NZS 2299 Occupational Diving Operations - Part 1 Standard Operational Practice, section 3.13*.

12.0 Adverse Event Management and Emergency Response

Unpredictability inherent in the diving environment and in human physiology means that divers are exposed to some risks that cannot be completely avoided by the usual hierarchy of control measures. Systems to safely manage foreseeable adverse events are therefore an essential part of diving risk control measures.

There is overlap between adverse event management and emergency response. Adverse events management systems are systems that aim to manage an adverse event in such a fashion that it does not progress to become an emergency or cause harm.

Adverse events management systems include but are not limited to—

- (i) availability of a standby diver;
- (ii) emergency breathing gas supply system;
- (iii) alternative means of ascent and exit from the water;
- (iv) emergency breathing gas supply systems;
- (v) management plans for omitted decompression and for decompression illness, including availability of recompression; and
- (vi) availability of sufficient oxygen to enable oxygen to be used for precautionary purposes.

12.1 Decompression Management

The appropriate standard to manage the risk of decompression illness for diving work (construction and other) is *AS/NZS 2299 Occupational Diving Operations - Part 1 Standard Operational Practice, Appendix F*.

A system must be in place that ensures the following factors that may predispose a diver to developing decompression illness are minimised:

- severe exercise during or after decompression
- poor physical fitness and obesity
- water temperature, for example cold water and hot showers
- dehydration
- increased carbon dioxide pressures
- alcohol intake
- physical injury
- dive profiles
- rapid and multiple ascents
- repetitive and multi day diving
- altitude exposure.

12.2 Emergency Plans

Dive sites must have a written emergency plan to deal with emergency situations. These emergency plans should be made readily available to all relevant workers who should be familiar with these plans. Situations covered by written emergency plans are to include:

- first aid and oxygen provision
- rescue and resuscitation
- evacuation, including evacuation to the nearest recompression facility
- missing persons.

Refer to the *Occupational Diving Code of Practice, Section 4*, for further details on what information is required to be documented for each situation listed above.

13.0 Records and Documentation

13.1 Prior to undertaking underwater diving work:

- **Diving work risk management checklist - TEC Form T-1757** shall be completed by a competent TEC representative and filed on File WHS/6527. Refer to Appendix 1 for details of the content of this form.

13.2 After completion of the underwater diving work:

Employers Records:

The diving supervisor is to keep a record containing the following minimum information for each diving operation and kept, as a minimum, for 12 months after the last dive of the operation:

- a) Date and time of diving operation.
- b) Location of diving operation.
- c) Name of dive supervisor.
- d) Dive plan.
- e) Records of risk assessments.
- f) Names of divers and standby divers.
- g) Nature of task(s).
- h) Maximum depth of the dive.
- i) Time left surface, time reached bottom and time left bottom (for each diver).
- j) Duration of dive, dive profile and breathing gases for each diver.
- k) Decompression schedule utilized for each diver (where applicable).
- l) Details of incidents and accidents.
- m) Diving equipment used.
- n) All other relevant details.
- o) Supervisor's signature.

13.2 After completion of the underwater diving work: (cont'd)

Diver's Record

Occupational divers are to complete a diver's log for their own records. The diver's log should include:

- a) date of dive
- b) operation number of the dive, that is sequential numbering of each of the dives for any one day
- c) location and nature of dive site, for example boat or shore diving
- d) environmental conditions at the dive site
- e) time in
- f) time out
- g) maximum depth of the dive
- h) bottom time
- i) the decompression tables followed by the diver
- j) any emergency or incident of special note which occurred during the dive, for example failure of diving equipment or emergency decompression
- k) any discomfort or injury suffered by the diver
- l) depth and duration of safety stop.

The following TEC forms are to be completed and filed in File WHS/6527 to meet the abovementioned documentation and recording requirements:

- **Diver's Record of Dive – TEC Form (T-1763)** shall be completed by the diver and signed by the dive supervisor on completion of the dive.

Note: Where a contractor diving company is engaged, a record produced by the contractor diving company that is equivalent to TEC Form T-1763 may be used in place of the TEC form.

- **Record of Dive - TEC Form (T-1764) and JSEA Form T-1022¹** shall be completed by the dive supervisor in conjunction with the TEC Representative. This form and JSEA Form T-1022 shall be filed on File WHS/6527.

¹*Each factor mentioned in AS/NZS 2299, part 1, appendix D, paragraph D2.4 is to be considered in the JSEA.*

- **Incident/Injury Reporting.** Where an incident has occurred during the diving operation, the relevant TEC incident report form shall be completed (Injury/Illness report Form T-1037, HSEQ Incident report Form T-1039). A reference to the incident/injury report's TRIM file number is to be recorded within the Employers Record of Dive form under the 'Remarks' section.

14.0 Definitions

Competent person	A person who has acquired through training, qualifications or experience, or a combination of these, the knowledge and skills to enable that person to perform a specified task.
Construction diving work	<p>Means underwater diving work to assemble, construct, demolish, dismantle, install, clean, inspect, maintain, remove, repair, salvage, sample, search for, photograph, film, video or make a sound recording of certain things:</p> <ul style="list-style-type: none"> • a building • a bridge • a pile or a structure supported by piles • a jetty, pontoon, wharf, mooring or slipway • a navigational aid • a pipe, cable or tunnel • scaffolding, whether or not for use with a building • a drilling rig • an oil or gas well platform • a weir or the structure or machinery of a dam or other artificial water storage, other than a swimming pool or aquarium • a craft or vehicle for use in, on or above water or land. <p>Construction diving work also includes underwater diving work associated with dredging, reclamation of land or other earthworks.</p>
Dive plan	A set of procedures for a given diving operation.
Open circuit SCUBA	Means self-contained underwater breathing apparatus that does not recirculate, or partially recirculate, the breathing gas.
Self-contained underwater breathing apparatus (SCUBA)	Open-circuit diving equipment that supplies the diver with breathing gas from the cylinder(s) carried by the diver.
Surface-supplied breathing apparatus (SSBA)	Diving equipment that supplies breathing gas at the required pressure for the depth, through a diver's hose to a diver from plant at the surface.
Underwater diving work	Means work conducted underwater while breathing compressed gas

15.0 Reference Documentation

TEC Procedures:

- CORP MAN 06 Risk Management Procedure
- CORP-PTW-01 Permit To Work Procedure
- OHS PROC 06 Safety Risk Management
- OHS PROC 12 Personal Protective Equipment
- OHS PROC 18 Safe Working in a Confined Space

TEC Forms:

- Diving work risk management checklist - TEC Form (T-1757)
- Diver's Record of Dive – TEC Form (T-1763)
- Record of Dive - TEC Form (T-1764)
- JSEA Form (T-1022)
- Injury/Illness report Form (T-1037)
- HSEQ Incident report Form (T-1039)

Legislation and Standards:

- Queensland Workplace Health and Safety Act 1995
- Queensland Workplace Health and Safety Regulation 2008
- Occupational Diving Work Code of Practice 2005
- AS/NZS 2299.1:2007 Occupational Diving Operations Part 1: Standard Operational Practice

16.0 Revision Timeframe

This document is required to be reviewed, as a minimum;

- Every 3 years; or
- As a result of any significant legislative or corporate change, or
- As result of an audit

17.0 Revision History

Rev. No.	Rev. Date	Revision Description	Author	Approv. By
0	29.12.2010	New Procedure.	T. Young	J Judge

Appendix 1 – Diving Work Risk Management Checklist

This checklist is to be used by TEC when reviewing an occupational diving company's risk management systems to ensure that they meet the requirements under the **Workplace Health and Safety Regulation 2008** and **Occupational Diving Work Code of Practice 2005**.

General requirements for Underwater Diving Work	
1. Does the company hold an original or copy of a certificate of medical fitness to dive that appears to be current (not more than one year old) for each of its divers? Note: the work the diver is to do must not be contrary to any limitations on diving stated in the certificate.	<input type="checkbox"/> YES
2. Does the company hold proof that all of their divers are competent for occupational diving work? A person described in any of the following sections of the <i>Workplace Health and Safety Regulation 2008</i> is a competent person for underwater diving work other than construction diving work: (a) section 154 (b) section 155(1) or (2) (c) section 156 (d) section 157	<input type="checkbox"/> YES
3. Does the company have documented diving work procedures that incorporate control measures? This should take the form of an appropriate diving operations manual that addresses the items suggested in AS/NZS 2299.1 Appendix E.	<input type="checkbox"/> YES
4. Does the company carry out a documented risk assessment process that is detailed in the diving operations manual?	<input type="checkbox"/> YES
5. Is the risk assessment process carried out by a competent person for the underwater diving work before work starts?	<input type="checkbox"/> YES
6. Does the risk assessment process: (a) identify the hazards associated with the work (b) assess the risk of death, illness or injury that may result because of the hazards (c) decide on and implement control measures to prevent, or minimise the level of, exposure to the risks.	<input type="checkbox"/> YES
7. Does the assessment of risk take into account: (a) the level of competence in underwater diving of the person who is to do the work (b) each factor mentioned in AS/NZS 2299, part 1, appendix D, paragraph D2.4.	<input type="checkbox"/> YES
8. In deciding on the control measures, is the hierarchy of control measures (as detailed in AS/NZS 2299, part 1, appendix D, paragraph D3.2(a) to (f)) taken into account?	<input type="checkbox"/> YES
9. Does the company ensure that the risk assessment process is carried out again if there is significant change in the way the work is to be done from the way the underwater diving work was to be done when the process was last carried out for the work? Or if there is a significant adverse change in the environmental conditions affecting the diving from the conditions prevailing when the process was last carried out for the work?	<input type="checkbox"/> YES

General requirements for Underwater Diving Work (cont'd)	
<p>10. Does the company ensure that a written record is made of the following before the underwater diving work is started or restarted or is allowed to start or restart:</p> <ul style="list-style-type: none"> (a) the date the risk assessment process is carried out (b) the date the work is to start or restart and end (c) the work (d) the location of the dive site (e) the name of each person at the dive site who will be involved in the work (f) each hazard identified (g) for each hazard identified—the assessment of the risk of death, illness or injury that may result because of the hazard (h) each control measure decided on. 	<input type="checkbox"/> YES
<p>11. Does the company have a process in place to monitor and review the effectiveness of control measures?</p>	<input type="checkbox"/> YES
<p>12. Have all divers doing underwater diving work read and understood the risk assessment record and signed an acknowledgement, on the record, that they have read the record?</p>	<input type="checkbox"/> YES
<p>13. Is a dive safety log kept about each dive done?</p>	<input type="checkbox"/> YES
<p>14. Does the dive safety log state the following information?</p> <ul style="list-style-type: none"> (a) the diver's name (b) the name of any diver with whom the dive is done (c) the name of any dive supervisor (d) the date and location of the dive (e) time in (f) time out (g) maximum depth of the dive (h) any incident, problem, discomfort or injury experienced or suffered by the diver (i) if the dive was done using a dive computer—the dive time (j) if the dive was done using dive tables—the repetitive dive group, if available, and either bottom time or dive time (k) if the repetitive dive group and surface interval result in a repetitive factor—the surface interval and the repetitive factor. 	<input type="checkbox"/> YES
<p>15. Does the dive safety log state the following <i>additional</i> information if required?</p> <p>If the underwater diving work is done using EANx, the dive safety log must also state the following information:</p> <ul style="list-style-type: none"> (a) oxygen content of the EANx (b) maximum operating depth for the EANx. <p>If the underwater diving work is done using mixed gas, the dive safety log must also state the following information:</p> <ul style="list-style-type: none"> (a) oxygen content and nitrogen content, if any, of the mixed gas (b) maximum operating depth for the mixed gas (c) minimum operating depth of the bottom mix. 	<input type="checkbox"/> YES <input type="checkbox"/> Not applicable
<p>16. Do divers verify their return from a dive by signing the dive safety log entry for the diver, or if the log is kept electronically—by entering in the log entry the name of, and a unique identifier for, the diver?</p>	<input type="checkbox"/> YES
<p>17. Does another person verify that the diver has signed the dive safety log on their return from a dive by signing the log entry?</p>	<input type="checkbox"/> YES
<p>18. Are dive safety logs kept for at least 1 year after the last entry in it is made?</p>	<input type="checkbox"/> YES

<i>Additional requirements for Construction Diving Work</i>	
19. Do all divers (including dive supervisor and stand-by diver) hold an original or copy of an ADAS diving certificate?	<input type="checkbox"/> YES
20. Has someone been appointed as the dive supervisor for the work or for the dive site where the work is to be done?	<input type="checkbox"/> YES
21. Will the dive supervisor personally supervise the work from a position out of the water at the dive site?	<input type="checkbox"/> YES
22. Can the dive supervisor communicate directly with each diver being supervised?	<input type="checkbox"/> YES
23. Has someone been appointed as stand-by diver for the work or for the dive site where the work is to be done (this person cannot be the dive supervisor)?	<input type="checkbox"/> YES
24. Will the stand-by diver be out of the water; be under the supervision of the dive supervisor; and be fully equipped and otherwise ready to dive to go to the rescue of the diver doing the work? OR	<input type="checkbox"/> YES <input type="checkbox"/> NO (go to 25).
25. Will the stand-by diver be 1 of only 2 divers who are under the water and under the supervision of the same dive supervisor; and each diver can clearly see the other diver; and can immediately go to the rescue of the other diver; and must not be substantially obstructed from reaching the other diver?	<input type="checkbox"/> YES <input type="checkbox"/> NO (go to 27).
26. Will restricted diving work be undertaken? Restricted diving work means construction diving work— (a) at a depth of over 30m; or (b) requiring a decompression stop.	<input type="checkbox"/> YES (go to 27). <input type="checkbox"/> NO (go to 29).
27. Will an operational recompression chamber be at, or within 5 minutes of, the dive site?	<input type="checkbox"/> YES
28. Will a person who holds an ADAS diving certificate be available to operate the chamber? The ADAS diving certificate must be for the category — (a) air diving to 50m (AS 2815, part 3); or (b) bell diving (AS 2815, part 4).	<input type="checkbox"/> YES
29. It is prohibited to do construction diving work in any of the circumstances listed below: Using open circuit scuba: a) be at a depth of over 30m; or b) use a tool powered by anything other than a person; or c) be doing work requiring a decompression stop; or d) be at risk of being injured or trapped as a result of anyone's use of mechanical lifting equipment or a buoyancy lifting device; or e) be underneath something that would require the diver to move sideways, other than at an upwards angle, if the diver were to attempt to ascend. Using SSBA supplying compressed air: a) do construction diving work at a depth of over 50m	<input type="checkbox"/> The contractor is aware of their obligations not to undertake prohibited diving work.
Comments:	

Checklist completed by:.....

Signed:.....

Dated:.....