IMCA

The International Marine Contractors Association

Emergency Procedures: Provisions to be Included for Diving Bell Recovery

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AODC 019 Rev. 1
April 1996

Emergency Procedures - Provisions to be Included for Diving Bell Recovery

1 OBJECTIVE

1.1 The objective is to provide guidance to be used in the preparation of emergency procedures to assist the recovery of diving bells in an emergency by providing:

a) an "aide memoir" for contractors of items which must be addressed before a contract is mobilised, together with a reference to the relevant source;

b) any additional information of which the contractor should take account.

1.2 Detailed criteria and equipment parameters are covered in the 1995 revision of the DESIGN document (Ref. 1), against which a diving system should be audited, and the relevant requirements of which are included in emergency procedures. This information is, therefore, not repeated here.

NOTE: A diving bell is any compression chamber which is capable of being manned and is used or designed for use under the surface of water in supporting human life at a pressure greater than atmospheric pressure during normal operation.

2 APPLICATION

2.1 This guidance is applicable in any geographic area in addition to national regulations which must always be adhered to. It supersedes the original Guidance Note published in 1984 which is now withdrawn.

2.2 Relevant Norwegian regulations are given at Ref. 2.

3 EMERGENCY PROCEDURES AND PREPAREDNESS

Diving contractors must have procedures for emergency bell recovery applicable to each diving operation. These must be understood by the Diving Supervisor, who is responsible for emergency recovery operations, all other members of the diving team and personnel who may participate in such operations. Suitable familiarisation and training should be given. Relevant sections of these must be provided in the bell for divers' use, suitably protected against moisture or damage.

Whilst emergency procedures must always be available, the aim should be to preclude the need for emergency recovery.

The procedures should address, but not be restricted to the following.

3.1 Emergency Breathing Gas

AODC 052 (Ref. 1) Section 1, and AODC 014 (Ref. 3) apply.

3.2 Diver Emergency Heating

AODC 052(Ref. 1) Section 1 applies. It should be borne in mind that in an oxygen-helium environment, the ambient temperature may be as low as 5°C.

3.3 Emergency Connections

AODC 052 (Ref. 1) Section 2 applies. (At the time of writing provision of these connections is under review by the IMO).

Provision should also be made for adjustment of the bell pressure where necessary during an emergency.

3.4 Through-water Communications

AODC 052 (Ref. 1) Sections 1 and 5 apply. A procedure for testing on the surface and prior to each bell run is given in Guidance Note IMCA D 008

3.4.1 It should be borne in mind that outside interference from dynamic positioning systems, topside machinery and other acoustic sources can cause interference.

3.4.2 In order to avoid possible problems due to incompatibility of systems supplied by different manufacturers, it is recommended that where practical to do so the topside unit should be readily removable for transportation to another vessel or location in an emergency.

3.5 Checklist of Valves to be Operated in an Emergency

AODC 052 (Ref. 1) Sections 1 and 5 apply. This is to be available in both dive control and the diving bell.

3.6 AODC Tapping Code

AODC 052 (Ref. 1) Section 1 and Ref. 5 apply (a copy of the latter is attached at Appendix III). This is to be kept in dive control and affixed to the inside and outside of the diving bell..

3.7 Survival inside a Stricken Bell

See para 8.

4 BELL RELOCATION DEVICES

4.1 Acoustic transponders, interrogator/receivers and strobe lights are to be installed in line with AODC 052 (Ref. 1) Section 2. The specification for the acoustic transponder and the Diver Operated Interrogation/receiver, are attached at Appendices I & II respectively.

4.2 At installations **NOT** capable of being involved in a rescue, each contractor must provide a means of checking the functioning of the acoustic transponder at appropriate intervals in compliance with their procedures and in line with manufacturer's recommendations.

5 SECONDARY RECOVERY

The criteria governing the status of the secondary system are addressed in AODC 052 (Ref. 1), Section 3.

5.1 Where guide wires are attached to a fixed structure underwater and the system is used without the use of a weight, consideration should be given to at least one of the wires being fitted with a "weak link" that will break if a sufficient load is applied. A method should be available of preventing the wire from pulling free from the bell to allow recovery of the bell to air diving range.

5.2 Whether or not the umbilical and its handling system have been designed for secondary recovery, there is a significant likelihood of damage to the umbilical if used for this purpose. This method should, therefore, only be used if other methods are unavailable.

5.3 Where ballast release and buoyant ascent is specified as a means of secondary recovery, the considerations governing its use and the configuration of the ballast release system, should conform to the guidance given in AODC 061 (Ref. 4); AODC 052 (Ref. 1) Section 3 also applies.

Surface craft should be cleared from the rescue area (other than in an extreme emergency) and an agreed time specified that should elapse before the bell starts the ascent. This is particularly important in the event of communications failure. "See also para 8.4".

6 ROV INTERVENTION

An ROV may be used to assist emergency recovery. This may be on an 'ad hoc' basis where a vehicle may be readily available in the vicinity of the diving operation. Where use of an ROV is specified in emergency procedures, however, the latter will specify the role in which it is intended to be used, in which case appropriate equipment must be available where necessary.

7 ADDITIONAL EQUIPMENT/FACILITIES TO BE PROVIDED

7.1 Diving Bell.

7.1.1 Provision should be made for disconnecting the bell wire and guide wires in the event that this becomes necessary.

7.1.2 When the bell is working at an intermediate depth consideration should be given to the operating position of the door so as to prevent flooding of the bell in the event of an uncontrolled descent.

7.2 Dive Control

An up-to-date photographic record and/or drawings should be available of the diving bell clearly indicating its features. In the event of an emergency, these records should be made available to whoever is in charge of the rescue.

8 INSTRUCTIONS TO DIVERS ON SURVIVAL INSIDE A STRICKEN BELL

Emergency procedures provided in the bell should include instructions for divers on the precise actions to be taken by them should they become trapped inside a stricken bell. Every diver should be aware of their location and content. The instructions should include the following general guidance suitably amplified or amended by individual contractors to take account of their specific equipment.

8.1 The efficiency of passive thermal protection systems is totally dependent on their correct use. They should not be donned too early in the emergency when the bell internal atmosphere is still warm or else heavy sweating can occur leading to dampness and cold. Once the suits have been put on they should not be opened up unless absolutely necessary, as every slight opening can cause significant heat loss.

8.2 Due to the enormous loss of body heat which would ensue, no attempt should be made to lock out of a stricken bell unless instructed to do so by the Diving Supervisor either directly, or via the rescue divers as per the tapping code (Ref. 5 and Appendix III).

8.3 In the few locations which exist where bells are deployed in warm water, an assessment should be carried out locally on how to prevent the divers becoming overheated, and adequate provision made.

8.4 Divers should ensure they are attached to whichever system of safety restraint is provided to maximise their safety during ascent and prevent blockage of the bell hatch in the event of unconsciousness.

8.5 Ballast weights, where fitted, should not be released unless diver(s) are instructed to do so by the Diving Supervisor either directly, or via the rescue divers or in accordance with existing emergency procedures, as per the tapping code (Ref. 5 and Appendix III).

REFERENCES

It is incumbent upon all parties to ensure they use the most recent revision of any document.

1. "Diving Equipment Systems Inspection Guidance Note", (DESIGN) AODC 052 Offshore Diving Operations; Vol. II: Offshore Diving Operations in the UK Sector of the NWECS.

2. "Regulations concerning manned underwater operations in the petroleum activity", NPD.

3. "Minimum Quantities of Gas Required Offshore", AODC 014.

4. "Bell Ballast Release Systems and Buoyant Ascent in Offshore Diving Operations", AODC 061.

5. "Emergency Bell Tapping Code" (plastic cards), available from IMCA.

Appendix I

Transponder Specification

A pressure housing capable of operating to at least 200 metres

Common emergency reply frequency 37.5 KHZ

Individual interrogation frequencies:

Channel A	38.5 KHZ ± 50 HZ
Channel B	39.5 KHZ ± 50 HZ

Receive sensitivity + 15 DB RE 1 Microbar

Minimum interrogation pulse width 4 MS

Turnaround delay 125.7 ± 0.2 MS

Reply pulse width 4 MS ± 0.5 MS

Reply frequency 37.5 KHZ ± 50 HZ

Maximum interrogation rate:

More than 20% of battery life remaining	Once per second
Less than 20% of battery life remaining	Once per 2 seconds

Minimum transponder output power 85 DB RE 1 Microbar at 1 metre

Minimum transducer polar diagram -6 DB at ± 135°
solid angle centred on xponder
vertical axis

Minimum listening life in water 10 weeks
Minimum battery life replying at 85 DB 5 days

Diver Held Interrogator/Receiver

A pressure housing capable of operating to at least 200 metres with pistol grip and compass. This is to be compatible with the transponders available on all other diving bells.

Front end	-	to contain the directional hydrophone array
Rear end	-	to contain the digit-led display readout calibrated in metres
Controls	-	on/off receiver gain
	-	channel selection

Common emergency reply frequency 37.5 KHZ

Individual interrogation frequencies:

Channel A	38.5 KHZ
Channel B	39.5 KHZ

Minimum transmitter output power 85 DB RE 1 microbar at 1 metre

Transmit pulse 4 milliseconds

Directivity ± 15 degrees

Capability to zero range on transponder:

Minimum detectable range 500 metres

Bell Emergency Communication

For use between the crew of a lost craft and rescue divers

Code	Situation
3.3.3	Communication opening procedure (inside & outside)
1	Yes or affirmative or agreed
3	No or negative or disagreed
2.2	Repeat please
2	Stop
5	Have you got a seal?
6	Stand by to be pulled up
1.2.1.2.	Get ready for through water transfer (open your hatch)
2.3.2.3.	You will NOT release your ballast
4.4	Do release your ballast in 30 minutes from now
1.2.3.	DO increase your pressure
3.3.3	Communication closing procedure (inside & outside)