Diving Equipment Systems Inspection Guidance Note

DESIGN for Saturation (Bell) Diving Systems

International Marine Contractors Association

www.imca-int.com

IMCA D 024 Rev. 2
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The International Marine Contractors Association (IMCA) is the international trade association representing offshore, marine and underwater engineering companies.

IMCA promotes improvements in quality, health, safety, environmental and technical standards through the publication of information notes, codes of practice and by other appropriate means.

Members are self-regulating through the adoption of IMCA guidelines as appropriate. They commit to act as responsible members by following relevant guidelines and being willing to be audited against compliance with them by their clients.

There are two core activities that relate to all members:

- Competence & Training
- Safety, Environment & Legislation

The Association is organised through four distinct divisions, each covering a specific area of members' interests: Diving, Marine, Offshore Survey, Remote Systems & ROV.

There are also five regional sections which facilitate work on issues affecting members in their local geographic area – Asia-Pacific, Central & North America, Europe & Africa, Middle East & India and South America.

IMCA D 024 Rev. 2

IMCA D 024 has been updated to align the document with IMCA D 018, D 023 and D 053. Section 15 has now been split into four sub-sections and section 16 on life support packages has been added.

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The information contained herein is given for guidance only and endeavours to reflect best industry practice. For the avoidance of doubt no legal liability shall attach to any guidance and/or recommendation and/or statement herein contained.

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DESIGN for Saturation Diving Systems (Bell)

IMCA D 024 Rev. 2 – July 2014

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1 Introduction

1.1 Background

In the early 1980s, in order to give some guidance to the offshore industry, IMCA's predecessor the Association of Offshore Diving Contractors (AODC) started to produce a number of reference documents, standards and guidance notes. This process continued through the 1980s. It was clear, however, that there was still considerable confusion with some diving systems being 'audited' several times a year by different clients, each of whose representatives had slightly different interpretations as to what was required.

AODC published document reference AODC 052 – *Diving Equipment Systems Inspection Guidance Note (DESIGN)* – in February 1989 that sought to clarify any interpretations necessary and to identify a common standard that could be applied by all parties during an inspection. It was intended for use offshore in the UK sector of the North Sea but in the absence of other guidance it became a standard reference in many parts of the world, particularly where there were no specific national regulations.

Subsequently AODC expanded and revised the document which was re-issued as Rev. 1 in February 1995. This more comprehensive document covered both air and saturation diving systems. It was still based on the requirements of the UK sector of the North Sea but was adopted by many clients and diving contractors world-wide. Some users, however, found it to be complex and difficult to use.

With the increasingly international nature of the offshore diving industry, IMCA revised AODC 052 Rev. 1 in order to simplify it, clarify any anomalies which had shown up and adapt it for international use, rather than restrict it to North Sea use. It was also decided to split it into separate documents, one for surface diving (IMCA D 023 published 2000) and the other for saturation diving (IMCA D 024 published 2001). Subsequently documents were issued in 2006 for surface supplied mixed gas diving (IMCA D 037) and mobile/portable surface supplied diving (IMCA D 040).

IMCA D 024 for saturation diving systems was revised and updated to Rev. 1 in 2013 and to Rev. 2 in 2014. At that time it was recognised that it was no longer adequate to simply have a small section in this document to cover hyperbaric evacuation.

The latest revision includes updated sections for the hyperbaric rescue unit, its launch system and its interfaces with the saturation diving system as well as the life support package (LSP).

It was recognised that any hyperbaric reception facility (HRF) forming part of the hyperbaric evacuation system (HES) would be likely to be in a different physical location to the equipment covered by IMCA D 024 and would thus need a separate DESIGN document (IMCA D 053).

1.2 Current Version of IMCA D 024

IMCA D 024 for saturation diving systems has now been revised and updated to incorporate equipment improvements and changed operating practices since its first publication in 2001 as well as expanding the sections for the hyperbaric rescue unit, its launch system and its interfaces with the saturation diving system. There is also a new section for the life support package (LSP). The format has also been changed slightly to improve ease of use and provide better referencing.

It is intended that this document should be used in conjunction with IMCA D 018 – *Code of practice on the initial and periodic examination, testing and certification of diving plant and equipment.* Cross-references to this Code are provided where appropriate (see 6.5.2).

1.3 Status of the Document

This document offers examples of good practice. It gives advice on aspects of a saturation diving system that should be configured in certain ways in order to provide a safer system of working. It also identifies how inspection and testing can be carried out safely and efficiently.

The document has no direct legal status but many courts, in the absence of specific local regulations, would accept that a company carrying out diving operations in line with the recommendations of this document was using safe and accepted practices.

Any company which wishes to do so is free to carry out its operations in ways which do not comply with the recommendations in this document but in the event of an accident or incident it may be asked to demonstrate that the methods or practices that it used were at least as safe as if it had followed the advice of this document.

It is also recognised that other Codes or standards exist. In the absence of specific local regulations, companies carrying out diving operations are free to use this IMCA document or any other suitable standard as the basis for their activities.

1.4 Work Covered by the Document

This document addresses various aspects of a saturation diving system as utilised within the offshore diving industry.

The aim of the document is to provide a comprehensive reference source addressing the philosophy of what equipment and layout is required for a safe saturation diving operation plus the examination, test and certification requirements necessary to meet agreed industry practice. This will apply anywhere in the world being:

- outside the territorial waters of most countries (normally 12 miles or 19.25 kilometres from shore);

OR

- inside territorial waters where offshore diving, normally in support of the oil & gas or renewable/ alternative energy industries, is being carried out. Specifically excluded are diving operations being conducted in support of civil, inland, inshore or harbour works or in any case where operations are not conducted from an offshore structure, vessel or floating structure normally associated with offshore oil & gas or renewable/alternative energy industry activities.

This document is intended to assist the following, among others:

- manufacturers and suppliers of diving plant and equipment;
- diving contractors commissioning new build diving systems;
- personnel involved in diving operations;
- vessel owners and marine crews involved with diving operations;
- staff involved in the maintenance, repair, testing or certification of plant and equipment;
- client and contractor representatives;
- diving system auditors;
- all personnel involved in quality assurance (QA) and safety;
- concession holders or operators who have a duty of care.

IMCA has included recommendations in areas where there is a difficult balance between commercial considerations and safety implications. It is recognised however that safety must never be compromised for any reason.

1.5 National and Other Regulations

A number of countries in the world have national regulations that apply to offshore diving operations taking place within waters controlled by that country. In such cases national regulations MUST take precedence over this document and the contents of this document should be used only where they do not conflict with the relevant national regulations.

Any person carrying out offshore diving operations should establish whether there are any national regulations applying in the area where diving will take place, remembering that a number of countries have regulations which apply anywhere in the world to diving taking place from vessels registered in that country (the flag state).

There may also be international regulations, codes or standards (such as International Maritime Organization (IMO) documents) that diving contractors either have to comply with or take serious note of.

1.6 Layout of Document

The information is presented in the form of detail sheets, each of which specifies the requirements for a generic item of plant or equipment, or a group of items, which are covered by the same criteria.

The testing requirements identified will normally correspond with the certification that the diving contractor maintains in a plant and equipment register, or records in the planned maintenance system.

Only generic items of diving plant and equipment are addressed and the detail sheets do not include information on constituent parts of ancillary equipment.

1.7 Implementation

Very little contained in this document is new, rather it recognises changes in good practice which have evolved over the years and thus it should be possible to implement the requirements of this document soon after publication.

There are some areas (such as common interfaces) that may not exist at the time of publication of this document and in such cases the document identifies that only equipment manufactured after certain dates need meet these requirements in full.

1.8 Updating Arrangements

This document is a dynamic document and the advice given in the published version will be reviewed periodically by IMCA and any necessary improvements incorporated, in the light of further experience gained. Any person with suggested improvements is invited to forward these, in writing, to IMCA (imca@imca-int.com).

1.9 Classification Societies

A number of classification societies publish rules for diving equipment. These normally require similar standards to this document; however it needs to be understood that the requirements of a particular classification society may not be the same as the requirements of this document. Compliance with one does not mean automatic compliance with the other.

1.10 Use of the Completed Document

A completed and up to date version of this document should be available for a saturation diving system prior to diving operations commencing.

The relevant item line in the document then needs to be updated each time a test becomes due or when a replacement certificate is issued.

It is intended that the overall document for a particular saturation diving system will be re-completed no more frequently than annually (unless the system is moved from one vessel to another, for example) and that at other times, such as a change of client or jurisdictional location, all that is normally required is a check on the completed document, possibly supported by a small number of spot checks of equipment or certificates.

1.11 Annual Auditing of Diving Systems

IMCA guidance document IMCA D 011 – *Annual auditing of diving systems* – explains how IMCA's DESIGN audit documents can be used as the basis for an annual audit.

2 List of Acronyms

Note: The Glossary (Appendix 2) of IMCA D 052 gives the meaning of the phrases below that are specific to hyperbaric evacuation.

AODC	Association of Offshore Diving Contractors
ASME	American Society of Mechanical Engineers
BA	Breathing apparatus
BIBS	Built-in breathing system
CCTV	Closed circuit television
DESIGN	Diving Equipment Systems Inspection Guidance Note
DMAC	Diving Medical Advisory Committee
DP	Dynamic positioning
ECU	Environmental control unit
FMEA	Failure modes and effects analysis
fsw	Feet of seawater
HAZOP	Hazard and operability study
HES	Hyperbaric evacuation system
HP	High pressure
HRF	Hyperbaric reception facility
HRU	Hyperbaric rescue unit
IMCA	International Marine Contractors Association
IMO	International Maritime Organization
LP	Low pressure
LSP	Life support package
msw	Metres of seawater
NDE	Non-destructive examination
PDF	Portable document format
PMS	Planned maintenance system
PPE	Personal protective equipment
PRV	Pressure relief valve
psi	pounds per square inch
PVHO	Pressure vessels for human occupancy
QA	Quality assurance
RA	Risk assessment
ROV	Remotely operated vehicle
SPHL	Self-propelled hyperbaric lifeboat
SWL	Safe working load
UPS	Uninterruptible power supply

3 The Competent Person

3.1 General

From the inception of occupational health and safety law, there has existed the problem of how to apply constraints that are sufficient to protect persons at work but that are not so restrictive as to render them impracticable. For any given activity the level of risk can vary widely according to individual circumstances and, in many situations, it would be unnecessarily burdensome to apply the same limitations to operations at the lower end of the risk scale as for those at the higher end. This is very much the case in the field of diving equipment, plant and components.

Over the years legislators have evolved the concept of 'The Competent Person' to allow a flexible response according to the prevailing circumstances. There are many examples of its use in health and safety legislation.

Legally, the term 'competent person' can refer to an individual, partnership, company or other form of organisation.

3.2 Application of the Philosophy of 'The Competent Person'

In the field of plant and equipment examination, test and certification, the alternative to using the concept of the competent person would be to specify precisely the qualifications, training and experience of persons undertaking any of these tasks, as well as exactly what has to be done on each occasion.

The difficulty of drawing up such detailed requirements would lead to a grave mismatch between the written requirements and what is required to secure adequate health and safety. In addition the end result would lack the flexibility to allow work to continue broadly in the form in which it is known today. The concept of the competent person avoids this problem.

The normally accepted definition of a competent person, with regard to plant and equipment examination and test (rather than someone involved with maintenance), is:

"Someone who by virtue of their training or experience, or a combination of both, has such practical and theoretical knowledge and actual experience of the plant which has to be examined or tested as will enable him to detect defects or weaknesses which it is the purpose of the examination or test to discover and to assess their importance in relation to the safety of the plant."

The competent person should have the maturity to seek such specialist advice and assistance as may be required to enable him to make necessary judgements and must be a sound judge of the extent to which he can accept the supporting opinions of other specialists.

3.3 Types of Competent Person

In some cases this document requires the competent person to satisfy themselves that the design or construction of diving plant and equipment makes it suitable for use. That requires a high level of diving expertise which will involve persons with a detailed knowledge of diving techniques and practices and the environment in which the plant will be used.

Other parts of the Code require a competent person to issue a certificate lasting for a period stating that the plant or equipment has been examined and tested and may be safely used. The competent person for these purposes should specialise in relevant aspects of the work and may be an employee of an independent company or an employee of the owner of the equipment, unless a specific legal requirement says this can not be the case. If employed by the owner of the equipment, however, his duties should include this type of work on a regular basis, and his responsibilities enable him to act independently and in a professional manner.

The competent person should also be active in his trade or profession and be capable of making an independent judgement on the safety of what is being tested or examined or the activity that is being supervised.

For the more straightforward tests or examinations, this level of competence would normally be met by a technician specialising in this type of work (IMCA D 018 category 2) and in some cases may be met by the diving supervisor or the life support supervisor (IMCA D 018 category 1). For more complex tests and examinations the competent person may require to possess specific academic or trade qualifications or to have access to specialised equipment (IMCA D 018 categories 3 and 4).

There are some circumstances, however, where diving plant and equipment is owned by the owner of an offshore installation or diving support vessel and national regulations may require that examination and testing of specific items such as pressure vessels, lifting appliances and other parts of the diving equipment is to be carried out by a competent person who is neither the owner of the installation nor his employee.

3.4 Categories of Competent Person

IMCA D 018 identifies in detail the various categories of competent person who are able to issue certificates confirming that plant and equipment has been examined and tested in line with the recommendations contained therein.

IMCA issues guidance on the assessment of competence, particularly for Category 1 and 2 personnel (IMCA C 003 – *Guidance document and competence tables: Diving Division*).

3.5 Appointment of a Competent Person

No official body appoints competent persons for the purpose of examining and testing diving plant and equipment. This is entirely a matter to be decided by the person or organisation that wishes to obtain the certification. The competence of any particular individual or organisation may, however, be challenged by any relevant national authority in its enforcement role.

3.6 Completing this Document

The completion of this document may be carried out by more than one person. In that case each person should be knowledgeable and experienced in the areas which they are completing.

The document may be completed entirely by employees of the owner of the diving plant or equipment or may be completed entirely by a specialist working for a client or third party. It may also be a combination of these. If the person completing the document is an employee of the diving contractor then they would normally have no involvement in the day to day operation of that particular diving system.

In all cases the person(s) completing the document should have the necessary competence to form sensible judgements on the matters contained within it.

4 Responsibilities

4.1 The Diving Contractor

The diving contractor is required to ensure that all plant and equipment necessary for the safe conduct of a diving operation is available for immediate use. This also applies to all facilities provided on a standby or reserve basis which should also be available for immediate use.

In both cases this means that the items need to be examined, tested and certified as suitable for use as necessary.

It is normally the responsibility of the diving contractor to ensure that a complete copy of this document is prepared for any individual diving system and is updated at regular intervals (normally as each certificate is renewed).

4.2 The Person Completing this Document

The person completing this document has two main areas of responsibility:

Firstly he must satisfy himself that he has the necessary knowledge and experience and is indeed competent to carry out the checks, examinations and tasks that he is being asked to do.

Secondly he must carry out his duties diligently and thoroughly. His decisions can have serious safety implications for those who subsequently use the equipment or plant as they are heavily reliant on the person completing this document identifying any faults, omissions or problems.

More detailed guidance on the system of auditing, types of auditors, etc. is contained in IMCA D 011.

5 Planned Maintenance Systems (PMS)

5.1 General

It is a basic requirement that plant and equipment used in diving operations must be properly maintained in order to ensure that it is safe while being used. Whilst this document does not specify what sort of planned maintenance programme should be employed to ensure conformance, experience has shown that such a system is the best way to achieve systematic and effective maintenance.

It needs to be understood that PMS refers to the regular and planned maintenance of items of equipment and not just to their inspection, testing and certification – although this may also be required as part of the PMS.

5.2 Planned Maintenance Programmes

These may be prepared in different formats such as:

- a series of notebooks or files etc., one being provided for each major item of equipment or for assemblies of equipment;
- a computer program, backed up by a hard or non-corruptible copy. The intent of this is to ensure that it is impossible to erase all of the records inadvertently;
- a card index system.

Whichever system is used provision must be made for the following:

- inclusion of manufacturers' recommendations and manuals, where appropriate;
- compliance with the requirements of this document where some types of certification are achieved by means of the PMS;
- a record of planned work to be kept showing each item of maintenance and the interval at which it should be maintained, i.e. daily, weekly, monthly, yearly, etc.;
- a record of unplanned work, including repairs;
- traceability to the person who carried out the work as recorded on an item of equipment whether manual or computer systems are employed;
- records to be kept logically. There should be no doubt on which day maintenance has been carried out and by whom;
- ensuring that maintenance which has been delayed on a particular piece of equipment for any reason, is carried out at the first available opportunity to avoid a hazardous situation arising;
- availability of adequate spares to permit routine and non-routine replacement as necessary.

5.3 Relevance of PMS

While this document is not directly concerned with the planned maintenance system, it is unlikely that a diving system would be able to meet the requirements of the periodic examination, testing and certification advice contained in IMCA D 018 unless an adequate PMS existed. In this respect the PMS would normally be one of the matters considered by the person completing this document when deciding on the level of test and examination required by IMCA D 018 in relation to any specific piece of plant and equipment.

A PMS normally includes the daily/weekly/monthly examinations, tests, maintenance, etc. required for the safe and efficient on-going operation of the equipment. This will typically be based on manufacturers' recommendations and the requirements of the diving contractor's own procedures.

6 Key Features of this Document

6.1 General

Since this document is produced to give guidance and to minimise confusion, it is necessary to elaborate on a number of terms used in the document and also to explain the way in which it is intended that the document will be used.

6.2 Meaning of Terms Used

Within IMCA D 018 various terms are used extensively such as 'examination', 'visual examination', 'function test' and 'test'. Detailed explanations of what these terms mean are included within the preamble to IMCA D 018 and should be referred to by the person completing this document in order to understand what any particular certificate actually shows.

6.3 Extension of Validity Periods

This document gives maximum validity periods for each certificate. However, it is obvious that an item with a validity on the certificate of 12 months does not become unsafe at 12 months and 1 day if it was safe at 11 months and 29 days.

This document recognises that diving plant and equipment often operates in remote locations where it is difficult to carry out the required testing. This may also be the case because of operational reasons where the equipment is in constant use.

Diving contractors are encouraged to plan ahead in order that certificates can be renewed in time. If, however, due to operational circumstances, a certificate cannot be renewed within the prescribed period, then an extension of up to a MAXIMUM of 30 days can be issued if the diving or life support supervisor operating the equipment confirms, in writing, that it is operating satisfactorily and appears in good condition. Where there is one or more qualified equipment technicians, whose duties include maintaining this equipment, then they should also confirm the equipment is satisfactory before such an extension is issued.

The issue of any such extension will need to follow the diving contractor's management of change (MOC) procedures.

The person completing this document should not themselves make the decision to extend validity periods but should, if relevant, establish if a written agreement exists as described above.

It must be clearly understood that the extension period referred to here is only in respect of compliance with this document. It does not provide extension where a government regulation may prescribe validity periods nor does it vary any requirements of a classification society. Similarly an agreement by a classification society or government body to extend a validity period of their certification does not alter the requirements of this document.

Any piece of plant or equipment whose certification validity has expired (subject to the possible 30 day extension above) should not be used again until it has undergone the necessary examination and testing by a competent person as laid out in this document.

6.4 Modifications

It is clear that modifications made to items of plant and equipment during the period of validity of a certificate can have an effect on the validity of the certificate.

Since there can be many different types of modification it is not possible to give specific guidance on what will and what will not affect the certification.

Replacement of the termination on a wire rope used for man carrying will certainly require a retest and recertification whereas replacing a small fitting on an LP air line with an identical fitting would be regarded as maintenance and would not normally affect the validity of the certification.

As a guide, however, replacement of one item with an identical or near identical item would not normally require full re-certification although simple tests such as a function test would typically be required – but even this will depend on the circumstances.

As a matter of good operating practice, any modifications made to, work carried out on or replacement parts fitted to diving plant and equipment should be recorded in a formal manner (such as using a management of change procedure) and details passed to the owner's/diving contractor's onshore offices unless this is part of the routine maintenance required under the PMS when then the actions will only require to be recorded within the PMS records.

It must be left up to the competence and judgement of the person carrying out the modifications and of the supervisor using the plant or equipment after modification as to whether full or partial re-certification is considered necessary.

6.5 Layout of Detail Sheets

6.5.1 Item Column

This column gives each piece of equipment, test or item a unique number for ease of identification. These numbers have no technical significance.

6.5.2 Description Column

This gives a short description of the item for ease of identification. Where testing is required, a reference is given to the relevant section in IMCA D 018 – *Code of practice on the initial and periodic examination, testing and certification of diving plant and equipment.*

6.5.3 Requirement Column

This describes exactly what the person completing this document needs to check for each item.

6.5.4 Need Column

This identifies the importance given to each requirement.

A. This signifies that the requirement is necessary and must be met. Only in the most unusual circumstances would a diving system be considered safe to use if a requirement with an A need had not been met.

B. This also signifies a requirement which is considered as necessary but there may be other ways of meeting the requirement than the method identified in the 'Requirement' column. It is left up to the discretion of the person completing this document as to whether the requirement is being suitably met.

C. This refers to a requirement which is optional and the absence of which would still allow the diving equipment to be used safely.

6.5.5 Response Column

This is where the person completing this document will write their comments and observations. It will be used to answer any questions asked in the 'Requirement' column (see 7.4 for details).

6.5.6 Certificate Issue Date Column

Where a certificate is required, the date of its issue should be entered here. The relevant part of the column is shaded if no certificate is required.

7 Completing the Document

7.1 Electronic/Paper

The document is available in two formats, hard (paper) copy and electronically. The paper version is perfectly acceptable and may often be used during inspections and checks (see section 7.3, however, regarding detail sheet section 11).

It is anticipated, however, that most users will prepare and maintain the document electronically as it is intended that it will be a dynamic document that is regularly updated as tests and, examinations are carried out and certificates re-issued.

7.2 Format

The document is available using Microsoft® Word, making extensive use of tables and Microsoft® Excel. These optimised versions are made available for electronic completion and delivery of the document by users.

A protected PDF version of this document as-published is also available.

7.3 Variations

The document has deliberately been made as flexible as possible, particularly when used electronically. If more space is needed in the 'Response' column then it can easily be created.

If there is more than one of the same item on a particular dive system then the section or part of a section should be duplicated and repeated. This means, for example, that if there are two surface compression chambers then that section would be completed twice, once for each chamber. Similarly if there were, for example, six diving helmets, then the part on diving helmets would be completed six times within the overall section.

Detail Sheet section 11 is different from the others in that it is intended that the two columns on the right side ('Response' and 'Certificate Issue Date') should be repeated for each compressor, pump, ECU etc. This will mean extending section 11 to the right by several more columns, depending on the number of compressors, pumps etc. involved. It is therefore likely that detail sheet section 11 will require to be prepared and maintained in an electronic format.

It is recommended that items not required for a particular system are not deleted but rather are marked as 'not applicable'. This will ensure that the tables in the various sections look similar to a master copy of the blank document, which may make it easier for a subsequent person to check.

7.4 Phraseology

It is obviously a matter for the person(s) completing the document as to exactly what they wish to say in the 'Response' column but some form of explanation should be written down.

Single words or short phrases such as 'acceptable', 'suitable', 'adequate', 'yes', 'meets the requirement' or similar should not be used as these provide no useful information to anyone reading the completed document. As a minimum, enough information should be given to allow a person reading the document to understand why the person completing it considers the 'Requirement' for a particular item to have been met.

Equally, where items of plant or equipment have unique serial numbers then these should be inserted in the 'Response' column.

In recent years some persons completing this document have used a number of photographs embedded electronically in the document as well as an explanation to demonstrate compliance and assist in a subsequent review of the document by others. It is certainly not a requirement that photographs are used but it may assist in cutting down long explanations or clearly illustrating a variation, deviation, non-compliance or non-conformance.

7.5 Variations/Deviations from Requirements

The person completing this document should prepare a list identifying any items which do not fully meet the requirements of this document. This will assist in making sure these items are dealt with speedily.

If the item in question has a C in the 'Need' column then the variation/deviation does not signify a non-conformance. However if the item is present but is not correct then it should be placed on the variation/deviation list.

7.6 Close Out

To assist in subsequent checking of this document a list should be available detailing how and when any variations, deviations or non-conformances have been closed out and completed. This list should form part of the document available to any client or other interested party for checking.

8 References

The following documents are referred to in this document. Further details on all IMCA/AODC/DMAC publications and their latest revisions are available from the IMCA website (www.imca-int.com). They are available as free downloads.

Association of Offshore Diving Contractors (AODC)

AODC 019	*Emergency procedures – provisions to be included for diving bell recovery*
AODC 059	*Pressure gauges and other forms of pressure monitoring equipment used in conjunction with diving operations*
AODC 061	*Bell ballast release systems and buoyant ascent in offshore diving operations*

Diving Medical Advisory Committee (DMAC)

DMAC 15	*Medical equipment to be held at the site of an offshore diving operation*
DMAC 28	*The provision of emergency medical care for divers in saturation*

IMCA

IMCA D 002	*Battery packs in pressure housings*
IMCA D 004	*The initial and periodic examination, testing and certification of hyperbaric evacuation launch systems*
IMCA D 009	*Protective guarding of gas cylinder transport containers (quads)*
IMCA D 011	*Annual auditing of diving systems*
IMCA D 018	*Code of practice on the initial and periodic examination, testing and certification of diving plant and equipment*
IMCA D 023	*DESIGN – Diving equipment systems inspection guidance note for surface orientated (air) systems*
IMCA D 037	*DESIGN for surface supplied mixed gas diving systems*
IMCA D 039	*FMEA guide for diving systems*
IMCA D 040	*DESIGN for mobile/portable surface supplied diving systems*
IMCA D 043	*Marking and colour coding of gas cylinders, quads and banks for diving applications*
IMCA D 045	*Code of practice for the safe use of electricity under water*
IMCA D 047	*Acrylic plastic viewports*
IMCA D 050	*Minimum quantities of gas required offshore*
IMCA D 051	*Hyperbaric evacuation systems (HES) interface recommendations*
IMCA D 052	*Guidance on hyperbaric evacuation systems*
IMCA D 053	*DESIGN for the hyperbaric reception facility (HRF) forming part of a hyperbaric evacuation system (HES)*
IMCA C 003	*Guidance document and competence tables: Diving Division*
IMCA SEL 022/M 194	*Guidance on wire rope integrity management for vessels in the offshore industry*

Diving Equipment Systems Inspection Guidance Note

DESIGN for Saturation (Bell) Diving Systems

Detail Sheets

International Marine Contractors Association

www.imca-int.com

IMCA D 024 Rev. 2 – Part 2

Record of Inspections

Name of vessel/installation: .....

Brief description of diving system: .....

.....

.....

.....

Last Audit/Inspection

Carried out by: .....

Date: .....

Location: .....

Non Conformances/Points Noted	**Date Resolved**
1	.....
2	.....
3	.....
4	.....
5	.....
6	

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Section 1 – General System Safety

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**Classification**				
1.1	General	The dive system may or may not be classified by a recognised classification society. If it is classified, details should be given in the 'Response' section Note: The next two points will only apply if the dive system is classified			
1.2	Conditions	If there are any conditions attached to the classification these should be clearly identified to those operating the system	A		
1.3	Close out	Any conditions attached to classification should be closed out or have an agreed close out period with the classification society	A		
2	**System Assessment**				
2.1	General	A systematic assessment of the diving system and its sub-systems should be available confirming that the equipment provided is both adequate and fit for its intended use. This assessment should take the form of a formal risk assessment, which may consist of a detailed risk assessment, HAZOP or an FMEA (IMCA D 039 provides guidance) to provide a systematic assessment for the identification of potential failure modes, to determine their effects and to identify actions to mitigate the failures Note: The auditor is not being asked to confirm the adequacy of this assessment, only that it has been carried out	A		
3	**Procedures**				
3.1	General	Dive system operating and emergency procedures should be available at the work site. These would typically comprise generic diving procedures supplemented by project specific addendums Note: The auditor is not being asked to confirm the adequacy of these procedures, merely that they are present	A		
4	**General System Safety**				
4.1	General Access	There must be a level of access available around the diving system, and any other working areas, sufficient to allow operational personnel to safely and efficiently carry out their duties	A		
4.2	Safety of Access	Consideration shall be given to the safety of personnel operating around the dive system in terms of such things as slip and trip hazards, access steps, hand rails, etc.	B		
4.3	Signs	Safety warning signage (such as electrical hazard, use of PPE, etc.) must be clearly displayed at all relevant locations; the signage shall comply with international/national safety signs requirements	A		
4.4	Sea Fastening (Design)	All items of diving plant on board the vessel should be appropriately sea fastened and there should be supporting documentation available from a competent person attesting that the necessary calculations and checks have been completed Note: This requirement may be different for a fixed installation Note: The auditor is not being asked to confirm the adequacy of these calculations and checks, only that they have been carried out	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
4.5	Sea Fastening (Installation)	If the sea fastening required any welded fixtures then there should be NDE reports available confirming these welds were satisfactorily tested by a competent person	A		
5	**Lighting**				
5.1	General	There must be a level of lighting available at all times around the diving system and any other working areas sufficient to allow personnel to safely and efficiently carry out their duties	A		
5.2	Emergency Lighting	Automatic emergency lighting should be available in all critical areas to allow personnel to move around safely	B		
6	**Access to Water**				
6.1	Safety	The bell must be able to enter and leave the water safely and in a controlled manner. This should be possible in all normal circumstances	A		
6.2	DP Vessels	When diving from a vessel on DP, the bell access to the water must be in an area that is a suitable distance away from any thruster or other object likely to cause problems	A		
6.3	DP Thruster Diagram	A diagram of all thrusters and other obstructions must be available. There must also be a diagram available of the maximum permitted lengths of divers' umbilical for each depth for the specific dive location(s)	A		
7	**Electrical Power**				
7.1	Schematic	Diving system electrical schematics should be available at the work site	A		
7.2	Power Requirements	An assessment is required to identify the electrical power required by the whole diving system in normal operational mode, including the bell launch and recovery and diver hot water systems	A		
7.3	Diving	An assessment is required to identify the electrical power for the diving equipment needed for the safe recovery of the bell and divers to the system if the primary power fails	A		
7.4	Life Support	An assessment is required to identify the electrical power for the diving equipment needed to provide life support for the divers living in the chambers if the primary power fails	A		
7.5	Emergency Power Requirements	Any equipment identified as necessary to satisfy either of the above conditions must be able to continue operating in the event of loss of primary power. This may be by the use of batteries, stored energy (hydraulic or air power), connection to an emergency generator, etc. If a UPS is used as emergency support for low powered electrical apparatus (such as computers and monitoring equipment), an assessment should be available detailing its duration under load against the time necessary to provide emergency power	A		
7.6	Emergency Power Testing *D 018, Sheet 34*	A test should have been carried out within the last 6 months to demonstrate the functioning and adequacy of emergency electrical power supplies. The testing should include checks that power continues to be supplied in normal circumstances even if a UPS fails and that the visual indication of such failure works correctly	A		
8	**Pressure Relief Valves**				
8.1	Identification	It must be possible to identify all PRVs for the unit serial number, unit location, set pressure, reset pressure; the date last tested/due test date	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
9	**Medical Equipment**				
9.1	Provision	There should be a list in place detailing where and what type of medical equipment is available. As a minimum this should comply with the requirements of DMAC 15 and DMAC 28 (or as agreed with company medical adviser) unless local regulations prohibit any of the contents	B		
9.2	First Aid	There should be facilities available for the provision of treatment of minor injuries. This may be by means of a local first aid kit, the presence of a sick bay, platform/ship's medic or similar	B		
10	**Maintenance**				
10.1	Requirement	A system should be in place whereby all items of plant and equipment are subject to regular maintenance	A		
10.2	Schedule	A schedule should exist indicating the frequency and content of each task. This should take into account the manufacturer's instructions and it should also meet the requirement of the relevant IMCA D 018 detail sheet	A		
10.3	Records	Records (written or electronic) should be available demonstrating that the plant and equipment has been subject to regular planned maintenance	A		

Section 2 – Dive Control

If there are two diving bells and thus two dive controls, then this section will need to be completed twice, once for each dive control. This will apply even if the two dive controls are in the same compartment.

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**General**				
1.1	Location	The diving supervisor must be protected from weather and other elements (including dropped objects) which may affect his concentration. This also means he must be kept suitably warm (or cool)	A		
1.2	Access	The diving supervisor needs good access to all relevant areas of control and must be able to read all gauges and displays without difficulty	A		
1.3	Lighting	Dive control and its controls must be adequately illuminated	A		
1.4	Operating Procedures	Copies of the diving contractor's manuals and diving rules must be available in dive control Note: The auditor is not being asked to confirm the adequacy of these manuals and rules, merely that they are present	A		
1.5	Emergency Procedures	Emergency procedures must be readily available. These would typically comprise generic emergency procedures supplemented by project specific addendums Note: The auditor is not being asked to confirm the adequacy of these procedures, merely that they are present	A		
1.6	Recording Documents	Diving logs or pre-printed sheets and other relevant documentation must be available. These may be hard copy or electronic	A		
1.7	Bell Checklists	Copies of the diving bell internal and external pre-dive checklists must be available in dive control Note: The auditor is not being asked to confirm the adequacy of these manuals and rules, merely that they are present	A		
1.8	Photographs	A photographic record that clearly identifies the bell valves, internal and external, should be available in dive control to allow the supervisor to guide the divers in an emergency	B		
1.9	Surface Diving	All bell diving operations must have the capability of deploying a surface standby diver in an emergency unless a robust alternative plan (proven through exercises) has been developed to ensure assistance can be rapidly given to a stricken or fouled bell at all depths within the working range of a surface diver, including the period while the bell is close to or in a moonpool	A		
1.10	Surface Diving Equipment	If a surface standby diver is required then it is not necessary that a full surface diving system be provided but the equipment which is provided should meet the relevant sections on minimum requirements for surface diving equipment as laid out in IMCA D 023, including an appropriate launch and recovery system for a freeboard of greater than two metres Note 1: The relevant sections of IMCA D 023 should be completed as part of the audit Note 2: This diver is acting as an emergency standby diver and does not require his own standby diver or a second recovery system	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
1.11	Dynamic Positioning	If the vessel operates on DP then a diagram of all thrusters and other obstructions must be displayed in dive control. There must also be available a diagram of the maximum permitted lengths of divers' umbilical for each depth for the specific dive location(s). This should include the umbilical lengths for the emergency surface standby diver	A		
2	**Communication**				
2.1	Bridge	If diving is taking place from a vessel then there must be both primary and secondary means of communication between the diving supervisor and the bridge. The primary link must be hard wire, immediately available and unable to be interrupted. One of these links must be able to operate without the need for external power supply	A		
2.2	Control Room	If diving is taking place from a platform or other production installation then there should be both primary and secondary means of communication between dive control and the control room. One of these links must be able to operate without the need for external power supply. The primary link should be immediately available and unable to be interrupted	A		
2.3	Divers	Two-way voice communications with each diver and the standby diver (bellman) must be provided	A		
2.4	Back-Up	These facilities should be fitted with a back-up power source, such as batteries	B		
2.5	Recording	A recording system must be fitted to record all communications between divers and supervisor. There should be a means of playing back the recording after the dive in order to check satisfactory quality	A		
2.6	Back-Up	This recording system should be fed from the UPS or other system to ensure continued operation for at least 30 minutes in the event of loss of main power	A		
2.7	Retention	Provision must be made for retention of recordings for 24 hours after the dive is over	A		
2.8	Through Water	A means of through water communication must be available to allow the supervisor to talk to the divers inside the bell when it is in the water	A		
2.9	Positioning	The through water surface transducer must be arranged so that noise interference from the vessel's machinery or thrusters is minimised	A		
2.10	Sound Powered	A sound powered phone should be fitted to allow the supervisor to talk to the divers in the bell	B		
2.11	Launch & Recovery Point	The diving supervisor must have verbal communications with the winch operator. This should be dedicated and hard wired if he is remote	A		
2.12	Other Areas	The diving supervisor must have voice communication with other areas, as relevant. This may include machinery operators, deck crew, etc.	A		
2.13	Cranes	If a crane is in use in conjunction with diving operations then there must be a dedicated communications link between the diving supervisor and the crane operator. Where possible this should be hard-wire	A		
2.14	ROV	If an ROV is in use in conjunction with diving operations then there must be a dedicated hard wire communications link between the diving supervisor and the ROV operator	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
2.15	Communication Testing *D 018, Sheet 6*	All communications links must have been examined and function tested in the last 6 months, in addition to any standard pre-dive checks. Check condition of batteries (if applicable)	A		
3	**Surveillance**				
3.1	Working Areas	The diving supervisor must be able to see (directly or by video link) the launch/recovery area and any working areas which are appropriate	A		
3.2	ROV	If an ROV is in use in conjunction with diving operations, the diving supervisor must have a monitor in dive control showing him the same picture as the ROV operator	A		
4	**Alarms**				
4.1	DP	If diving is being carried out from a vessel operating on DP then an audible and visible alarm activated by the DP operator must be fitted in dive control to inform the supervisor of the DP status. It must be tested before each dive when operating on DP	A		
4.2	General Alarm	The vessel or installation general alarm must be linked in to dive control (or sited close by) so that the supervisor is aware of it	A		
4.3	Muting	Any audio (bell, klaxon, etc.) must be capable of being muted or cancelled if it is so noisy or obtrusive that it does not allow the supervisor to hear his other communications	A		
4.4	Reclaim	An audible and visible alarm should be fitted to the control panel to warn the supervisor of reclaim compressor malfunction	B		
4.5	Alarm Testing *D 018, Sheet 34*	Alarms must have been function tested within the last 6 months	A		
5	**Gas Supplies** – *Note: Use of the word 'gas' refers to any breathable mixture, whether air, nitrox, heliox or other mix*				
5.1	Sources	Sufficient sources of gas, of breathing quality, must be available and suitably arranged so that if the on line source to the diving bell/diver fails, an alternative source can be immediately switched on line	A		
6	**Monitoring**				
6.1	Oxygen	There must be an oxygen analyser with an audible and visible high and low alarm fitted in line on the downstream gas supply to the diver(s)	A		
6.2	Reclaim	If diver gas reclaim is being used, there must be a carbon dioxide analyser with audible and visible high level alarm fitted to the down-stream side of the diver gas supply. The adjustment of gas sample flow rate must not affect any other analyser fitted	A		
6.3	Bell Atmosphere	There must be a means by which the diving supervisor can monitor the bell atmosphere for oxygen and carbon dioxide levels. This may be by a manual procedure carried out by the bellman or by a remote reading in dive control	A		
6.4	Other monitoring	Consideration should be given to the provision of additional monitoring, such as hydrocarbons and H_2S, based on the particular conditions of the worksite following a risk assessment	C		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.5	Control Area Ambient Atmosphere	An oxygen analyser with audible and visible high and low alarm must be sited in dive control to warn occupants of any rise or fall of oxygen levels outside pre-set parameters due to gas leakage in to the area	A		
6.6	Analyser Testing *D 018, Sheet 2*	Analysers should be examined, function tested and calibrated in situ within the last 6 months	A		
7	**Gauges**				
7.1	General	The diving supervisor must have available to him enough suitable gauges so that he is aware of the depth of the diving bell, each diver and of the supply pressures of each main and secondary breathing supply	A		
7.2	Gauge Protection	A pressure limiting device may be fitted to avoid gauges being over pressurised	C		
7.3	Depth	These are gauges used to provide information for operational and decompression control. The scale must be appropriate to the duty, i.e. large enough to be read easily and accurately. They should normally operate in the range 25 to 75% of full scale deflection although they will need to operate in the 0 to 25% range if used for decompression. If used for the final stages of decompression they must have scale divisions of no more than 0.5msw/2 fsw	A		
7.4	Unit Marking	All depth gauges should be marked in the same unit system (imperial or metric). Dual scale marking is acceptable	A		
7.5	Contractor's Tables	The unit marking system of the gauges (imperial or metric) should correspond to the units used in the contractor's diving tables	A		
7.6	Digital Gauges	If the gauge is digital then the display must be large and clear enough to be read in all conditions. It must be clearly marked on the unit whether it reads in feet or metres and it should display the reading to one decimal point. (If further information is required, refer to AODC 059)	A		
7.7	Gas Supply	These are gauges that indicate pressure. They may be used for life support purposes or may only be indicating gauges. They must be positioned to show the line pressure of sources coming in to the panel and also of any supplies leaving the panel. A system must be in place to ensure that incorrect readings cannot happen in certain valve positions	A		
7.8	Scale Divisions	They must meet the requirements for depth gauges above except that they may be much smaller and with larger scale divisions. They are not calibrated as depth gauges	A		
7.9	Unit Marking	All gas source/supply gauges should be marked in the same unit system (imperial or metric). Dual scale marking is acceptable	A		
7.10	Cross-over Valves	Great care must be taken if cross-over valves are fitted with the result that any gauge can possibly read more than one thing. Cross-over valves should either be fixed in one position (the handles may be removed to avoid accidental changes) or should indicate very clearly which source they are connected to. In any event any gauge fitted with a cross-over valve must indicate very clearly at all times exactly what it is reading. This is particularly important if one gauge can show the depth of more than one diver	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
7.11	Supply Gauge Isolation	It is normal practice to have an indicating gauge showing the supply pressure to the bell/diver as the supply leaves the panel. This is a single point of failure if the gauge is dislodged or damaged. It is acceptable to fit an isolation valve to the gauge providing that: ♦ closing the valve does not interfere with the diver's supply ♦ the handle on the valve clearly indicates whether it is open or closed ♦ the handle is secured in the open position using light wire, tape or similar such that it can cannot be inadvertently closed Alternatively a flow restrictor can be fitted to limit gas losses in the event of gauge failure, instead of an isolation valve. If a flow restrictor is fitted then it should be clearly marked on the panel/schematic	B		
7.12	Gauge Calibration *D 018, Sheet 18, 19 & 20*	All gauges must have been visually examined, function tested in situ, calibrated and/or tested (as relevant) to the required accuracy in the last 6 months	A		
8	**Pipework and Valves**				
8.1	General	All valves must be free of corrosion and should operate easily	A		
8.2	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
8.3	Marking	The function of all valves must be clearly marked	A		
8.4	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn. Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		
8.5	Exhausts	Exhaust pipework must not vent into an enclosed space. Note: Panel PRVs and sampling for analysis do not constitute exhaust pipework	A		
8.6	Accessibility	Gas pipework, particularly in panels and at connection points, must be easily accessible for maintenance and repair	B		
8.7	Pipework Testing *D 018, Sheet 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
8.8		Valves and pipework need to have been visually examined in the last 6 months	A		
8.9		Valves and pipework need to have had a gas leak test to maximum working pressure in the last 2 years	A		
8.10	Relief Valves	Pressure relief valves may or may not be fitted within the control area. If they are fitted then they should comply with the testing requirements detailed below			
8.11	Relief Valve Testing *D 018, Sheet 24.3*	Visual examination in the last 6 months	A		
8.12		Function test at required relief setting followed by leak test at maximum working pressure in the last 2½ years	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
9	**Electrics**				
9.1	General	All electrical equipment must be securely installed with all power leads and wiring secured in such a way that it is protected from accidental damage	A		
9.2	Emergency Lighting	There must be sufficient self-contained emergency lighting units in dive control to allow the supervisor and any other personnel to operate safely in an emergency	A		
9.3	Hazard Signs	Electrical hazard warning signs should be displayed on all relevant panels and equipment.	B		
9.4	Safety	The electrical supply to the bell must be fitted with an earth leakage detection system and alarms in line with the requirements of IMCA D 045	A		
9.5	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
10	**Firefighting**				
10.1	Availability	Suitable firefighting arrangements must be made for dive control. This may be by means of permanent ship or platform provided equipment or by means of portable extinguishers etc. It should be capable of dealing with any type or size of foreseeable fire hazard	A		
10.2	Firefighting Testing *D 018, Sheet 15 & 16*	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		
10.3		If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
10.4		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
10.5		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
10.6		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		
11	**Hot Water Temperature**				
11.1	Display	A display must be visible to the supervisor in dive control showing the temperature of the hot water being supplied to the bell/diver	A		
11.2	Alarm	There must be an audible and visible alarm which indicates if the water temperature moves outside the pre-set limits	A		
12	**Breathing Apparatus**				
12.1	Provision	Emergency breathing apparatus fitted with communications must be available for the supervisor (and winch operator if relevant) so that he may perform his duties in a smoky or polluted atmosphere	A		
12.2	Umbilical Supply	If umbilical supplied from a compressor then the air intake for the compressor must be situated in a pollution free zone. A BA set should also be available in case of umbilical supply failure or to allow escape	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
12.3	BA Testing *D 018, Sheet 5.1 & 9.1*	Visual examination and function test (including communications) in the last 6 months. Check made at the same time that cylinder is fully charged	A		
12.4		External visual examination of cylinder plus gas leak test to maximum working pressure in the last 2½ years	A		
12.5		Internal and external visual examination of cylinder plus gas leak test to maximum working pressure in the last 5 years (possible overpressure test)	A		

Section 3 – Surface Compression Chamber

There are so many permutations of chamber types that it is impossible to give one table below which will suit all types. The table is therefore drawn up as a generic type and will need to be modified to suit the individual layout and equipment of each chamber. Where there is more than one chamber, a table should be completed for each one.

A drawing should be available showing the chamber complex general arrangement, including locks, trunkings, doors, door numbers and floodable volumes.

A pressure test procedure should be available showing the pressure boundary test sequence

Total number of chambers in dive system	Number of tables completed for surface chambers	Number of this table			Description/serial number of chamber covered by this table
			of		

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**Pressure Vessel**				
1.1	Design	The pressure vessel forming the chamber must have been designed and built to a recognised international standard and be fit for the purpose of human occupancy Note: Any unit manufactured after 1 July 2014 must also be certified to the recognised international standard Note: The design standard, serial number, date of manufacture, etc. can often be found hard stamped on a suitable part of the unit, in an accessible position	A		
1.2	Minimum Diameter	Any surface compression chamber used for saturation diving and manufactured after 1 January 2015 should have a minimum internal diameter of 72 inches if using imperial measurements or 1800 mm if using metric measurements Chambers manufactured before that date do not need to meet this size requirement	A		
1.3	Occupancy	The chamber must have a specified maximum number of occupants. This capacity will be used to establish the number of bunks, BIBS, etc. which are required	A	Number of occupants:	
1.4	Volume	It is important that the volume of each lock of the chamber is accurately known to allow gas calculations to be carried out	A	Volume of chamber:	
1.5	Chamber Testing *D 018, Sheet 25.1*	Visual examination within the last 6 months	A		
1.6		Thorough internal and external visual inspection plus a gas leak test at full working pressure in the last 2½ years	A		
1.7		Internal overpressure test within the last 5 years (or other testing as agreed by an international classification society) plus a gas leak test at full working pressure	A		
2	**Viewports**				
2.1	Condition	Viewports must be free of cracks or scratches that could affect pressure integrity	A		
2.2	Protection	Where there is a risk of damage to a viewport from dropped objects or other physical impact, then suitable protection must be provided. This may be accomplished by the installation of plastic covers (or similar) over the viewports	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
2.3	Identification	If the serial number or other identifying mark for each viewport is not visible when fitted in situ then it should be prominently marked on the outside of the chamber adjacent to each viewport	B		
2.4	Viewport Testing *D 018, Sheet 25.2*	Manufactured in accordance with recognised standard and fit for purpose. Further information in IMCA D 047	A		
2.5		Overpressure tested to 1.25 times maximum rated working pressure when new or other testing to establish structural integrity as required by the ASME PVHO standard	A		
2.6		Visual examination in situ in the last 6 months	A		
2.7		Gas leak test as an integral part of the chamber they are fitted to in the last 2½ years	A		
2.8		Internal overpressure test as an integral part of the chamber they are fitted to in the last 5 years (or other testing to establish structural integrity as required by the competent person)	A		
2.9		Complete renewal within the last 10 years. That is from the date of fabrication	A		
3	**Firefighting** – *Note: This section refers to firefighting facilities external to the chamber. Separate arrangements need to be made for inside the chamber (see 6.27 below).*				
3.1	Availability	Suitable firefighting arrangements must be made for the chamber area. This may be by means of permanent ship or platform provided equipment or by means of portable extinguishers etc. It should be capable of dealing with any type or size of foreseeable fire hazard	A		
3.2	Unmanned areas	Consideration should be given to the provision of a fire detection system in the chamber area if it is an unmanned area	C		
3.3	Firefighting Testing *D 018, Sheet 15 & 16*	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		
3.4		If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
3.5		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
3.6		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
3.7		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		
4	**Medical Equipment**				
4.1	Provision	Medical equipment must be provided to the level specified in the diving contractor's manuals and as a minimum meet the requirements of DMAC 15 (or as agreed with company medical adviser) unless local regulations prohibit any of the contents	A		
4.2	Container	The equipment should be in a suitable protective container clearly marked with a white cross on a green background	B		
4.3	Validity	The equipment must have been checked for integrity within the last 6 months with the date the next check is due clearly marked on it	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
5	**Chamber (External)**				
5.1	Paintwork	Paintwork must be in good condition and the chamber free from serious corrosion	A		
5.2	Insulation	Insulation (if fitted) should be clean and in good condition	B		
5.3	Seals	Seals on mating faces must be clean, undamaged and covered lightly in silicone grease. If the sealing area is painted then this must be in good condition	A		
5.4	External Lights	Any external light assemblies must be designed and mounted in such a way that they will not damage viewports as a result of prolonged heat. They should be in good condition	A		
5.5	Doors	All chamber doors should be marked clearly with an individual number for identification purposes	B		
5.6	Hollow Penetrators	All hollow penetrators (other than the bores of medical and equipment locks) must be fitted with protection valves or other devices to stop catastrophic pressure loss	A		
5.7	Electrical Penetrators	All electric penetrators must be certified by a competent person (IMCA D 018 category 3 or 4) as fit for purpose	A		
5.8	Penetrator Marking	All penetrators must be clearly marked to show their function	A		
5.9	Valves	Valves must be free of corrosion and should move freely through their full range of operation	A		
5.10	Valve Marking	All valves must be clearly marked with their function	A		
5.11	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		
5.12	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
5.13	Food or Equipment Locks Interlock	A safety interlock system must be fitted to the clamping mechanism securing the lock outer door. This interlock must make it impossible to open the mechanism/door if there is still pressure inside the lock and impossible to obtain a gas tight seal on the lock if the door/mechanism is not properly closed	A		
5.14	Interlock Pipework Testing *D 018, Sheets 24.1, 34*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
5.15		Visual examination and function test in the last 6 months	A		
5.16		Gas leak test at maximum working pressure of the system in the last 2 years	A		
5.17	Relief Valve	A relief valve of a suitable size should be fitted to protect the chamber and allow for venting in the event of over pressurisation	B		
5.18	Relief Valve Testing *D 018, Sheet 24.3*	Visual examination within the last 6 months	A		
5.19		Function test at required relief setting followed by leak test to maximum working pressure in the last 2½ years. Normally the leak test is carried out integral with the chamber	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
5.20	Communications	There should be two-way voice communications between the area of the outside door of any food or equipment lock and life support control	B		
5.21	Communication Testing *D 018, Sheet 6*	Examination and function test plus check condition of batteries (if applicable) in the last 6 months	A		
5.22	ECU	If an external environmental control unit with large diameter piping is fitted then it should be fitted with a non-return valve for inlet and flow fuse for exhaust at the hull penetration respectively. These can be fitted either externally or internally and are normally in place of the normal hull protection valve at that point (see 5.6 above)	B		
5.23	Flow Fuse Testing *D 018, Sheet 34*	Visual examination and function test of satisfactory operation within the last 6 months	A		
5.24	Pipework Testing *D 018, Sheets 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
5.25		Visual examination within the last 6 months	A		
5.26		Gas leak test at maximum working pressure in the last 2 years	A		
5.27	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
6	**Chamber (Internal)**				
6.1	Paint Work	Paintwork must be in good condition and the chamber free from serious corrosion	A		
6.2	Seals	Seals on mating faces must be clean, undamaged and covered lightly in silicone grease. If the sealing area is painted then this must be in good condition	A		
6.3	Hollow Penetrations	All hollow penetrators (other than the bores of medical and equipment locks) must be fitted with protection valves or other devices to stop catastrophic pressure loss (see also 5.6 above)	A		
6.4	Penetrator Marking	All penetrators must be clearly marked to show their function	A		
6.5	Valves	Valves must be free of corrosion and should move freely through their full range of operation	A		
6.6	Valve Marking	All valves must be clearly marked with their function	A		
6.7	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		
6.8	Exhausts	Any open ended exhaust orifice must be fitted with guards to prevent suction hazard, including those located in transfer trunkings and medical locks. The design of such guards should minimise the risk of injury to divers using a trunk	A		
6.9	Inlets	Any gas inlet pipework should be fitted with some form of diffuser, except those located in transfer trunkings	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.10	Communication	There must be two-way voice communications between the divers inside each compartment of the chamber and those outside at the life support control point	A		
6.11	Secondary Communications	A secondary (back up) communication system (such as a sound powered phone) should exist between the divers inside each compartment of the chamber and those outside at the life support control point	B		
6.12	Communications Testing *D 018, Sheet 6*	Examination and function test plus check condition of batteries (if applicable) in the last 6 months	A		
6.13	BIBS	In each compartment of the chamber there must be one BIBS connection and mask for each intended occupant plus one spare	A		
6.14	Type	BIBS should be overboard dump type with exhausts piped outside the chamber and also outside the container/compartment if mounted in a container/compartment	A		
6.15	BIBS Testing *D 018, Sheet 5.2*	Visual examination and function test (including communications if fitted) in the last 6 months	A		
6.16	Comfort	There must be one bunk in the living compartment for each intended occupant. Each bunk should be well designed and firmly supported. They should also be wide and long enough to allow a normal person to lie in comfort	A		
6.17	Illumination	There must be sufficient internal lighting to allow valves and controls to be operated safely. It must also be sufficient to allow surveillance from outside	A		
6.18	Sufficiency	There should be sufficient lighting to allow the occupant of each bunk to read easily	B		
6.19	Doors	All manway doors must be capable of being opened from either side. They should move freely and open sufficiently to allow stretcher access	A		
6.20	Securing	All doors should be able to be secured in the open position	A		
6.21	Equalisation	Doors should be fitted with a means of pressure equalisation	B		
6.22	Marking	All chamber doors should be marked clearly with an individual number for identification purposes	B		
6.23	Sanitary Facilities	Suitable toilet facilities must be available	A		
6.24	Toilet	If a flush type toilet is fitted then it must have sufficient interlocks to stop it being flushed while occupied	A		
6.25	Washing	Washing facilities (including shower) must be provided	A		
6.26	Sanitary System Testing *D 018, Sheet 27*	Visual examination and function test within the last 6 months	A		
6.27	Firefighting	There must be a suitable means fitted to extinguish a fire in the chamber	A		
6.28	Firefighting Testing	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.29	*D 018, Sheets 15 & 16*	If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
6.30		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
6.31		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
6.32		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		
6.33	Gauges	A gauge or other means of indicating depth should be provided showing the occupants what their depth is	B		
6.34	Gauge Calibration *D 018, Sheet 19*	All gauges must have been visually examined and checked against a certified test instrument to the required accuracy in the last 6 months	A		
6.35	ECU	There must be suitable means of controlling the internal environment of the chamber. This must remove excess CO_2, provide heating/cooling and control humidity	A	Specify type of system:	
6.36	Discharge	The gas discharge point of the unit should have a clear passage for discharge	B		
6.37	Secondary System	A secondary system should also be available for controlling the internal environment of the chamber. This must remove excess CO_2, provide heating/cooling and control humidity	A		
6.38	ECU Testing *D 018, Sheets 13*	Visual examination and function test within the last 6 months	A		
6.39	Oxygen Input	The discharge point for injected oxygen should be situated in such a place that good mixing is ensured. Typically this will be sited at the discharge point of the ECU	B		
6.40	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
6.41	Emergency Medical Treatment	Facilities must be available to use one compartment of the chamber system to provide emergency medical treatment to an injured diver while still under pressure. Such arrangements should comply with DMAC 28	A		
6.42	Pipework Testing *D 018, Sheets 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
6.43		Visual examination within the last 6 months	A		
6.44		Gas leak test at maximum working pressure in the last 2 years	A		
6.45	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		

Section 4 – Bell Launch and Recovery System

The requirements of this section are intended for a single bell diving system. It is recognised that in any twin bell diving system, with both bells operational, there is considerable safety back-up provided by the second bell. In such a case a number of the requirements below could be achieved by use of the second bell rather than only by the specific requirements below.

Where there is more than one launch and recovery system, a table should be completed for each one.

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**General**				
Note: While some components of the handling system can be tested and certified as individual units, it is normally a requirement that the overall handling system is tested as a composite unit. If individual components are replaced, this may require a retest of the whole system. This is a decision for the competent person.					
1.1	Testing	A full company approved load test procedure should be provided for the system identifying all components included in the testing such as, but not limited to, cursor, trolley, sheaves, wire rope terminations, winches, etc. This should include a diagram showing the critical areas that are to be subjected to NDE	A		
1.2	Weight	The weight of the bell, plus any other components to be lifted, should have been physically checked in the last 12 months by weighing. This will be both in water when fully submerged and in air. The bell should be in working condition, that is fully manned (weights to simulate divers) and equipped. The results should be recorded	A	Weight in air is _____ kg Weight in water is _____ kg	
1.3	Marking	The safe working load (SWL) must be clearly marked on every winch and on the A frame, trolley, guide wire weight or similar	A		
1.4	Suitability	Each of these SWLs must be greater to or equal the weight of the fully manned and equipped diving bell in air (or in water if relevant), or greater than the load they will have to handle if they do not directly lift the bell	A		
1.5	Design Parameters	Documentation should be available showing clearly the designed SWL which should be equal to or greater than the SWL in 1.4 above Note: The auditor is not being asked to confirm the adequacy of the calculations, merely that they are present	A		
2	**Main Bell Winches**				
2.1	Suitability	Only winches deemed suitable for man-riding by the manufacturer (or a competent person) must be used	A		
2.2	Operating Lever	The winch raise/lower control must be designed to return to the neutral position when released by the operator	A		
2.3	Marking	The raise, lower and neutral positions of the operating lever must be clearly marked	A		
2.4	Main Brake	An automatic brake must be fitted which will come on when the operating lever is returned to the neutral position or if there is a loss of power to the winch	A		
2.5	Secondary Brake	A secondary braking system must also be fitted for use in case the main brake fails. This may be automatic or manually operated	A		
2.6	Clutch	If any sort of clutch mechanism is fitted to the winch, there must be a positive means of preventing it becoming disengaged during operation	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
2.7	Operating Instructions	A notice giving the operating instructions for the winch, including the actions necessary if power is lost, must be displayed where the winch operator can see it	A		
2.8	Secondary Power	An independent (secondary) source of power to the winch must be available in case of failure of the primary power	A		
2.9	Second Motor	In the case of any winch used to lift the diving bell (including cursor winches), there must be a secondary motor as well Note: This requirement does not apply to winches used for secondary recovery (see section 4 below)	A		
2.10	Drum Capacity	The winch drum must be able to accept the full length of wire being used. This means that there should be a clear space between the outside of the top layer of wire and the edge of the drum flange of at least 2.5 times the wire diameter	A		
2.11	Guarding	Unless access is physically restricted, guards should be fitted to the winch and drum to stop anything (clothing, fingers, etc.) being drawn in to the machinery	B		
2.12	Wire Spooling	Arrangements should exist to ensure that the wire being recovered on to any man-riding winch is correctly spooled. In the case of main bell winches this is often by means of a mechanical spooling device	B		
2.13	Line Out	There should be a method by which the winch operator can see how much of the main bell lift wire and main bell umbilical have been paid out. This may be by line-out meters or at its simplest by marking the bell wire and umbilical at 10 metre intervals, using the same marking system. The purpose is to stop a large amount of excess umbilical being paid out	B		
2.14	Winch Testing *D 018, Sheet 22.1*	Visual examination and function test at maximum SWL. Independent static load test on each brake system at 1.25 times maximum SWL in the last 6 months	A		
2.15		Independent static load test on each brake system at 1.5 times maximum SWL plus a dynamic test at 1.25 times maximum SWL followed by NDE of critical areas in the last 12 months	A		
3	**Main Lift Wire(s)**				
3.1	Type	The lift wire(s) must be non-rotating	A		
3.2	Connection	The connection of the wire to the bell must be of a suitable type. It should have two retaining means (for example a nut locked with a split pin) for the removable pin	A		
3.3	Lubrication	Unless the wire is to be renewed every 2 years, it should be pressure lubricated every 6 months, at least from the bell back to the maximum depth of immersion in the period. If it has been laid up for a substantial period then it should have been pressure lubricated before lay up	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
3.4	Wire Testing *D 018, Sheet 29.1*	There have been a number of problems in the past with high tensile bell wire ropes which appear to lose strength even when properly stored. For this reason a test to destruction should be carried out when any high tensile bell wire rope is first put in to service to establish the actual breaking force of the wire at that time. Provided the test result does not fall below the manufacturer's MBF, future destructive test results should be compared to that original figure (the base value), rather than to any claim (or test certificate provided) by the manufacturer. If the test to destruction when the wire is first put into service does indicate an MBF below that of the manufacturer, then the manufacturer's MBF should always be adopted as the base value against which to monitor future deterioration in breaking force. However if the result falls 10% below the MBF then the rope should be discarded. The sample tested to destruction should prove an adequate safety factor exists. This is normally 8 times safe working load	A		
3.5		Static test at 1.25 times SWL plus function test at SWL as an integral part of lifting system in the last 6 months. Visual examination of visible section at the same time	A		
3.6		Cut back a length of rope (see 3.9 below) and test to destruction to prove an adequate safety factor in the last 12 months	A		
3.7		Re-terminate and apply static load test at 1.5 times SWL in the last 12 months	A		
3.8	Certificate Retention	As it is necessary to be able to trace the testing history of a main lift wire, all certification, including original manufacturer's certificate, initial test certificate (3.4 above) and any annual test certificates (3.6 above) should be available for inspection	A		
3.9	Note: (refer to IMCA SEL 022/M 194, section 13 for full guidance)	There should be an annual removal of a length of wire rope from just beyond the first sheave from the bell termination with the bell below the surface, allowing for swell, to be discarded. A length sufficient to provide test samples for two tensile tests should be cut from the bell end adjacent to the termination. In certain circumstances the competent person may waive the recommendation to cut all the way back to the first sheave. In systems where there is a single vertical fall directly from the winch to the bell it will be necessary to cut right back to the winch. A sample should be tested to destruction to verify that the required factor of safety is maintained. Should the test prove unsatisfactory due to problems with test procedures or where the wire rope fails within a length equal to six wire rope diameters (6d) from the base of the socket or cone, a second test may be carried out. This alternative test should not be used as a way of avoiding discard where a valid test is performed which indicates low strength. The ultimate strength test to be carried out on a sample from the part subject to the most severe dynamic loading will be used to verify that a factor of safety of 8:1 is still being maintained and if not the wire rope should be discarded. Even if the factor of safety is being maintained but the result falls 10% below the base value adopted following the test carried out when the rope was first put into service, it should be discarded. One of the tensile test samples should be dismantled and the internals examined.			

Item	Description	Requirement	Need	Response	Certificate Issue Date
4	**Secondary Recovery**				
4.1	Provision	There must be a secondary means of recovering the diving bell to the surface, bringing it on board and mating it to the chamber system. This must be independent of the main recovery system Note: This requirement is intended to refer to the means of lifting (wires, lifting gear, winch, etc.). It is not intended to say that a second A frame, gantry or set of supporting steelwork should be provided	A		
4.2	Demonstration	In the last 12 months the secondary recovery system must have been demonstrated to be able to recover the bell to the surface, bring it on board and correctly mate it to the chamber system	A		
4.3	SWL	The secondary recovery system must have a certified SWL which is at least equal to the weight of the fully loaded bell in air (see 1.2 above) or in water, depending on the part of the recovery operation it is intended for	A		
4.4		If the secondary recovery system has another use (for example guide weight deployment) then it must have a certified SWL covering at least the weight required in 4.3 above PLUS its main task	A		
Note: Where a winch is used for secondary recovery from the water to the deck it should meet all of the man-riding requirements given in 4.5 to 4.18 below. If it is only used to lift the bell to the water surface after which some other mechanism lifts the bell in air, then it need not meet the man-riding requirements					
4.5	Suitability	Only winches deemed suitable for man-riding by the manufacturer (or a competent person) should be used	A		
4.6	Operating Lever	The winch raise/lower control must be designed to return to the neutral position when released by the operator	A		
4.7	Marking	The raise, lower and neutral positions of the operating lever must be clearly marked	A		
4.8	Main Brake	An automatic brake must be fitted which will come on when the operating lever is returned to the neutral position or if there is a loss of power to the winch	A		
4.9	Secondary Brake	A secondary braking system must also be fitted for use in case the main brake fails. This may be automatic or manually operated	A		
4.10	Clutch	If any sort of clutch mechanism is fitted to the winch, there must be a positive means of preventing it becoming disengaged during operation	A		
4.11	Operating Instructions	A notice giving the operating instructions for the winch, including the actions necessary if power is lost, should be displayed where the winch operator can see it	A		
4.12	Secondary Power	An independent (secondary) source of power to the winch must be available in case of failure of the primary power	A		
4.13	Drum Capacity	The winch drum must be able to accept the full length of wire being used. This means that there should be a clear space between the outside of the top layer of wire and the edge of the drum flange of at least 2.5 times the wire diameter	A		
4.14	Guarding	Unless access is physically restricted, guards should be fitted to the winch and drum to stop anything (clothing, fingers, etc.) being drawn in to the machinery	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
4.15	Wire Spooling	Arrangements should exist to ensure that the wire being recovered on to any man-riding winch is correctly spooled. In the case of main bell winches this is often by means of a mechanical spooling device	B		
4.16	Line Out	There should be a method by which the winch operator can see how much of the lift wire has been paid out. This may be by a line-out meter or at its simplest by marking the wire at 10 metre intervals	B		
4.17	Winch Testing *D 018, Sheet 22.1*	Visual examination and function test at maximum SWL. Independent static load test on each brake system at 1.25 times maximum SWL in the last 6 months	A		
4.18		Independent static load test on each brake system at 1.5 times maximum SWL plus a dynamic test at 1.25 times maximum SWL followed by NDE of critical areas in the last 12 months	A		
Note: Where a wire rope is used for secondary recovery to the deck, it must meet the requirements of 4.19 to 4.27 below. (Note: Certain configurations, such as double reeving through a guide weight, may not require the use of non-rotating wire)					
4.19	Type	The lift wire(s) must be non-rotating	A		
4.20	Connection	The connection of the wire to the pad eye (or similar) must be of a suitable type. It should have two retaining means (for example a nut locked with a split pin) for the removable pin	A		
4.21	Lubrication	Unless the wire is to be renewed every 2 years, it should be pressure lubricated every 6 months, at least from the bell back to the maximum depth of immersion in the period. If it has been laid up for a substantial period then it should have been pressure lubricated before lay up	B		
4.22	Wire Testing *D 018, Sheet 29.1*	There have been a number of problems in the past with high tensile bell wire ropes which appear to lose strength even when properly stored. For this reason a test to destruction should be carried out when any high tensile bell wire rope is first put in to service to establish the actual minimum breaking force of the wire at that time. Provided the test result does not fall below the manufacturer's MBF, future destructive test results should be compared to that original figure (the base value), rather than to any claim (or test certificate provided) by the manufacturer. If the test to destruction when the wire is first put into service does indicate an MBF below that of the manufacturer, then the manufacturer's MBF should always be adopted as the base value against which to monitor future deterioration in breaking force. However if the result falls 10% below the MBF then the rope should be discarded. The sample tested to destruction should prove an adequate safety factor exists. This is normally 8 times safe working load	A		
4.23		Static test at 1.25 times SWL plus function test at SWL as an integral part of lifting system in the last 6 months. Visual examination of visible section at the same time	A		
4.24		Cut back a length of rope (see 4.27 below) and test to destruction to prove an adequate safety factor in the last 12 months	A		
4.25		Re-terminate and apply static load test at 1.5 times SWL in the last 12 months	A		
4.26	Certificate Retention	As it is necessary to be able to trace the testing history of a main lift wire, all certification, including original manufacturer's certificate, initial test certificate (4.22 above) and any annual test certificates (4.24 above) should be available for inspection	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
4.27	Note: (refer to IMCA SEL 022/M 194, section 13 for full guidance)	There should be an annual removal of a length of wire rope from just beyond the first sheave from the bell termination with the bell below the surface, allowing for swell, to be discarded. A length sufficient to provide test samples for two tensile tests should be cut from the bell end adjacent to the termination. In certain circumstances the competent person may waive the recommendation to cut all the way back to the first sheave. In systems where there is a single vertical fall directly from the winch to the bell it will be necessary to cut right back to the winch. A sample should be tested to destruction to verify that the required factor of safety is maintained. Should the test prove unsatisfactory due to problems with test procedures or where the wire rope fails within a length equal to six wire rope diameters (6d) from the base of the socket or cone, a second test may be carried out. This alternative test should not be used as a way of avoiding discard where a valid test is performed which indicates low strength. The ultimate strength test to be carried out on a sample from the part subject to the most severe dynamic loading will be used to verify that a factor of safety of 8:1 is still being maintained and if not the wire rope should be discarded. Even if the factor of safety is being maintained but the result falls 10% below the base value adopted following the test carried out when the rope was first put into service, it should be discarded. One of the tensile test samples should be dismantled and the internals examined.			
5	**Lift Attachment Points**				
5.1	Main	The main lift attachment point to the bell should be by means of a properly designed pad eye or similar	A		
5.2	Secondary	There should be a secondary attachment point on the diving bell if the main one is damaged. This secondary point should also be a properly designed pad eye or similar (it may be a second hole in the same pad eye)	A		
5.3	Testing (of both main and secondary lift points) *D 018, Sheet 22.1*	Visual examination and test at 1.25 times maximum SWL in the last 6 months	A		
5.4		Load test at 1.5 times maximum SWL followed by NDE of critical areas in the last 12 months	A		
6	**Main Umbilical**				
6.1	General	The main bell umbilical should not be designated as a secondary means of recovery for the bell unless both it and its handling system are specifically designed for that function	A		
7	**Guide Wires**				
7.1	Provision	A system should be provided to restrict excessive lateral or rotational movement of the diving bell in the water. This will normally take the form of two guide wires stabilised with a weight	B		
7.2	Winch(es)	If the winch(es) is designated as man-riding, for example as a secondary recovery method for the bell, then it must meet all the requirements in 4.5 to 4.18 above Note: It is not necessary to record the detailed information here if it is already completed in 4.5 to 4.18 above	A		
7.3	Non Man-Riding	If the winch(es) is not designated as man-riding then it is required only to meet the normal standards for lifting equipment applying at the site	B		
7.4	Wire Rope(s)	If the wire rope(s) is designated as man-riding, for example as a secondary recovery method for the bell, then it must meet all the requirements in 4.19 to 4.27 above Note: It is not necessary to record the detailed information here if it is already completed in 4.19 to 4.27 above	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
7.5	Non Man-Riding	If the wire rope(s) is not designated as man-riding then it is required only to meet the normal standards for lifting equipment applying at the site	B		
8	**Cross-Haul System**				
8.1	General	Where a winching system is used to traverse the bell horizontally while in the water, and thereby supports part or all of the weight of the bell in water, it must be load and function tested at 1.5 times the weight of the bell in water within the last 6 months	A		
8.2	Winch	If the winch is designated as man-riding, for example as a secondary recovery method for the bell, then it must meet all the requirements in 4.5 to 4.18 above Note: It is not necessary to record the detailed information here if it is already completed in 4.5 to 4.18 above	A		
8.3	Non Man-Riding	If the winch is not designated as man-riding then it is required only to meet the normal standards for lifting equipment applying at the site, subject to the test at 8.1 above	B		
8.4	Wire Rope	If the wire rope is designated as man-riding, for example as a secondary recovery method for the bell, then it must meet all the requirements in 4.19 to 4.27 above Note: It is not necessary to record the detailed information here if it is already completed in 4.19 to 4.27 above	A		
8.5	Non Man-Riding	If the wire rope is not designated as man-riding then it is required only to meet the normal standards for lifting equipment applying at the site, subject to the test at 8.1 above	B		
9	**Heave Compensation**				
9.1	General	If a heave compensation system is fitted, then the type must be specified	A		
9.2	Instructions	Clear operating instructions should be available in dive control covering all aspects of operation of the system	B		
9.3	Warning	A warning (light etc.) should be visible to both the diving supervisor and the winch operator if the heave compensation system is in operation	B		
9.4	Heave Compensator Testing *D 018, Sheet 22.1*	Visual examination and function test at maximum SWL as an integral part of the lifting system in the last 6 months	A		
9.5		Dynamic test at 1.25 times maximum SWL as an integral part of the lifting system in the last 12 months	A		
10	**Hydraulics**				
10.1	General	Normally, the bell handling system is powered by hydraulics. This system should be well maintained and should not be exposed in such a way that physical damage is likely. There should be no obvious leaks of hydraulic oil	B		
10.2	Power Requirements	An assessment must be available of the maximum hydraulic power required for normal and emergency bell launch and recovery modes. This requires an itemised list	A		
10.3	Redundancies	The various redundancies available should be stated and explanations available as to how the transfer from one system to another is made	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
10.4	Safety	Detail the safety features for hydraulic lock out including: when trunking is pressurised and/or clamp is not fully open	A		
10.5	Hoses	All hoses must be suitable for the purpose, properly installed and protected from damage	A		
10.6	Securing	All hoses must be appropriately supported and secured at intervals not exceeding 2m	A		
10.7	Hose Identification	It must be possible to identify all hoses and their latest test date. Such as by means of a hose register or PMS record	B		
10.8	Hydraulics Testing *D 018, Sheet 22.2*	Visual examination and function test as an integral part of the handling system within the last 6 months	A		
10.9		Intercooler/heater, if fitted, checked for function and flow rate within the last 6 months	A		
10.10		Hydraulic fluid/oil batch no, type and grade plus date originally filled to be available	A		
10.11		Hydraulic fluid/oil analysed OR completely replaced within the last 12 months	A		
10.12	Relief Valves	Pressure relief valves may or may not be fitted within the hydraulic system. If they are fitted then they should comply with the testing requirements detailed below			
10.13	Relief Valve Testing *D 018, Sheet 24.3*	Visual examination in the last 6 months	A		
10.14		Function test at required relief setting followed by leak test at maximum working pressure in the last 2½ years	A		
11	**Pneumatic Hoses**				
Note: Normally, the bell handling system is powered by hydraulics. If however the winch(es) are pneumatic then the requirements listed in 10.1 to 10.14 above are not relevant and instead the requirements of this section should be substituted.					
11.1	Suitability	All hoses must be suitable for the purpose, properly installed and protected from damage	A		
11.2	Security	All hoses must be appropriately supported and secured at intervals not exceeding 2m	A		
11.3	Damage	All hoses should be well maintained and there should be no obvious damage to any of them	A		
11.4	Identification	It must be possible to identify all hoses for their safe working pressure and latest test date. Such as by means of a hose register or PMS record	A		
11.5	End Restraints	All pneumatic hoses (HP and LP) must be secured at the connection point with a whip-check device (tie back) attached to a secure fixed point. The type of whip-check used will differ depending on the pressures involved. A tie back needs to be considered for its length, material and security	A		
11.6	Hose Testing *D 018, Sheet 28*	Visual examination and function test in the last 6 months	A		
11.7		Pressure leak test to maximum rated working pressure in the last 2 years	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
12	**Electric Winches**				
Note: Normally, the bell handling system is powered by hydraulics (or it may be pneumatic). If however the winch(es) are electrically powered then the requirements listed in 10.1 to 10.14 above are not relevant and instead the requirements of this section should be substituted					
12.1	General	The electrical system should be well maintained and should not be exposed in such a way that physical damage is likely. There should be no obvious damage to any of the cables or components	B		
12.2	Power Requirements	An assessment must be available of the maximum electrical power required for normal and emergency bell launch and recovery modes. This requires an itemised list	A		
12.3	Redundancies	The various redundancies available should be stated and explanations available as to how the transfer from one system to another is made	A		
12.4	Safety	Detail the safety features for safety lock out including: when trunking is pressurised and/or clamp is not fully open	A		
12.5	Cables	All cables must be suitable for the purpose, properly installed and protected from damage	A		
12.6	Support	All cables must be appropriately supported and where relevant fastened in to cable trays or similar	A		
12.7	Cable Identification	It must be possible to identify all cables and their latest test date. Such as by means of a PMS record	B		
12.8	Electrical Testing *D 018, Sheet 11*	Visual examination, function test of unit (including protective devices) plus continuity and resistance testing of all cables within the last 6 months	A		
13	**Communication**				
13.1	General	The diving supervisor must have a means of verbal communication to/from the winch driver. This should be dedicated and hard wired where they are remote from each other	A		
13.2	Communication Testing *D 018, Sheet 6*	The communications must have been function tested in the last 6 months in addition to normal pre-dive checks	A		
14	**Breathing Apparatus**				
14.1	Provision	Emergency breathing apparatus fitted with communications must be available for the winch driver and moonpool team so that they may perform their duties in a smoky or polluted atmosphere	A		
14.2	Umbilical Supply	If umbilical supplied from a compressor then the air intake for the compressor must be situated in a pollution free zone. BA sets should also be available in case of umbilical supply failure or to allow escape	B		
14.3	BA Testing *D 018, Sheet 5.1 & 9.1*	Visual examination and function test (including communications if fitted) in the last 6 months. Check made at the same time that cylinder is fully charged	A		
14.4		External visual examination of cylinder plus gas leak test to maximum working pressure in the last 2½ years	A		
14.5		Internal and external visual examination of cylinder plus gas leak test to maximum working pressure in the last 5 years (possible overpressure test)	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
15	**Bell Clamp**				
15.1	General	A safety interlock system must be fitted to the clamping mechanism securing the bell to the chamber. This interlock must make it impossible to open the clamp if there is still pressure inside the trunk and impossible to obtain a gas tight seal on the trunk if the clamp is not properly closed	A		
15.2	Safety Interlock Pipework Testing *D 018, Sheet 24.1, 34*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
15.3		Visual examination and function test within the last 6 months	A		
15.4		Gas leak test at maximum working pressure in the last 2 years	A		
16	**Vessel Emergency**				
16.1	General	Provision must be made in the emergency procedures for recovering the bell to the deck and mating it in the event of a vessel emergency	A		
16.2	Power	Arrangements must be in place that sufficient power is available for the safe completion of a dive and recovery of the bell to the system if the vessel power fails. Any equipment identified as necessary to satisfy this requirement must be able to continue operating in the event of loss of the vessel's primary power	A		
17	**Firefighting**				
17.1	Availability	Suitable firefighting arrangements must be made for the handling system area. This may be by means of permanent ship or platform provided equipment or by means of portable extinguishers etc. It should be capable of dealing with any type or size of foreseeable fire hazard	A		
17.2	Unmanned areas	Consideration should be given to the provision of a fire detection system in any unmanned areas	C		
17.3	Firefighting Testing *D 018, Sheet 15 & 16*	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		
17.4		If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
17.5		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
17.6		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
17.7		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
18	**Overall Testing**				
18.1	General	It is normal that the launch/recovery system is load tested as a complete unit rather than as individual components. This should happen at the intervals given below but also if the unit is relocated to a different work site or any of the major components are replaced, altered or repaired. The certificate for the overall test should state clearly all the component parts which were tested.			
18.2	Overall Testing *D 018, Sheet 22.1*	Visual examination and function test of complete system at maximum SWL. Independent static load test on each brake system at 1.25 times maximum SWL in the last 6 months	A		
18.3		Independent static load test on each brake system at 1.5 times maximum SWL plus a dynamic test at 1.25 times maximum SWL followed by NDE of critical areas in the last 12 months	A		

Section 5 – Diving Bell

Where there is more than one diving bell, a table should be completed for each one.

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**Pressure Vessel**				
1.1	Design	The pressure vessel forming the bell must have been designed and built to a recognised international standard and be fit for the purpose of human occupancy Note: Any bell manufactured after 1 July 2014 must also be certified to the recognised international standard Note: The design standard, serial number, date of manufacture, etc. can be found hard stamped on a suitable part of the bell, in an accessible position (see 5.1 below)	A		
1.2	Volume	It is important that the volume of the bell is accurately known to allow gas calculations to be carried out	A	Volume of bell	
1.3	Pressure Vessel Testing *D 018, Sheet 25.1*	Visual examination within the last 6 months	A		
1.4		Thorough internal and external visual inspection plus a gas leak test at full working pressure in the last 2½ years	A		
1.5		Internal overpressure test within the last 5 years (or other testing as agreed by an international classification society) plus a gas leak test at full working pressure Note: The competent person may consider wall thickness measurement if insulation has been in place for a number of years	A		
2	**Viewports**				
2.1	Condition	Viewports must be free of cracks or scratches that could affect pressure integrity	A		
2.2	Protection	Viewports in the lower half should have protective covers both internal and external. Other viewports require external protective covers only. This protection may be accomplished by the installation of plastic covers (or similar) over the viewports	B		
2.3	Identification	If the serial number or other identifying mark for each viewport is not visible when fitted in situ then it should be prominently marked on the outside of the bell adjacent to each viewport	B		
2.4	Viewport Testing *D 018, Sheet 25.2*	Manufactured in accordance with recognised standard and fit for purpose. Further information in IMCA D 047	A		
2.5		Overpressure tested to 1.25 times maximum rated working pressure when new or other testing to establish structural integrity as required by the ASME PVHO standard	A		
2.6		Visual examination in situ in the last 6 months	A		
2.7		Gas leak test as an integral part of the bell they are fitted to in the last 2½ years	A		
2.8		Internal overpressure test as an integral part of the bell they are fitted to in the last 5 years (or other testing to establish structural integrity as required by the competent person)	A		
2.9		Complete renewal within the last 10 years. That is from the date of fabrication	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
3	**Access Hatches**				
3.1	Design	The bell must be designed such that the diver can freely exit and re-enter the bell if it is resting on the seabed. This will normally require a stand-off frame, stage or two stage ballast release	A		
3.2	Opening	Hatches must be capable of being opened from either side	A		
3.3	Securing	Hatches should be able to be secured in the open position	B		
3.4	Equalisation	Hatches should be fitted with a means of pressure equalisation	B		
3.5	Seals	Seals on mating faces must be clean, undamaged and covered lightly in silicone grease. If the sealing area is painted then this must be in good condition	A		
3.6	Sealing	The hatches should be capable of providing a pressure seal against both internal and external pressure	B		
4	**Buoyant Ascent**				
Note: In certain circumstances reliance on buoyant ascent of the bell is part of the emergency procedures. This is covered in detail in AODC 061					
4.1	Non Use	Although the bell may be fitted with a ballast release system some diving contractors have decided not to use them in an emergency. If this is the case then this decision must be clearly recorded in the appropriate documents and made known to all on the work site. The emergency procedures must also clearly identify the alternative method chosen (typically a second diving bell). The ballast weights must be secured such that they cannot accidentally come off. In such a case no testing or compliance with Items 4.4 to 4.11 below is required.	A		
4.2	Visual Examination *D 018, Sheet 34*	Visual examination for damage or deterioration in the last 6 months of the equipment used to secure bell ballast weights that are not intended to be released	A		
4.3		Visual examination for damage or deterioration in the last 6 months of any other components (penetrators, operating mechanisms, seals, etc.) forming part of the buoyant ascent system not intended for use	A		
Note: Where ballast weights are fitted and designated for use in an emergency they must meet the following criteria:					
4.4	Release	Must be capable of release from inside the bell and the release mechanism must be protected against accidental release	A		
4.5	Two Actions	Two independent actions must be needed to release the weights	A		
4.6	Accidental Shedding	The weights must not be capable of being shed accidentally, for example if the bell is inadvertently tilted	A		
4.7	Single Failure	If the system utilises only one weight then there must be no single component whose failure could cause the weight to become detached. This requirement does not apply if there are two or more weights operating independently	A		
4.8	Isolations	If the release mechanism is operated by means of pressurisation (gas or hydraulic) then isolations need to be in place such that they cannot be activated accidentally by external water pressure or internal gas pressure	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
4.9	Ballast Release System Testing *D 018, Sheet 30*	Visual examination and function test of all mechanisms within the last 6 months	A		
4.10		Overload test to 1.5 times the static load of the ballast weight in air plus NDE of critical items in the last 12 months	A		
4.11		Dry function test of all components and release mechanisms in the last 12 months	A		
4.12		Test of bell positive buoyancy when loaded as if fully manned and equipped in its present configuration in the last 12 months including a stability test to ensure the bell floats upright in seawater	A		
Note: Cutters or release mechanisms for the main bell umbilical and/or the main lift wire may be fitted to some bells. If they are fitted they require to meet the following criteria:					
4.13	Operation	Must be capable of operation from inside the bell and the operating mechanism must be protected against accidental operation	A		
4.14	Two Actions	Two independent actions must be needed to operate the cutter(s) or release mechanism	A		
4.15	Isolations	If the cutter(s) or release mechanism are operated by means of pressurisation (gas or hydraulic) then isolations need to be in place such that it cannot be activated accidentally by external water pressure or internal gas pressure	B		
4.16	Cutter/Release Mechanism Testing *D 018, Sheet 30*	Visual examination and function test of mechanism within the last 6 months	A		
4.17		Dry function test in the last 12 months	A		
5	**Bell External**				
5.1	Identification	A name plate must be clearly visible on the outside of the bell giving the manufacturing details and identification number of the pressure vessel	A		
5.2	Anodes	If external anodes are fitted they should be in reasonable condition and not painted over	A		
5.3	Paint Work	Paintwork must be in good condition and the bell free from serious corrosion	A		
5.4	Insulation	Insulation (if fitted) should be clean and in good condition	A		
5.5	Hollow Penetrators	All hollow penetrators must be fitted with protection valves or other devices to stop catastrophic pressure loss	A		
5.6	Electrical Penetrators	All electric penetrators must be certified by a competent person (IMCA D 018 category 3 or 4) as fit for purpose	A		
5.7	Penetrator Marking	All penetrators must be clearly marked to show their function	A		
5.8	Valves	Valves must be free of corrosion and should move freely through their full range of operation	A		
5.9	Valve Marking	All valves must be clearly marked with their function	A		
5.10	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
5.11	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
5.12	Emergency Manifold	A manifold should be provided on the bell for connection of basic supplies in an emergency. As a minimum this should provide two connections as laid down by IMO ¾" NPT (female) for hot water ½" NPT (female) for breathing gas	A		
5.13	Manifold Marking	It is desirable to paint the manifold and/or the surrounding area with a bright colour which makes it readily identifiable	C		
5.14	Communications	A communications connection might also be available	C		
5.15	Tapping Code	A copy of the AODC/IMCA bell tapping code must be mounted on the outside of the bell in a clearly visible position	A		
5.16	Lift Attachment Point	The main lift attachment point to the bell should be by means of a properly designed pad eye or similar	B		
5.17	Secondary	There should be a secondary attachment point on the diving bell if the main one is damaged. This secondary point should also be a properly designed pad eye or similar (it may be a second hole in the same pad eye)	B		
5.18	Attachment Point Testing	This is covered in detail in Section 4 and is normally included in the handling system tests			
5.19	Strobe Light	A strobe light with a minimum operating duration of 24 hours must be fitted to the bell to assist in location in an emergency	A		
5.20	Transponder	In line with AODC 019 a transponder operating on 37.5 kHz must be fitted to the bell to aid in location in an emergency	A		
5.21		A means of testing and interrogating this transponder must be readily available on the surface at the dive site	A		
5.22	Transponder Testing *D 018, Sheet 12*	Physical examination for damage and function test in the last 6 months	A		
5.23	Onboard Gas	There must be an emergency supply of breathing gas carried on board sufficient to support each working diver plus the bellman outside the bell for a minimum of 30 minutes at a breathing rate of 40 litres/minute at the maximum depth of the diving operation	A		
5.24	Onboard Oxygen	Sufficient oxygen must be available for metabolic consumption by the maximum number of divers at 0.5 litres/minute per diver for at least 24 hours at the end of a bell run	A		
5.25	Pressure Reduction	The pressure of all onboard gas (both oxygen and heliox) must be reduced to a maximum of 30 bar over ambient before it enters the bell interior	A		
5.26	Marking	All cylinders must be colour coded and marked with the name and chemical symbol of their contents in line with IMCA D 043 or a recognised local national standard	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
5.27	Cylinder Condition	Each cylinder should be in good condition and free from serious corrosion	A		
5.28	Test Date	The last test date stamp on each cylinder should be painted over with a small patch of distinctive coloured paint to aid location. If this is inaccessible then the cylinder serial number should be visible or else stencilled in a visible location	B		
5.29	Cylinder Testing *D 018, Sheet 10.1*	External visual examination of the cylinders within the last 6 months	A		
5.30		Thorough internal and external visual examination plus gas leak test to maximum working pressure within the last 2 years	A		
5.31		Hydraulic overpressure test to 1.5 times maximum working pressure (or the factor required by the design code or standard if different) within the last 4 years	A		
5.32	Food Lock Interlock	If a food lock is fitted, a safety interlock system must be fitted to the clamping mechanism securing the lock outer door. This interlock must make it impossible to open the mechanism/door if there is still pressure inside the lock and impossible to obtain a gas tight seal on the lock if the door/ mechanism is not properly closed	A		
5.33	Interlock Pipework Testing *D 018, Sheets24.1, 34*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
5.34		Visual examination and function test in the last 6 months	A		
5.35		Gas leak test at maximum working pressure of the system in the last 2 years	A		
5.36	Overpressure Relief	A means should be available to avoid over-pressurisation of the diving bell. This may be a relief valve or an overpressure alarm	B		
5.37	Overpressure Relief Testing *D 018, Sheet 24.3*	Visual examination within the last 6 months	A		
5.38		Function test at required relief setting followed by leak test to maximum working pressure in the last 2½ years. Normally the leak test is carried out integral with the pressure vessel	A		
5.39	External Lights	External lights must be provided which illuminate the bell over 360 degrees	A		
5.40		These lights must be wired in such a way that failure of one does not extinguish the others	A		
5.41	External Battery Pack	If fitted, an external battery pack must have the battery terminals and leads insulated to protect against short circuits. More detailed advice is given in IMCA D 002	A		
5.42		Periodic examination and testing of the cells by a competent person should be included in the planned maintenance system	A		
5.43		As a general rule, shunt diode protection should be provided to avoid polarity reversal under discharge conditions	B		
5.44		The battery housing must be fitted with an appropriate relief mechanism for example a relief valve to protect against over pressurisation	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
5.45	Overpressure Relief Testing *D 018, Sheets 24.3 & 24.4*	Visual examination of relief means in the last 6 months	A		
5.46		Gas leak test at maximum working pressure in the last 2½ years	A		
5.47		Function test at required relief setting in the last 2½ years for a relief valve	A		
5.48		Complete renewal in the last 10 years for a bursting disc	A		
5.49	Bellman's Umbilical	If the umbilical for the bellman is stored on the outside of the bell then there must be adequate and properly designed umbilical stowage points to allow it to be tied back to avoid damage during launch and recovery of the bell	A		
5.50		The umbilical must however be capable of quick release by the bellman once he is out of the bell in an emergency	A		
5.51		If it is planned to undertake two man bell runs using a bellman's umbilical stowed outside the bell then the end of the umbilical must be arranged in such a way as to allow the bellman to attach his mask or helmet and test it before the working diver exits the bell	A		
5.52	Pipework Testing *D 018, Sheets 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
5.53		Visual examination within the last 6 months	A		
5.54		Gas leak test at maximum working pressure in the last 2 years	A		
5.55	Electrical Testing *D 018, Sheet 11*	Visual examination, function test(including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
6	**Bell Internal**				
6.1	Capacity	The bell must be specified and outfitted for either two, three or four man bell runs	A		
6.2	Minimum volume	The bell should have the following minimum volume, although this is very dependent on the configuration, whether one umbilical is carried outside etc. 2 man bell – 3.0 m^3 (105 cu ft) 3 man bell – 4.5 m^3 (160 cu ft) 4 man bell – 6.0 m^3 (210 cu ft)	B		
6.3	Paintwork	Paintwork must be in good condition and the bell free from serious corrosion	A		
6.4	Hollow Penetrators	All hollow penetrators must be fitted with protection valves or other devices to stop catastrophic pressure loss (see also 5.5 above)	A		
6.5	Penetrator Marking	All penetrators must be clearly marked to show their function	A		
6.6	Valves	Valves must be free of corrosion and should move freely through their full range of operation	A		
6.7	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.8	Valve Marking	All valves must be clearly marked with their function	A		
6.9	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		
6.10	Exhausts	Any open ended exhaust orifice must be fitted with guards to prevent suction hazard	A		
6.11	Inlets	Any gas inlet pipework should be fitted with some form of diffuser	B		
6.12	Flood-up valve	There should be a valve fitted to allow partial flooding of the bell by the bellman. This should be in an easily accessible position and clearly visible. This valve should be in addition to the internal hull stop valve	B		
6.13	Internal Lighting	Sufficient lighting must be provided to allow ease of reading depth gauge, gas control panel and any other instruments	A		
6.14	Back-up Lighting	Secondary (back up) lighting must be provided. This may be battery powered	A		
6.15	Depth Gauges	Gauges must be provided to let the divers know both the internal and external depth of the bell Note: These will normally only be used to indicate depth to the divers	A		
6.16	Gauge Testing *D 018, Sheet 19*	Visual examination and check by comparison against a certified test instrument to the required accuracy within the last 6 months	A		
6.17	Heating	A means must be available for warming both the diver(s) in the water and the inside of the bell. This will normally be by hot water from the surface and there should be a means inside the bell of monitoring the hot water supply temperature. Note: This requirement only applies to areas of the world where the ambient water temperature at the diving depth requires the diver to be heated	A		
6.18	Bell Heater	There must be a means of isolating the bell heater from the divers hot water supply	A		
6.19	Gas Heating	If diving at depths below 150 msw there must be a means of heating the divers inspired gas	A		
6.20	Survival Equipment	There should be a means provided, independent of surface supplies, to maintain the diver's body temperature and reduce CO_2 for a minimum period of 24 hours in an emergency. This will normally be by means of survival bags and emergency scrubbers. Note: The heating requirement only applies to areas of the world where the ambient water temperature at the diving depth (or the depth the bell may descend to) requires the divers to be heated. The CO_2 reduction requirement will apply in all circumstances	B		
6.21	Survival Pack Testing *D 018, Sheet 33*	Visual examination in the last 6 months for damage or water ingress plus condition of passive scrubber charge	A		
6.22		Packs unpacked, checked and repacked in the last 12 months	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.23	Gas Monitoring	There must be a means by which the divers in the bell can analyse the atmosphere for O_2 and CO_2 independent of the surface	A		
6.24	Gas Monitor Testing *D 018, Sheet 1 & 2*	Examination, function test, confirm in date and recalibrate if relevant within the last 6 months	A		
6.25	Bell Contamination Gas Monitoring	Consideration should be given to providing a means of monitoring the bell atmosphere for hydrocarbons and H_2S	C		
6.26	Contamination Monitor Testing *D 018, Sheet 1 & 2*	Examination, function test, confirm in date and recalibrate if relevant within the last 6 months	A		
6.27	CO_2 Removal	There must be a powered scrubber unit to provide primary CO_2 removal from the atmosphere	A		
6.28	Gas Supplies	Each diver's gas supply must be arranged so that if one line fails then this does not interfere with the gas supply to another diver	A		
6.29	Alarm	There should be an alarm fitted to alert the bellman if the diver(s) supply switches over to the onboard gas	B		
6.30	Blow-down	The bell diving supervisor should have control of the bell blow-down at all times	A		
6.31	Non Interference	Gas supplies must be arranged so that blowing down or flushing the bell does not interfere with the gas supply of any diver outside the bell	A		
6.32	Water Trap	If gas reclaim is fitted, the water trap must be readily accessible to the bellman	B		
6.33	Bellman Supply	There must be a primary gas supply for the bellman, which can be from on board bottles or from the surface, sufficient to allow him to exit the bell and recover an injured diver. This supply must be independent of the primary gas supply to the diver(s) in the water	A		
6.34	Bellman Secondary Supply	The bellman must also have a secondary supply but this supply may be common with the working divers primary supply, provided it is protected if the working diver's line fails	A		
6.35	BIBS	An oral/nasal or full face BIBS mask must be supplied for each occupant of the bell. This should be capable of providing breathing gas either from the surface or from the on board cylinders	A		
6.36	Oxygen	The externally carried oxygen supply must be fitted with a means whereby it is regulated to a low pressure before it enters the bell. HP oxygen must not be available inside the bell	A		
6.37	Flow Limiting	The oxygen coming in to the bell must be fitted with a system which limits either the rate of flow or the volume which can enter in order to minimise the risk of excess O_2 building up in the bell	A		
6.38	Cylinder Pressure	A means should be available to allow the gas cylinder pressures to be read from both inside and outside the bell Note: This is an indicating gauge only	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.39	Indicating Gauge Testing *D 018, Sheet 20*	Visual examination and function test within the last 6 months	A		
6.40	Communications	Two-way voice communications between the supervisor and each diver including the standby diver (bellman) must be provided	A		
6.41	Through Water	A means of through water communications must be available to allow the supervisor to talk to the divers inside the bell when it is in the water	A		
6.42	Sound Powered	A sound powered phone should be fitted to allow the supervisor to talk to the divers in the bell	B		
6.43	Communication Testing *D 018, Sheet 6*	All communications links must have been examined and function tested in the last 6 months in addition to any standard pre-dive checks	A		
6.44	Diver Recovery	A method must be available whereby the bellman can recover an unconscious diver in to the bell. This will normally be a self-locking pulley which can be attached to the diver's harness (pelvic lift type)	A		
6.45	Second System	Consideration should be given to providing a second pulley system in the case of bells where more than one diver may be locked out	C		
6.46	Partial Flooding	A partial flooding system should be fitted to allow the bell to be part filled in order to assist the re-entry into the bell of an injured diver. A guard will need to be fitted to the pipe end if relevant. See 6.12	B		
6.47	Attachment Point	The attachment point for the pulley(s) inside the bell should be designed for the purpose and approved by a competent person.	A		
6.48	Bellman Restraint	Consideration should be given to providing a means to stop the bellman falling in to the open manway either as a result of a slip or of losing consciousness	C		
6.49	Medical Equipment	Medical equipment must be provided to the level specified in the diving contractor's manuals, and as a minimum meet the requirements of DMAC 15 (or as agreed with company medical adviser) unless local regulations prohibit any of the contents	A		
6.50	Container	The equipment should be in a suitable protective container clearly marked with a white cross on a green background	B		
6.51	Validity	The equipment must have been checked for integrity within the last 6 months with the date the next check is due clearly marked on it	A		
6.52	Seats	There must be a seat provided in the bell for the bellman. This should have a restraining harness or lap belt fitted which is available for use	A		
6.53	Restraint	There must also be a means of restraining each diver during ascent and descent in order to minimise the risk of injury. Note: This does not signify a separate seat for each diver	A		
6.54	Divers Umbilicals	There must be adequate storage inside the bell to accommodate the maximum length and number of umbilicals that it is intended to use	A		
6.55	Tapping Code	A copy of the AODC/IMCA emergency tapping code must be easily accessible to the bell occupants	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.56	Emergency Procedures	A copy of the relevant parts of the emergency procedures (preferably plasticised) must be available inside the bell	A		
6.57		A list of valve positions to be adopted in an emergency must be available in the bell. This should duplicate the list kept in dive control	A		
6.58	Pipework Testing *D 018, Sheets 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
6.59		Visual examination within the last 6 months	A		
6.60		Gas leak test at maximum working pressure in the last 2 years	A		
6.61	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
6.62	Alarm Testing *D 018, Sheet 34*	Visual examination for damage or deterioration plus function test within the last 6 months	A		

Section 6 – Life Support Control

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**General**				
1.1	Procedures	There must be a full set of all the contractor's relevant saturation and life support procedures and manuals available in the control area. This must include all relevant emergency procedures Note: The auditor is not being asked to confirm the adequacy of these procedures, merely that they are present	A		
1.2	Logs	There must be a full set of the required logbooks or sheets available in the control area to allow the recording of all necessary parameters and other required information	A		
1.3	Lighting	The control area must be well lighted such that the life support personnel are able to read any instruments easily and to carry out their duties without difficulty	A		
1.4	Environment	The life support personnel must be protected from weather and other elements (including dropped objects) which may affect their ability to perform safely. This will also mean they must be kept suitably warm (or cool) and must not be exposed to extremes of noise or other environmental problems	A		
1.5	Access	The life support personnel must have good access to all controls and should be able to read all gauges and instruments easily	A		
2	**Communication** – *Note: All communications referred to below are hard wired. The use of radios for any of these communication links is not acceptable*				
2.1	Chambers	There must be two-way voice communications between life support control and any personnel inside each compartment of the chambers	A		
2.2	Secondary System	A secondary system should be provided as a back-up to the above system	A		
2.3	Dive Control	There must be two-way communications between life support control and dive control	A		
2.4	Food or Equipment Locks	Two-way voice communications must exist between life support control and the exterior of each food or equipment lock on the chamber system	A		
2.5	Hyperbaric Evacuation System	There must be two-way voice communications between life support control and the launch location of the hyperbaric rescue unit	A		
2.6		There must be two-way voice communications between life support control and the divers inside the hyperbaric rescue unit	A		
2.7	Others	Life support personnel may have voice communication with other relevant areas. This may include compressor areas, gas room, etc.	C		
2.8	Communication Testing *D 018, Sheet 6*	All communications links must have been examined and function tested in the last 6 months The condition of the batteries should have been checked (if applicable)	A		
3	**Gauges**				
3.1	General	Life support personnel must have available to them enough suitable gauges so that they are aware of the depth of each compartment of the chamber system and of the supply pressures of each main and back up breathing supply	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
3.2	Pressure Limiting	A pressure limiting device may be fitted to avoid gauges being over pressurised	C		
3.3	Depth	These are gauges used to provide information for operational and decompression control. The scale must be appropriate to the duty, i.e. large enough to be read easily and accurately. They should normally operate in the range 25 to 75% of full scale deflection although they need to operate in the 0 to 25% range during decompression. If used for the final stages of decompression they must have scale divisions of no more than 0.5msw/2 fsw	A		
3.4	Unit Marking	All depth gauges should be marked in the same unit system (imperial or metric). Dual scale marking is acceptable	A		
3.5	Contractor's Tables	The unit marking system of the gauges (imperial or metric) should correspond to the units used in the contractor's diving tables.	A		
3.6	Digital Gauges	If the gauge is digital then the display must be large and clear enough to be read in all conditions. It must be clearly marked on the unit whether it reads in feet or metres and it should display the reading to one decimal point. (If further information is required, refer to AODC 059)	A		
3.7	Separate Gauges	There must be at least one dedicated gauge displaying the depth of each compartment at all times	A		
3.8	Gas Source/Supply	These are gauges that indicate pressure but are not directly used for life support.			
3.9	Gauge Position	They must be positioned to show the line pressure of sources coming in to the panel and also of any supplies leaving the panel. A system must be in place to ensure that incorrect readings cannot happen in certain valve positions	A		
3.10	Scale Divisions	They must meet the requirements for depth gauges above except that they may be much smaller and with larger scale divisions. They are not calibrated as depth gauges	A		
3.11	Cross-over Valves	Great care must be taken if cross-over valves are fitted with the result that any gauge can possibly read more than one thing. This is particularly the case if a depth gauge can read the depth of more than one compartment. Cross-over valves should either be fixed in one position (the handles may be removed to avoid accidental changes) or should indicate very clearly what supply they are connected to. In any event any gauge fitted with a cross-over valve must indicate very clearly at all times exactly what it is reading	A		
3.12	Gauge Calibration *D 018, Sheets 18, 19 & 20*	All gauges must have been visually examined, function tested in situ, calibrated and/or tested (as relevant) to the required accuracy in the last 6 months	A		
4	**Pipework and Valves**				
4.1	General	All valves must be free of corrosion and should operate easily	A		
4.2	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
4.3	Valve Marking	The function of all valves must be clearly marked	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
4.4	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		
4.5	Exhaust Venting	Exhaust pipework must not vent in to an enclosed space Note: Panel PRVs, medical lock vents and sampling for analysis do not constitute exhaust pipework	A		
4.6	Accessibility	Gas pipework, particularly in panels and at connection points, must be easily accessible for maintenance and repair	B		
4.7	Pipework Testing *D 018, Sheet 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
4.8		Valves and pipework need to have been visually examined in the last 6 months	A		
4.9		Valves and pipework need to have had a gas leak test to maximum working pressure in the last 2 years	A		
4.10	Relief Valves	Pressure relief valves may or may not be fitted within the control area. If they are fitted then they should comply with the testing requirements detailed below			
4.11	Relief Valve Testing *D 018, Sheet 24.3*	Visual examination in the last 6 months	A		
4.12		Function test at required relief setting followed by leak test at maximum working pressure in the last 2½ years. Normally the leak test is carried out integral with the pipework	A		
5	**Electrics**				
5.1	General	All electrical equipment must be securely installed with all power leads and wiring secured in such a way that it is protected from accidental damage	A		
5.2	Emergency Lighting	There must be sufficient self-contained lighting units in life support control to allow personnel to operate safely in an emergency	A		
5.3	Hazard Signs	Electrical hazard warning signs should be displayed on all relevant panels and equipment	B		
5.4	Electrical Testing *D 018, Sheet 11*	All electrical equipment should have been visually examined and function tested (including protective devices) in the last 6 months. Cables should have continuity and resistance tests	A		
6	**Firefighting**				
6.1	Availability	Suitable firefighting arrangements must be made for all areas critical for life support, including the control area. This may be by means of permanent ship or platform provided equipment or by means of portable extinguishers etc. It should be capable of dealing with any type or size of foreseeable fire hazard	A		
6.2	Unmanned areas	Consideration should be given to the provision of a fire detection system in any unmanned areas	C		
6.3	Firefighting Testing	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.4	*D 018, Sheet 15 & 16*	If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
6.5		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
6.6		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
6.7		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		
7	**Medical Equipment**				
7.1	Provision	Medical equipment must be provided to the level specified in the diving contractors manuals and as a minimum meet the requirements of DMAC 15 and DMAC 28 (or as agreed with company medical adviser) unless local regulations prohibit any of the contents	A		
7.2	Marking	The equipment should be in a suitable protective container clearly marked with a white cross on a green background	B		
7.3	Examination	This equipment must have been checked for integrity within the last 6 months with the date the next check is due clearly marked on it	A		
8	**Breathing Apparatus**				
8.1	Provision	Emergency breathing apparatus fitted with communications must be available for the life support personnel so that they may perform their duties in a smoky or polluted atmosphere	A		
8.2	Umbilical Supply	If umbilical supplied from a compressor then the air intake for the compressor must be situated in a pollution free zone. A BA set should also be available in case of umbilical supply failure or to allow escape	A		
8.3	BA Testing *D 018, Sheet 5.1 & 9.1*	Visual examination and function test (including communications) in the last 6 months. Check made at the same time that the cylinder is fully charged	A		
8.4		External visual examination of cylinder plus gas leak test to maximum working pressure in the last 2½ years	A		
8.5		Internal and external visual examination of cylinder plus gas leak test to maximum working pressure in the last 5 years (possible overpressure test)	A		
9	**Surveillance**				
9.1	Divers	The life support personnel must be able to have sight of the divers inside each compartment of the chamber system. If this is not possible through easily accessible viewports or if life support control is remote from the chambers then a CCTV system must be provided	A		
9.2	Working Areas	Consideration may be given to providing CCTV monitoring in life support control of relevant areas such as food locks or any working areas which are appropriate	C		

Item	Description	Requirement	Need	Response	Certificate Issue Date
10	**Alarms**				
10.1	General Alarm	The vessel/installation general alarm system must be linked in to life support control, or sited close by so that it can be clearly heard by the life support personnel	A		
10.2	Muting	Any audio (bell, klaxon, etc.) must be capable of being muted or cancelled if it is so noisy or obtrusive that it does not allow the life support personnel to hear their other communications	A		
10.3	Oxygen Level	An oxygen analyser with audible and visible high and low alarm must be sited in any enclosed life support control to warn the occupants of any rise or fall of oxygen levels outside pre-set parameters due to gas leakage in to the area	B		
10.4	ECU Indicator	There should be a visual indication in the control room showing whether each ECU is running or not	A		
10.5	Gas Storage	There should be a facility to warn the personnel in life support control if the gas storage O_2 alarm is activated	A		
10.6	Analyser and Alarm Testing *D 018, Sheets 2, 34*	Analysers must have been examined, function tested and calibrated in situ within the last 6 months	A		
10.7		Alarms must have been function tested within the last 6 months	A		
11	**Monitoring**				
11.1	General	There must be a means of measuring the various environmental parameters inside each compartment of the chamber system. In the case of some parameters this requires both primary and secondary (back up) capabilities. The parameters to be monitored are:	A		
11.2	Oxygen Primary	Oxygen – Primary analysis	A		
11.3	Oxygen Secondary	Oxygen – Secondary analysis	B		
11.4	CO_2 Primary	Carbon dioxide – Primary analysis	A		
11.5	CO_2 Secondary	Carbon dioxide – Secondary analysis	B		
11.6	Temperature	Temperature	A		
11.7	Humidity	Humidity	A		
11.8	Analyser Testing *D 018, Sheet 2*	Analysers must be examined, function tested and calibrated in situ within the last 6 months	A		
12	**Gas Supplies to Control Panel** – *Note: In this section, 'gas' refers to any mixture intended for breathing, whether air, nitrox, heliox or any other mixture*				
12.1	Primary Supply	There must be a primary gas supply to each compartment in the chamber complex. This supply must provide sufficient gas, of breathing quality, and be suitably arranged so that if this on line supply fails, an alternative supply can be immediately switched on at the control panel	A		
12.2	Secondary Supply	There must be a suitable secondary gas supply to each compartment in the chamber complex providing sufficient gas, of breathing quality, in order to provide an alternative supply if the primary supply fails Note: This does not require a second pipe, merely another supply that can be switched on at the control panel	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
12.3	Separation	Both primary and secondary gas supplies must be separate from the supply to both the bell and the diver in the water. The supplies must be arranged such that if one line fails then this does not interfere with the supply to other lines	A		
12.4	Automatic Oxygen Make-Up	If O_2 make-up is an automatic system then there must be a system in place which ensures that the system cannot fail in the 'on' position and flood the chamber with O_2	A		
12.5	Manual Oxygen Make-Up	If the O_2 make-up system is manual then there must be a flow indicator in life support control on the downstream side of the chamber O_2 make-up line to indicate that O_2 is flowing in to the chamber	A		
12.6	Therapeutic Gas	A system must exist whereby therapeutic gas can be supplied to each diver in the chamber complex by means of BIBS masks. It must also be possible to change the mix of gas being supplied without undue difficulty	A		

Section 7 – Main Bell Umbilical

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**General**				
1.1	Suitability	The umbilical must be suitable for the intended use. This means it must be robust and able to be handled by the intended deployment system. It must also contain a sufficient number and diameter of hoses and cables to provide all supplies safely at the maximum depth to which it will be used	A		
1.2	Handling	The deployment system must be able to handle the umbilical in such a way that it is not exposed to damage	A		
2	**Fitting**				
2.1	Attachment	The umbilical must be securely attached to the bell by means of a strength member or strain relief fitting so that neither the individual components or any bell penetrations are subject to load	A		
2.2	Arrangement	The leads of the hoses and cables at the bell end should be arranged to avoid chafing or kinking	A		
3	**Umbilical Winch**				
3.1	Braking System	If an umbilical winch is used then it should be fitted with a mechanical braking system to stop the umbilical paying out under load when the winch motor is in use (over running), in neutral or at rest	B		
4	**Testing**				
4.1	Electrical components *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
4.2	Hose Components *D 018, Sheet 28*	When new, hydro test to 1.5 times maximum working pressure or as recommended	A		
4.3		Visual examination and function test in the last 6 months	A		
4.4		Pressure leak test to maximum working pressure in the last 2 years	A		
5	**Emergency Umbilical**				
5.1	Provision	Consideration should be given to carrying an emergency umbilical capable of being connected to the emergency manifold as detailed in Section 5, Item 5.12. The design and make-up should be as per the emergency procedure manual	C		
5.2		If an emergency umbilical is carried offshore then it must be:			
5.3	Storage	– stored in suitable conditions	B		
5.4	Testing	– tested and certified as below	A		
5.5	Electrical components *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
5.6	Hose Components *D 018, Sheet 28*	When new, hydro test to 1.5 times maximum working pressure or as recommended	A		
5.7		Visual examination and function test in the last 6 months	A		
5.8		Pressure leak test to maximum working pressure in the last 2 years	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6	**Secondary Recovery**				
6.1	Intention	The umbilical should only be used as a means of secondary recovery if it is specifically designed for that purpose. If so, it must be tested in line with the requirements in the handling system section	A		

Section 8 – Diver Heating System

Note: This section will only apply to a diving system that uses hot water for diver heating

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**General**				
1.1	Suitability	The equipment used to generate and supply the hot water to the diver must be suitable for the purpose	A		
2	**Redundancy**				
2.1	Requirement	There must be an alternative and independent source for supplying heat to the diver	A		
2.2	Electrical Back-Up	If electricity is required to generate heating or pump it to the diver then there must be a back-up system in the event of primary failure (such as the vessel losing main power). This must be able to function for as long as it takes to recover the diver(s) to safety	A		
3	**Temperature**				
3.1	Monitoring	The diving supervisor must have a display showing the temperature of the water being supplied to the diver	A		
3.2	Alarm	A high and low temperature alarm (audible and visible) must be fitted to alert the diving supervisor if pre-set upper and lower limits are exceeded	A		
4	**Oil-Fired Heaters**				
4.1	Location	Oil fired heaters must be located such that they present no risk to the dive system in the event of fire	A		
4.2	Air Intake Pollution	Their position must also present no risk in terms of pollution or contamination of air supply intakes to the vessel or any breathing air compressors	A		
4.3	Spill Tray	They must be fitted with a spill tray which drains off to a safe area (to reduce risk of fire or pollution)	A		
4.4	Fuel Supply	Where possible the fuel supply should be hard piped	B		
4.5	Shut-Off Valve	The local tank filler should be fitted with a dead-mans handle or automatic shut off valve which closes when the tank is full	B		
4.6	Overflow	The local tank must be fitted with an overflow system with a capacity greater than the filling supply system (i.e. capable of allowing a rate of overflow greater than the filling rate)	A		
4.7	Overflow Dump	The overflow system must dump to a safe area	A		
5	**Firefighting**				
5.1	Provision	All hot water machines need to have suitable provision of firefighting equipment in their vicinity. This may be by means of permanent ship or platform provided equipment or by means of portable extinguishers etc. It must be capable of dealing with any type or size of foreseeable fire hazard	A		
5.2	Fire Detection	If any hot water machines are situated in enclosed and unmanned areas then consideration should be given to fitting a fire detection system. This should be particularly considered for oil-fired units	C		

Item	Description	Requirement	Need	Response	Certificate Issue Date
5.3	Testing *D 018, Sheet 15 & 16*	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		
5.4		If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
5.5		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
5.6		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
5.7		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		
6	**Testing**				
6.1	Hot Water System *D 018, Sheet 21*	Visual examination and function test in the last 6 months	A		
6.2	Pipework Testing *D 018, Sheet 24.1*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
6.3		Visual examination in the last 6 months	A		
6.4		Gas (or fluid) leak test at maximum working pressure in the last 2 years	A		
6.5	Gauge Testing *D 018, Sheet 20*	Visual examination and function test of any indicating gauges in the last 6 months	A		
6.6	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
6.7	Pressure Vessels *D 018, Sheets 9.2, 26*	External visual examination in the last 6 months	A		
6.8		If a seamless cylinder or pressure vessel, internal and external examination plus gas (or fluid) leak test to maximum working pressure in the last 15 months	A		
6.9		If a seamless cylinder or pressure vessel, internal and external examination plus over pressure test to 1.5 times maximum working pressure (or the factor required by the design code or standard if different) plus gas (or fluid) leak test to maximum working pressure in the last 5 years	A		
6.10		If a welded pressure vessel then internal and external examination plus gas (or fluid) leak test to maximum working pressure in the last 2½ years OR Internal over pressure test to the factor required by the design code or standard plus gas (or fluid) leak test to maximum working pressure in the last 2½ years	A		
6.11	Alarm Testing *D 018, Sheet 34*	Visual examination for damage or deterioration plus function test within the last 6 months	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.12	Relief Valves	Pressure relief valves may or may not be fitted within the control area. If they are fitted then they should comply with the testing requirements detailed below			
6.13	Relief Valve Testing *D 018, Sheet 24.3*	Visual examination in the last 6 months	A		
6.14		Function test at required relief setting followed by leak test at maximum working pressure in the last 2½ years. Normally the leak test is carried out integral with the pipework	A		

Section 9 – Divers' Umbilicals

This section applies to excursion umbilicals used with a bell, the bellman's umbilical and the surface diving umbilical for the surface standby/safety diver but does not apply to the bell main umbilical, which has its own separate section.

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**General**				
1.1	Construction	The umbilical(s) must be suitable for the tasks intended. They must be robust and made up from components designed for use in an umbilical	A		
1.2	Stowage	Adequate umbilical stowage should be provided for the surface standby diver's umbilical. This should allow the umbilical to be coiled up away from risk of damage and such that minimum bend radius of components is not compromised	B		
1.3	Marking	Umbilicals must be marked for length at least every 10 metres (33 feet) using a recognised system which allows easy visual identification of the length paid out	A		
1.4	Security	The divers end of the umbilical must be fitted with a means which allows it to be securely fastened to the diver's safety harness without putting any strain on the individual whip ends	A		
1.5	High O_2 Content Marking	Any hoses carrying O_2 in greater concentration than 25% must be identified as O_2 clean and be O_2 compatible	A		
1.6	Oxygen Service	All hoses must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
2	**Length**				
2.1	Record of Length	The length of the diver's umbilical which it is permissible to pay out will normally be dictated by some outside factor such as the bail-out endurance (depending on depth/distance) or the distance to the nearest thruster on a DP vessel. This maximum length must be clearly identified for each diving operation and arrangements should preferably be made to ensure that this is the maximum length of umbilical which can be paid out	A		
2.2	Bellman's Umbilical	The bellman's umbilical should be 2 metres (6½ feet) longer than the working diver(s) umbilical	B		
3	**Testing**				
3.1	Electrical components *D 018, Sheet 11*	Visual examination, function test plus continuity and resistance tests of all cables within the last 6 months	A		
3.2	Hose Components *D 018, Sheet 28*	When new, hydro test to 1.5 times maximum working pressure or as recommended	A		
3.3		Visual examination and function test in the last 6 months	A		
3.4		Pressure leak test to maximum working pressure in the last 2 years	A		

Section 10 – Divers' Personal Equipment

This section covers divers' helmets (or masks), bail-out bottles and other parts of the diver's emergency breathing supply. It does not cover other items such as suits, gloves etc. which should meet normal standards for personal protective equipment.

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**Helmets (or Masks)**				
1.1	Marking	Each helmet (or mask) should be indelibly marked with a unique serial number	B		
1.2	Condition	All helmets (or masks) should be in good condition with no obvious defects	A		
1.3	Type	The helmet (or mask) must be of a type which is suitable for the intended diving operation	A		
1.4	Diver Gas Reclaim	If a diver gas reclaim system is fitted then the helmets intended for use with this system must be specifically designed for that purpose	A		
1.5	Safety	Helmets should be fitted with a means to stop them becoming detached from their clamp while in use and this means should be manufacturer approved. Similarly masks should be fitted with a means to stop the hood becoming detached from the face plate while in use (in addition to the normal clamp) and this means should be manufacturer approved	A		
1.6	Maintenance	Each helmet (or mask) must be subject to regular planned maintenance and a record of such maintenance should be available, using manufacturer's information where relevant. This maintenance must also include any neck dam. Records of the maintenance should identify the person(s) carrying it out and their competence to do so	A		
1.7	Helmet Testing *D 018, Sheet 5.3*	Visual examination and function test at atmospheric pressure in the last 6 months	A		
1.8		Inspected and tested in line with manufacturer's recommendations in the last 12 months	A		
2	**Emergency Gas Supply (Bail-Out) Cylinders**				
2.1	Provision	Every diver (other than the bellman) must be provided with a reserve supply of breathing gas carried in a bail-out cylinder or similar	A		
2.2	Endurance	The cylinder(s) must have sufficient endurance to allow the diver to return to the bell in an emergency. This will normally mean that a calculation should be available showing that the capacity of the cylinder(s) at the depth of diving will allow breathing gas for 1 minute for every 10 metres horizontal excursion. This calculation should be carried out using 40 l/min as a minimum consumption	A		
2.3	Marking	Each cylinder must be correctly colour coded and marked with the name of the contents	A		
2.4	Test Date	The last test date stamp on each cylinder should be painted over with a small patch of distinctive coloured paint to aid location. If this is inaccessible then the cylinder serial number should be visible or else stencilled in a visible location	B		
2.5	Cylinder Testing – Seamless Cylinders *D 018, Sheet 10.1*	External and internal visual examination in the last 6 months	A		
2.6		External and internal visual examination plus gas leak test to maximum working pressure in the last 2years (possible overpressure test)	A		
2.7		Hydraulic overpressure test to 1.5 times maximum working pressure (or the factor required by the design code or standard if different) plus the 2 yearly tests above, in the last 4 years	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
2.8	Cylinder Testing – Composite Cylinders *D 018, Sheet 10.2*	External and internal visual examination in the last 6 months	A		
2.9		External and internal visual examination plus gas leak test to maximum working pressure in the last 12 months (possible overpressure test)	A		
2.10		Hydraulic proof pressure test to the pressure marked on the cylinder OR volumetric expansion test as appropriate to the design of the cylinder in the last 5 years. In either case plus the 6 and 12 monthly tests above	A		
3	**Whips and Connectors** – *Note: The above two sections cover the mask/helmet and the bail-out cylinder. This section covers the connections between these items and other parts of the diver's emergency breathing system*				
3.1	Provision	Suitable connections, fittings etc. must be provided to allow the bail-out cylinder to supply emergency breathing gas to the diver's mask/helmet if needed	A		
3.2	Contents Indicator	The diver's emergency breathing gas supply should be fitted with a means of indicating the pressure of the contents, such as a contents gauge. It should also be fitted with a means of reducing the pressure for breathing, such as a first stage regulator. Note: Specially designed counter-lung or rebreather emergency gas systems may meet this requirement in different ways	B		
3.3	Condition	All whips, hoses, gauges, fittings etc. must be in good condition with no obvious defects	A		
3.4	Type	All hoses, fittings, whips, gauges, etc. must be of a suitable type and pressure rating for the purpose. In particular, care should be taken to ensure that items of lower pressure rating than required are not used. This is particularly important for the first stage regulator	A		
3.5	Maintenance	All items forming part of the diver's emergency gas supply system must be subject to regular inspection and maintenance. Records of such maintenance should be available	A		
3.6	Hose Testing *D 018, Sheet 28*	Visual examination and function testing at full working pressure in the last 6 months	A		
3.7		Pressure leak test to maximum rated working pressure in the last 2 years	A		
3.8	Gauge Testing *D 018, Sheet 20*	Visual examination and function test of pressure indicating gauge in the last 6 months	A		
3.9	Pipework Testing *D 018, Sheet 24.1*	Internal pressure test of all valves, pipe work, fittings, etc. to 1.5 times maximum working pressure when new	A		
3.10		Visual examination of pipework/fittings in the last 6 months	A		
3.11		Gas leak test of pipework and fittings at maximum working pressure in the last 2 years	A		
3.12	Relief Valves	Pressure relief valves may or may not be fitted to any first stage regulators. If they are fitted then they should comply with the testing requirements detailed below			
3.13	Relief Valve Testing *D 018, Sheet 24.3*	Visual examination in the last 6 months	A		
3.14		Function test at required relief setting followed by leak test at maximum working pressure in the last 2½ years	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
4	**Diver's Harnesses**				
4.1	Requirement	Each diver (including the standby) should be provided with a suitable safety harness. This should be manufactured to an appropriate national or international standard and be fit for the purpose it will be used for	A		
4.2	Marking	Each harness should be permanently marked with a unique reference number for ease of identification. The date of manufacture and the date first put in to service should be readily identifiable	B		
4.3	Discard Criteria *D 018, Sheet 35*	Harnesses should be discarded 5 years from the time first put in to service, or sooner if recommended by the manufacturer or deemed appropriate by the diving contractor due to conditions of use	A		
4.4		Even if in service for less than 5 years, harnesses should be discarded 10 years from the date of manufacture or sooner if recommended by the manufacturer or deemed appropriate by the diving contractor due to conditions of use	A		

Section 11 – Compressors, Pumps, Etc.

The auditor should record the name and asset or identification number of each item of equipment to be audited. External environmental control units will comprise a number of components such as compressors, refrigeration units, pressure vessels, pipework etc. It is not possible to be specific about all the requirements as systems vary so much, but each item must be named and comply with the requirements below. Note: Where there is more than one piece of equipment then there should be a clear statement in the 'Response' and 'Certificate Issue Date' columns as to the status of each one. This is simple if this document is held electronically but for hard copy may require a separate sheet for each piece of equipment	Name of the compressor, pump or items of ECU equipment to be audited

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**General**				
1.1	Listing	A detailed list should be available of each item of equipment forming part of the diving system. This should specify the make, type and model as well as the intended use of each	B		
1.2	Location	All equipment must be located in a suitable area. This means that any personnel working on the equipment must not be exposed to any hazard while doing so	A		
1.3	Protection	Similarly the equipment itself must be protected from obvious physical damage	A		
1.4	Intakes	The intakes of all air compressors must be sited in an area where they are not exposed to any pollution – particularly exhaust fumes	A		
1.5	Access	The equipment must be easily accessible to diving personnel, both for routine maintenance and in an emergency	A		
1.6	Suitability	The equipment must be in accordance with the manufacturer's specification and fit for the purpose it will be used for (as per IMCA D 018, Detail Sheet 7)	A		
1.7	Instructions	The equipment must have a manufacturer's or similar operating manual. Detailed operating instructions taken from this manual must be available at the site	A		
1.8	Visibility	Where possible these instructions should be visible beside the equipment	C		
1.9	Signs	If appropriate, there should be warning signs stating that an item of equipment may start, vent or stop automatically and care should be taken	B		
1.10	Oxygen Service	Any compressor or pump intended for pumping oxygen or any gas mixture containing more than 25% oxygen must be designed for that purpose	A		
2	**Maintenance**				
2.1	Planned Maintenance	The equipment must have a detailed planned maintenance schedule showing what work has to be done and the intervals this work has to be carried out	A		
2.2	Records	Detailed records must be available of all maintenance activities including the PMS carried out in as required in 2.1 above	A		
2.3	Filters	All filters must be checked at the intervals specified in the planned maintenance system and the filters should be cleaned or replaced as required	A		

2.4	Visible Date	The date of the last inspection of each filter should be clearly visible on it along with the date when its next service is due	B		
3	**Firefighting**				
3.1	Provision	All equipment needs to have suitable provision of firefighting equipment in its vicinity. This may be by means of permanent ship or platform provided equipment or by means of portable extinguishers etc. It must be capable of dealing with any type or size of foreseeable fire hazard	A		
3.2	Fire Detection	If any items of equipment are situated in enclosed and unmanned areas then consideration should be given to fitting a fire detection system	C		
3.3	Firefighting Testing *D 018, Sheet 15 & 16*	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		
3.4		If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
3.5		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
3.6		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
3.7		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		
4	**Safety Devices**				
4.1	Solenoid Switches	Solenoid switches may be fitted to automatically stop equipment if it overheats or malfunctions. An alarm for this may be fitted in dive control and/or chamber control	C		
4.2	Cracked Plate Detector	A diaphragm type compressor must be fitted with a cracked plate detector which will automatically stop the compressor in the event of failure	A		
4.3	Cracked Plate Detector Testing *D 018, Sheets 7 & 17*	Visual examination and function test in the last 6 months	A		
4.4	Explosion Protection	Any compressor used for gas transfer, and not intended for use with gases containing over 25% oxygen, should be fitted with a protective device which will shut the compressor down if the oxygen percentage entering the compressor exceeds 25%	B		
4.5	Shut Down Device Testing *D 018, Sheet 7*	Visual examination and function test in the last 6 months	A		
4.6	Relief Valves	A relief valve should be fitted to protect any pressure container (e.g. an air/gas receiver) if it could be over pressured	B		
4.7	Relief Valve Testing *D 018, Sheet 24.3*	Visual examination in the last 6 months	A		
4.8		Function test at required relief setting followed by leak test at maximum working pressure in the last 2½ years. Normally this leak test is carried out integral with the pressure container	A		

5	**Pipework**				
5.1	Suitability	All pipework (rigid or flexible), valves, fittings, etc. should be suitable for the purpose, properly installed and protected from damage	A		
5.2	Security	All flexible hoses other than charging whips must be appropriately supported and secured at intervals not exceeding 2m	A		
5.3	Identification	It must be possible to identify all flexible hoses for their safe working pressure and latest test date. Such as by means of a hose register or PMS record	A		
5.4	End Restraints	All gas supply hoses (HP and LP) must be secured at the connection point with whip-check devices attached to a secure fixed point. The type of whip-checks will differ depending on the pressure of gas. A tie back needs to be considered for its length, material and security	A		
5.5	High O_2 Content Marking	Any pipework or flexible hoses carrying O_2 in greater concentration than 25% must be identified as O_2 clean and be O_2 compatible	A		
5.6	Oxygen Service	All pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
5.7	Pipework Testing *D 018, Sheet 24.1 and 24.2*	Pressure test to 1.5 times maximum working pressure when new	A		
5.8		Visual examination in the last 6 months	A		
5.9		Gas leak test at maximum working pressure in the last 2 years	A		
6	**Air/Gas Receivers**				
6.1	Suitability	All air/gas receivers must have been manufactured to a recognised international code or standard and be fit for the purpose they will be used for	A		
6.2	Receiver Testing *D 018, Sheet 26*	Visual examination in the last 6 months	A		
6.3		Internal and external inspection OR internal overpressure test plus (in both cases) gas leak test to full working pressure in the last 2½ years	A		
7	**Electrics**				
7.1	Integrity	All electrical supplies must be properly connected using suitable equipment	A		
7.2	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
8	**Operational Testing**				
8.1	Equipment and Compressor Testing *D 018, Sheets 7,13 & 14*	Visual examination and function test of the equipment in the last 6 months	A		
8.2		Check of delivery rate and pressure of compressors in the last 6 months	A		
8.3		Check of output purity of compressors against a suitable standard in the last 6 months	A		

Section 12 – High Pressure Gas Storage

This section refers to any bulk high pressure gas storage which forms part of the diving system. This will include HP gas storage banks or quads, HP oxygen storage quads and any treatment gas storage.

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**General**				
1.1	Quantity	There must be sufficient supplies available to comply with the requirements of IMCA D 050	A		
1.2	Location	All HP storage should be located in a suitable place where there is a minimal risk of damage occurring	A		
1.3	Oxygen	Oxygen (or mixes containing over 25% oxygen) must be stored in the open and well clear of any fire hazards	A		
1.4	Marking	Cylinders and quads must be colour coded and marked with the name and chemical symbol of the contents in accordance with IMCA D 043 or a recognised local national standard	A		
1.5	Test Date	The last test date stamp on each cylinder should be painted over with a small patch of distinctive coloured paint to aid location. If this is inaccessible then the cylinder serial number should be visible or else stencilled in a visible location	B		
1.6	Condition	Each cylinder should be in good condition and free from serious corrosion	A		
1.7	Guarding	Any transportable quad of gas cylinders should have protective guarding fitted to it as laid out in IMCA D 009	B		
1.8	Inert Gas	Any inert gas (helium, nitrogen etc) intended for use as a breathing gas must contain a minimum oxygen content of at least 2% unless special arrangements are in place for the use of pure inert gas	A		
1.9	Enclosed Storage	Where bulk HP gas is stored in an enclosed space then an oxygen analyser with high and low alarm must be sited so that any person is warned of an alarm situation before they enter the enclosed space or while they are in the enclosed space. This alarm should be either very audible or very visible. Ideally it will be both	A		
1.10	Bridge Repeat	If the dive system is installed on a vessel then this alarm should be repeated on the bridge	A		
1.11	Signs	Hazard signs warning of high pressure gas must be visible prior to entering the enclosed space	A		
1.12	Dumping	Any relief valves or bursting discs should be piped to dump overboard and not in to the enclosed space	B		
2	**Testing**				
2.1	Cylinder Testing *D 018, Sheet 9.1*	External visual examination in the last 6 months	A		
2.2		External visual examination and gas leak test to maximum working pressure in the last 2½ years	A		
2.3		Internal and external visual examination and gas leak test to maximum working pressure in the last 5 years (possible over pressure test and/or NDE followed by a gas leak test to maximum working pressure)	A		
2.4	Welded Pressure Vessel Testing *D 018, Sheet 26*	External visual examination in the last 6 months	A		
2.5		Internal overpressure test or thorough internal and external visual inspection plus (in both cases) a gas leak test at full working pressure within the last 2½ years	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
2.6	Pipework Testing *D 018, Sheets 24.1 & 24.2*	Pressure test to 1.5 times maximum working pressure when new	A		
2.7		Internal cleanliness verified to appropriate standard	A		
2.8		Visual examination in the last 6 months	A		
2.9		Gas leak test at maximum working pressure in the last 2 years	A		
2.10	Lifting Equipment Testing (Quad Slings etc.) *D 018, Sheet 23*	Visual examination in the last 6 months	A		
2.11		Load test at 1.5 times maximum SWL or alternative examination/testing as required by the competent person in the last 12 months	B		
2.12	Relief Valves/ Bursting Discs Testing *D 018, Sheets 24.3 & 24.4*	Visual examination within the last 6 months	A		
2.13		Function test at required relief setting (relief valves only) in the last 2½ years	A		
2.14		Gas leak test to maximum working pressure in the last 2½ years (normally integral with equipment to which relief valve/disc is fitted)	A		
2.15		Complete renewal in the last 10 years (bursting discs only)	A		
2.16	Analyser and Alarm Testing *D 018, Sheets 2 and 34*	Analysers must have been examined, function tested and calibrated in situ within the last 6 months	A		
2.17		Alarms must have been function tested within the last 6 months	A		
3	**Firefighting**				
3.1	Provision	All HP gas storage needs to have suitable provision of firefighting equipment in the vicinity. This may be by means of permanent ship or platform provided equipment or by means of portable extinguishers etc. It must be capable of dealing with any type or size of foreseeable fire hazard and able to provide cooling for the cylinders	A		
3.2	Fire Detection	If any HP gas storage is situated in enclosed and unmanned areas then consideration should be given to fitting a fire detection system	C		
3.3	Firefighting Testing *D 018, Sheet 15 & 16*	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		
3.4		If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
3.5		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
3.6		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
3.7		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
4	**Gas Content Status**				
4.1	State Boards	A record must be kept in a designated place of the contents and pressure of each cylinder or quad. These records must be updated daily when the system is in use	A		
4.2	Minimum Quantities	This record should also show clearly the minimum quantities required from 1.1 above	B		
5	**Oxygen and Gas Mixes with Over 25% Oxygen**				
5.1	Signs	Fire hazard warning signs should be erected in the vicinity of any stored oxygen or mixes over 25% oxygen	A		
5.2	Pressure	The pressure of oxygen or mixes containing over 25% oxygen should be regulated down at the quad or cylinder to a maximum of 40 bar (600 psi) for breathing gas or 60 bar (900 psi) for supplies to gas blenders	B		
5.3	Pumping	Oxygen and mixes containing over 25% oxygen should not be pumped unless the compressor/pump and associated systems have been specifically designed for such service	B		
5.4	Valves	All valves used for oxygen or gas mixes containing over 25% oxygen should be slow opening types such as rising stem valves. Quarter turn valves should not be used (apart from 5.5 below)	B		
5.5	Quarter Turn Valves	Where the oxygen or mix containing over 25% oxygen is regulated down to below 15 bar (225 psi) then quarter turn valves may be used as emergency shut off valves provided they are clearly marked as such and lightly secured in the open position during normal operations	C		
5.6	Pipework	Oxygen should be hard piped wherever possible. Only flexibles compatible with oxygen should be used and they should be kept as short as possible	A		
5.7	Oxygen Service	All pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
6	**Flexible Pipework**				
6.1	Suitability	All hoses must be suitable for the purpose, properly installed and protected from damage	A		
6.2	Security	All hoses other than charging whips must be appropriately supported and secured at intervals not exceeding 2m	A		
6.3	Identification	It must be possible to identify all hoses for their safe working pressure and latest test date. Such as by means of a hose register or PMS record	A		
6.4	End Restraints	All gas supply hoses (HP and LP) must be secured at the connection point with whip-check devices attached to a secure fixed point. The type of whip-checks will differ depending on the pressure of gas. A tie back needs to be considered for its length, material and security	A		
6.5	High O_2 Content Marking	Any hoses carrying O_2 in greater concentration than 25% must be identified as O_2 clean and be O_2 compatible	A		

Section 13 – Diver Gas Reclaim

Note: This section only applies to diving systems fitted with this feature. It is not a requirement of IMCA that such equipment be fitted to any particular system.

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**General**				
1.1	Suitability	Any system intended for the reclaim of divers' breathing gas must be specifically designed for that purpose and be supplied by a manufacturer for that purpose. If it is a special system then there must be a clear written statement from a competent person that it is fit for purpose and fitted with all necessary safety devices	A		
2	**Helmets/Masks**				
2.1	General	Any diving helmets/masks intended for use with the gas reclaim system must be specifically designed for the purpose	A		
3	**Operating Procedures**				
3.1	General	Detailed operating instructions for the gas reclaim system must be readily available in dive control	A		
4	**Compressors and Pumps**				
4.1	General	All compressors and pumps used as part of the divers' gas reclaim system must meet the requirements laid out in section 11 of this document	A		
5	**Volume Cylinders**				
5.1	General	All cylinders, pressure vessels and receivers used as part of the divers gas reclaim system must meet the requirements laid out in Sections 11 and 12 of this document	A		
6	**Gas Bag** *(if fitted – most diver gas recovery systems do not have a gas bag)*				
6.1	Position	The gas bag for recovered diver gas should be sited in a location which allows it to fully inflate safely	A		
6.2	Monitoring	In addition to the stop/start controls for compressor operation, a suitable means of monitoring the gas bag to avoid over inflation must be fitted. This may be an audible and visible over inflation alarm fitted to the gas bag. Such an alarm must operate in the gas bag area, at the compressor location and in both dive control and chamber control	A		
6.3	Bacteria	As bacteria can grow inside the bag over time, there should be a management system to monitor for such bacterial growth	B		
6.4	Indicator Lights	Indicator lights should be installed in dive control showing if the compressor which empties the bag is running/idle	B		
6.5	Excess Capacity	In situations where the gas recovery system discharge capability could be greater than the gas bag capacity (such as very deep dives) special precautions need to be taken to avoid the bag being overfilled. This may be by means of an automatic valve which allows the bag to fill then exhausts the excess gas overboard	B		
6.6	Means of Relief	The gas bag should be fitted with a relief valve or bursting disc to prevent its rupture if it is overfilled	B		
6.7	Dumping	The relief valve/bursting disc should be connected to an overboard dump system or some other system to enable the safe venting of any released gas	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.8	Testing (Relief Valve) *D 018, Sheet 24.3*	Visual examination within the last 6 months	A		
6.9		Function test at required relief setting followed by leak test to maximum working pressure within the last 2½ years (normally integral with equipment to which relief valve is fitted)	A		
6.10	Testing (Bursting disc) *D 018, Sheet 24.4*	Visual examination within the last 6 months	A		
6.11		Gas leak test to maximum working pressure in the last 2½ years (normally integral with equipment to which disc is fitted)	A		
6.12		Complete renewal in the last 10 years	A		
6.13	Alarm Testing *D 018, Sheet 34*	Alarms must have been function tested within the last 6 months	A		
7	**Control Panel**				
7.1	Location	The diver's gas reclaim control panel should be sited in dive control within easy reach of the diving supervisor and where all gauges and controls can be clearly seen	B		
7.2	Alarm	An audible and visible alarm should be incorporated in the panel to warn the diving supervisor of a reclaim compressor malfunction	B		
7.3	Alarm Testing *D 018, Sheet 34*	Alarms must have been tested within the last 6 months	A		
8	**Oxygen Make-Up**				
8.1	Flow Control	The oxygen make-up system should have the flow limited such that it cannot grossly exceed the rate of metabolic consumption of the diver(s)	B		
8.2	Power Failure	Oxygen injection orifices must be fitted with a means by which they will close if there is a power failure. This will prevent a potential dangerous build up of oxygen levels within the reclaim system	A		
8.3	Power Failure Closure Testing D 018, Sheet 34	The power failure closure mechanism must have been function tested within the last 6 months	A		
9	**Analysis**				
9.1	Oxygen	There must be a dedicated oxygen analyser fitted in dive control on the downstream gas supply to the divers/diving bell with audible and visible alarm for high and low oxygen level. Note: This is also referred to in Section 2, paragraph 6.1	A		
9.2	Volume Tank Analysis	There must be a dedicated oxygen analyser fitted in dive control on the gas supply line into the volume tank with audible and visible alarm for high oxygen level. The adjustment of sample flow rate must not affect the correct functioning of any other analyser fitted at the same point. (This analyser is normally part of the reclaim control system and should not be routinely used to sample gas from other locations.)	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
9.3	Carbon Dioxide	There must be a dedicated CO_2 analyser fitted in dive control to the downstream side of the diver gas supply with audible and visible alarm for high CO_2 level. The adjustment of sample flow rate must not affect the correct functioning of any other analyser fitted at the same point. Note: This is also referred to in Section 2, paragraph 6.2	A		
9.4	Volume Tank Analysis	There must be a dedicated CO_2 analyser fitted in dive control on the gas supply line into the volume tank with audible and visible alarm for high CO_2 level. The adjustment of sample flow rate must not affect the correct functioning of any other analyser fitted at the same point. (This analyser is normally part of the reclaim control system and should not be routinely used to sample gas from other locations.)	A		
9.5	Analyser and Alarm Testing *D 018, Sheets 2 and 34*	Analysers must have been examined, function tested and calibrated in situ within the last 6 months	A		
9.6		Alarms must have been function tested within the last 6 months	A		
10	**Pipework and Valves**				
10.1	General	All valves must be free of corrosion and should operate easily	A		
10.2	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
10.3	Marking	The function of all valves must be clearly marked	A		
10.4	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		
10.5	Exhausts	Exhaust pipework must not vent in to an enclosed space Note: Panel PRVs and sampling for analysis do not constitute exhaust pipework	A		
10.6	Accessibility	Gas pipework, particularly in panels and at connection points, must be easily accessible for maintenance and repair	B		
10.7	Pipework Testing *D 018, Sheets 24.1 and 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
10.8		Valves and pipework need to have been visually examined in the last 6 months	A		
10.9		Valves and pipework need to have had a gas leak test to maximum working pressure in the last 2 years	A		

Section 14 – Chamber Gas Reclaim and Purification

Note: This section only applies to diving systems that are actually fitted with this sort of equipment. It is not a requirement of IMCA that such equipment be fitted to any particular system.

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**Gas Bags**				
1.1	Position	The gas bag for recovered gas should be sited in a location which allows it to fully inflate safely	B		
1.2	Monitoring	In addition to the stop/start controls for compressor operation, a suitable means of monitoring the gas bag to avoid over inflation must be fitted. This may be an audible and visible over inflation alarm fitted to the gas bag. Such an alarm must operate in the gas bag area, at the compressor location and in chamber control. If it is possible to exhaust the diving bell contents to the gas bag then such an alarm must also be fitted in dive control	A		
1.3	Visual Monitoring	There may also be CCTV monitoring of the gas bag	C		
1.4	Bacteria	As bacteria can grow inside the bag over time, there should be a management system to monitor for such bacterial growth	B		
1.5	Indicator Lights	Indicator lights should be installed in chamber control showing if the compressor which empties the bag is running/idle	B		
1.6	Excess Capacity	In situations where the chamber discharge capability could be greater than the gas bag capacity (such as very deep dives) special precautions need to be taken to avoid the bag being overfilled. This may be by means of an automatic valve which allows the bag to fill then exhausts the excess gas overboard	B		
1.7	Means of Relief	The gas bag should be fitted with a relief valve or bursting disc to prevent its rupture if it is overfilled	B		
1.8	Dumping	The relief valve/bursting disc should be connected to an overboard dump system or some other system to enable the safe venting of any released gas	B		
1.9	Testing (Relief Valve) *D 018, Sheet 24.3*	Visual examination within the last 6 months	A		
1.10		Function test at required relief setting followed by leak test to maximum working pressure within the last 2½ years (normally integral with equipment to which relief valve is fitted)	A		
1.11	Testing (Bursting Disc) *D 018, Sheet 24.4*	Visual examination within the last 6 months	A		
1.12		Gas leak test to maximum working pressure in the last 2½ years (normally integral with equipment to which disc is fitted)	A		
1.13		Complete renewal in the last 10 years	A		
1.14	Alarm Testing *D 018, Sheet 34*	Alarms must have been function tested within the last 6 months	A		
2	**Analysis**				
2.1	General	Reclaimed chamber gas may contain a number of impurities. Before it is re-used there must be a system in place to make sure that it is analysed for both O_2 and CO_2 content	A		
2.2	Nitrogen Level	If there is no method for nitrogen content analysis on site then precautions should be taken to ensure that the use of reclaimed gas does not cause nitrogen levels in the chamber to rise above the levels allowed within the contractor's procedures	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
2.3	Analyser Testing *D 018, Sheet 2*	Analysers must be examined, function tested and calibrated in situ within the last 6 months	A		
3	**Compressors and Pumps**				
3.1	General	All pumps and compressors used in support of chamber gas reclaim and purification must meet the requirements laid out in section 11 of this document	A		
4	**Pipework and Valves**				
4.1	General	All valves must be free of corrosion and should operate easily	A		
4.2	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
4.3	Marking	The function of all valves must be clearly marked	A		
4.4	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		
4.5	Exhausts	Exhaust pipework must not vent in to an enclosed space Note: Panel PRVs and sampling for analysis do not constitute exhaust pipework	A		
4.6	Accessibility	Gas pipework, particularly in panels and at connection points, must be easily accessible for maintenance and repair	B		
4.7	Pipework Testing *D 018, Sheet 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings etc. to 1.5 times maximum working pressure when new	A		
4.8		Valves and pipework need to have been visually examined in the last 6 months	A		
4.9		Valves and pipework need to have had a gas leak test to maximum working pressure in the last 2 years	A		
5	**Dirty Gas Cylinders**				
5.1	General	If a cylinder(s) is used to store reclaimed (dirty) gas then it must be clearly colour coded and marked with its contents as laid out in IMCA D 043	A		
5.2	Cylinder Testing	Any cylinder(s) used for this purpose, along with their relief valves etc. must be examined and tested in line with the requirements of section 12 of this document	A		
6	**Operating Procedures**				
6.1	General	Detailed operating instructions for the gas reclaim and purification system must be easily available to the personnel operating the system	A		

Section 15.1 – General – HES System

Note: The term HES covers all aspects of the hyperbaric evacuation system including procedures, onshore reception etc. This section of the DESIGN document covers the parts of the HES that are situated in the same place as the saturation diving system. This will typically be the actual hyperbaric rescue unit plus its launch system and other supporting equipment.

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**Classification**				
1.1	General	The hyperbaric evacuation system or HRU may or may not be classified by a recognised classification society. Details should e given in the 'Response' section Note: It is possible that some components of the system are within the classification of the DSV while others are not and may be certified Note: The next two points will only apply if the system (or part of the system) is classified			
1.2	Conditions	If there are any conditions attached to the classification these should be clearly identified to those operating the system	A		
1.3	Close out	Any conditions attached to classification should be closed out or have an agreed close out period with the classification society	A		
2	**System Assessment**				
2.1	General	A systematic assessment of the hyperbaric evacuation system and its sub-systems should be available confirming that the equipment provided is both adequate and fit for its intended use. This assessment should take the form of a formal risk assessment, which may consist of a detailed risk assessment, HAZOP or an FMEA (IMCA D 039 provides guidance) to provide a systematic assessment for the identification of potential failure modes, to determine their effects and to identify actions to mitigate the failures Note: Part or all of this requirement may be included in the measures taken to comply with section 1, sub-section 2 of this document Note: The auditor is not being asked to confirm the adequacy of this assessment, only that it has been carried out	A		
3	**Procedures**				
3.1	General	Appropriate sections of the hyperbaric evacuation procedures should be available at the relevant places such as life support control room, launch point, surface crew compartment of HRU (if relevant), inside the HRU, LSP, etc. These should all be the most recent revision Note: The auditor is not being asked to confirm the adequacy of these procedures, merely that they are present	A		
4	**HES System Safety**				
4.1	General Access	There must be a level of access available around the hyperbaric evacuation system, and any other working areas, sufficient to allow operational personnel to safely and efficiently carry out their duties. This also includes the arrangements for personnel to enter and leave the surface crew compartment of the HRU (if applicable)	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
4.2	Safety of Access	Consideration shall be given to the safety of personnel operating around the hyperbaric evacuation system in terms of such things as trip and slip hazards, access steps, hand rails, etc. Consideration should also be given to adjacent activities and equipment which could interfere with the HES	B		
4.3	Signs	Safety warning signage (such as electrical hazard, use of PPE, etc.) must be clearly displayed at all relevant locations; the signage shall comply with international/national safety signs requirements	A		
4.4	Sea Fastening (Design)	All items of hyperbaric evacuation system on board a vessel (and not permanently built in) should be appropriately sea fastened and there should be supporting documentation available from a competent person attesting that the necessary calculations and checks have been completed Note: This requirement may be different for a fixed installation Note: The auditor is not being asked to confirm the adequacy of these calculations and checks, only that they have been carried out	A		
4.5	Sea Fastening (Installation)	If the sea fastening required any welded fixtures then there should be NDE reports available confirming these welds were satisfactorily tested by a competent person	A		
5	**Lighting**				
5.1	General	There must be a level of lighting available at all times around the hyperbaric evacuation system and other relevant working areas sufficient to allow personnel to safely and efficiently carry out their duties	A		
5.2	Emergency Lighting	Automatic emergency lighting should be available in all critical areas to allow personnel to move around safely	B		
6	**Access to Water**				
6.1	Safety	The HRU must have clear and unobstructed access to the water. It must also be able to enter the water safely and in a controlled manner in all normal circumstances	A		
7	**Electrical Power**				
7.1	Schematic	Hyperbaric evacuation system electrical schematics should be available at the work site	A		
7.2	Evacuation Power Requirements	An assessment is required to identify the electrical power required by the HRU and launch system during an evacuation	A		
7.3	HRU Power Requirements	An assessment is required to identify the electrical power required by the HRU when in autonomous mode	A		
7.4	Emergency Power Requirements	Any equipment identified as necessary to satisfy the conditions in 7.2 above must be able to continue operating in the event of loss of primary power. This may be by the use of batteries, stored energy (hydraulic or air power), connection to an emergency generator etc. If a UPS is used as emergency support for low powered electrical apparatus (such as computers and monitoring equipment), an assessment should be available detailing its duration under load against the time necessary to provide emergency power Note: If the primary power supply is from batteries then it is acceptable for this supply to be split such that one can act as a back-up to the other	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
7.5	Testing *D 018, Sheet 34*	A test should have been carried out within the last 6 months to demonstrate the functioning and adequacy of emergency electrical power supplies. The testing should include checks that power continues to be supplied in normal circumstances even if a UPS fails and that the visual indication of such failure works correctly	A		
8	**Medical Equipment**				
8.1	Provision	There should be a list in place detailing where and what type of medical equipment is available for the HRU. As a minimum this should comply with the requirements of DMAC 15 (or as agreed with company medical adviser) unless local regulations prohibit any of the contents	B		
9	**Maintenance** – *Note: The maintenance of the various components of the HES may involve more than one entity or company*				
9.1	Requirement	A system or systems should be in place whereby all items of plant and equipment within the hyperbaric evacuation system are subject to regular maintenance. This is important as the units will often be exposed to the environment and are rarely operated	A		
9.2	Schedule	A schedule or schedules should exist indicating the frequency and content of each task. This should take into account the manufacturers' instructions and it should also meet the requirement of the relevant IMCA D 018 detail sheet.	A		
9.3	Records	Records (written or electronic) should be available demonstrating that the plant and equipment has been subject to regular planned maintenance	A		
10	**Interface Compliance**				
10.1	Compliance Assessment	Any parts of an HES manufactured after 1 July 2014 should meet the common interface standards laid out in IMCA D 051. Units manufactured before that date may not meet these standards or may partially meet them An assessment should have been carried out to confirm if all parts of the HES comply with these interface standards. This assessment should identify total compliance, partial compliance (identifying clearly what does and what does not comply) or total non-compliance. Where there is a non-compliance the assessment should identify the alternative arrangements made Note: The auditor will normally rely on paperwork provided to him rather than being required to carry out physical measurements	A		Date of Assessment:

Section 15.2 – HRU Interface with Dive System

Note: The section below is particularly relevant to dive systems with long or convoluted evacuation routes to the HRU. A number of the requirements may not apply to systems with short, straight trunkings

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**HRU Clamp**				
1.1	Safety Interlock	A safety interlock system must be fitted to the clamping mechanism between the HRU and the trunking connection to the chamber system. This interlock must make it impossible to open the mechanism if there is still pressure inside the trunk and impossible to obtain a gas tight seal on the trunk if the mechanism is not properly closed	A		
1.2	Testing *D 018, Sheets 24.1 & 34*	Internal pressure test of all valves, pipework, fittings etc. to 1.5 times maximum working pressure when new	A		
1.3		Visual examination and function test within the last 6 months	A		
1.4		Gas leak test at maximum working pressure in the last 2 years	A		
2	**Diver Evacuation Route**				
2.1	General	The evacuation route should be such that access for divers to the HRU is possible in all normal circumstances. This should include the possibility of an injured diver requiring evacuation by stretcher. Note: The stretcher may be of the flexible type	A		
2.2	Doors	All manway doors must be capable of being opened from either side. They should move freely and open sufficiently to allow stretcher access	A		
2.3	Lifting Pulley	If it is necessary to use a pulley type system to move the stretcher then the pulley must be of a length that allows connection at the furthest extremity of the trunk	B		
2.4	Attachment Point	The attachment point for the pulley(s) inside the HRU and/or trunking should be designed for the purpose and approved by a competent person	A		
2.5	Movement Assistance	Suitable and sufficient means should be available to allow a diver to make his way safely along or up the trunking. This may include anti-slip surfaces, hand holds, ladders, rungs etc.	B		
2.6	Lighting	Sufficient lighting should be available to allow the personnel under pressure to see clearly the evacuation route and to operate any equipment they are required to use	B		
3	**Communications**				
3.1	Life Support to Launch Point	There must be a dedicated hard wire two-way voice communication system between life support control on the mother vessel and the HRU launch point	A		
3.2	Life Support to HRU Chamber	Prior to launch there must be a dedicated hard wire two-way voice communication system between life support control on the mother vessel and the divers inside the HRU	A		
3.3	Life Support to HRU Crew (if applicable)	Prior to launch there must be a means of two-way voice communication between life support control on the mother vessel and the personnel inside the surface crew compartment of the HRU (if applicable)	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
3.4	Life Support to Clamp	There must be a means of two-way voice communication between life support control on the mother vessel and the external HRU trunking exhaust point/clamp release point	B		
3.5	Life Support to Trunk	Consideration should be given to providing a means of communication between divers in the trunk and life support control, particularly if the trunking is long or convoluted	C		
3.6	Bridge to Launch Point	There must be a means of two-way voice communication between the vessel bridge (or other central control point) and both the launch point and the personnel inside the surface crew compartment of the HRU (if applicable)	B		
3.7	Clamp to Launch Point	If the clamp release point and the launch point are not adjacent then there must be an agreed means of communication between these two points. This may be by voice or hand signals	B		
3.8	Communication Testing *D 018, Sheet 6*	Examination and function test plus check conditions of batteries (if applicable) in the last 6 months	A		
4	**Surveillance**				
4.1	Trunk Entrance	Video surveillance should be available to allow life support control to monitor personnel entering the trunking	A		
4.2	Trunk Exit	Consideration should be given to a means of surveillance of personnel exiting the trunking in to the HRU	C		
5	**Trunking** – *Note: Trunking refers to the method of moving divers from the living area to the HRU. It may be a short trunk, a lengthy convoluted trunk, more than one trunk or it may involve an intermediate pressure vessel*				
5.1	Design	The trunking and any other pressure vessel forming part of the interface between the dive system and the HRU must have been designed and built to a recognised international standard and be fit for the purpose of human occupancy Note: Any unit manufactured after 1 July 2014 must also be certified to the recognised international standard Note: The design standard, serial number, date of manufacture, etc. can often be found hard stamped on a suitable part of the unit	A		
5.2	Fire protection	An evaluation should have been made of the trunking route in terms of exposure to fire risk. If such a risk exists then external measures should be available. Such measures may include fire retardant coatings, insulation, deluge systems etc.	B		
5.3	Damage protection	An evaluation should have been made of the trunking route in terms of exposure to physical damage such as from dropped objects. If such a risk exists then protective measures should be installed	B		
5.4	Paintwork	Paintwork must be in good condition and the trunking free from serious corrosion	A		
5.5	Insulation	Insulation (if fitted) should be clean and in good condition	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
5.6	Pressure Test Boundary	It is a requirement (see IMCA D 024, section 3, Introduction) that a pressure test procedure should be available showing the pressure test boundaries and the testing sequence. The auditor should confirm that this procedure includes any trunking, chambers, doors, clamps etc. that form part of the interface between the dive system and the HRU	A		
5.7	Trunk Testing *D 018, Sheet 25.1*	Visual examination within the last 6 months	A		
5.8		Thorough internal and external visual inspection plus a gas leak test at full working pressure in the last 2½ years	A		
5.9		Internal overpressure test within the last 5 years (or other testing as agreed by an international classification society) plus a gas leak test at full working pressure	A		
5.10	Volume	It is important that the volume of the trunking and any other pressure vessel forming part of the interface between the dive system and the HRU chamber is accurately known to allow gas calculations to be carried out	A	Volume of trunking:	
5.11	Venting Test	A test should have been carried out using a typical heliox mix to establish the time taken to vent the trunking to atmosphere from the anticipated maximum storage depth that the system is intended to be used at. The test should be documented and record depth against time at suitable intervals (typically 50 msw apart) in order to create a plot that can be used for operational planning Note: This test does not need to be repeated for each different diving depth as it is acceptable to obtain the relevant time from the plot obtained at the test described above	A		
5.12	Hollow Penetrators	All hollow penetrators must be fitted with protection valves or other devices externally to stop catastrophic pressure loss	A		
5.13	Penetrator Marking	All penetrators must be clearly marked to show their function	A		
5.14	Valves	Valves must be free of corrosion and should move freely through their full range of operation	A		
5.15	Valve Marking	All valves must be clearly marked with their function	A		
5.16	Exhausts	Any open ended exhaust orifice must be fitted with guards to prevent suction hazard. The design of such guards should minimise the risk of injury to divers using the trunking	A		
5.17	Testing of Valves and Pipework *D 018, Sheet 24.1*	Internal pressure test of all valves, pipework, fittings etc. to 1.5 times maximum working pressure when new	A		
5.18		Visual examination within the last 6 months	A		
5.19		Gas leak test at maximum working pressure of the system in the last 2 years	A		
5.20	Analysis	An assessment should have been carried out as to whether separate analysis of oxygen content is required for the contents of the trunking. If the assessment indicates such a need then analysis should be carried out from life support control and the analysis equipment should have been inspected as part of the diving system's IMCA D 024 audit	A		
5.21	Depth Monitoring	A means of monitoring the depth inside the trunking should be available in the vicinity of the HRU launch point. This would typically be an indicating type gauge with a scale reading over a suitable range	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
5.22	Unit Marking	The unit marking system of the depth monitoring device (imperial or metric) should correspond to the units used in the contractor's diving tables. Dual scale marking is acceptable	A		
5.23	Digital Gauges	If the gauge is digital then the display must be large and clear enough to be read in all conditions. It must be clearly marked on the unit whether it reads in feet or metres and it should display the reading to one decimal point. (If further information is required, refer to AODC 059)	A		
5.24	Gauge Calibration *D 018, Sheet 20*	Visual examination for physical condition and function test throughout normal operating range in the last 6 months	A		
6	**Viewports (if fitted in trunking)**				
6.1	Condition	Viewports must be free of cracks or scratches that could affect pressure integrity	A		
6.2	Protection	Where there is a risk of damage to a viewport from dropped objects or other physical impact, then suitable protection must be provided. This may be accomplished by the installation of plastic covers (or similar) over the viewports	A		
6.3	Identification	If the serial number or other identifying mark for each viewport is not visible when fitted in situ then it should be prominently marked on the outside adjacent to each viewport	B		
6.4	Viewport Testing *D 018, Sheet 25.2*	Manufactured in accordance with recognised standard and fit for purpose. Further information in IMCA D 047	A		
6.5		Overpressure tested to 1.25 times maximum rated working pressure when new or other testing to establish structural integrity as required by the ASME PVHO standard	A		
6.6		Visual examination in situ in the last 6 months	A		
6.7		Gas leak test as an integral part of the trunking they are fitted to in the last 2½ years	A		
6.8		Internal overpressure test as an integral part of the trunking they are fitted to in the last 5 years (or other testing to establish structural integrity as required by the competent person)	A		
6.9		Complete renewal within the last 10 years. That is from the date of fabrication	A		
7	**HRU Interface Panel**				
7.1	Short Connections	Flexible connections between the dive system supplies and the HRU interface panel should be kept as short as possible to minimise the risk of damage	A		
7.2	Protection	All flexible connections between the dive system supplies and the HRU interface panel should be protected from physical damage including dropped objects	B		
7.3	Safety Restraints	Flexible gas hoses should be fitted with a safety restraint at each end to protect against whipping in the event of failure	B		
7.4	Regular Inspection	A system should be present requiring regular visual inspection of all the flexible connections to ensure they are not deteriorating due to their exposed location. The results should be recorded	B		
7.5	Hose Venting	A means should be provided to allow all flexible gas hoses to be closed and exhausted prior to disconnection	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
7.6	Testing of Pipework, Valves etc. *D 018, Sheets 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
7.7		Internal cleanliness verified to appropriate standard	A		
7.8		Visual examination in the last 6 months	A		
7.9		Gas leak test at maximum working pressure in the last 2 years	A		
7.10	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		

Section 15.3 – Hyperbaric Rescue Unit (HRU)

There are two basic types of hyperbaric rescue unit (HRU):

a) a pressure chamber adapted for use in an evacuation. This is likely to be designed for lift-off and may have a free-floating capability;
b) a dedicated rescue system where a pressure chamber is fitted into or forms part of a purpose-built lifeboat.

The requirements below will need to be interpreted in relation to which type of HRU is fitted.

Where there is more than one chamber or lifeboat, a table should be completed for each one.

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**General**				
1.1	Type	Which type of HRU is fitted?			
1.2	Propulsion	Is the HRU fitted with a means of propulsion or does it require external assistance (cranage, towing vessel etc.) to ensure it can be rapidly moved clear of the site			
1.3	Capacity	The HRU must be outfitted to accommodate the maximum number of divers who may be under pressure. If more than one HRU then the total HRU capacity should meet this requirement	A		
1.4	Marking	The HRU must be marked in accordance with international recommendations. These can be found in IMCA D 027	A		
1.5	Floating	Any HRU designed to be free floating must be both positively buoyant and also stable when fully equipped and manned. This must have been demonstrated by means of practical testing	A		Date of Test:
1.6	Communication	There must be a means of communication between the HRU launch point and the HRU surface crew personnel (if relevant). This may be by line of sight, voice communication, radio or other means	B		
2	**Pressure Vessel**				
2.1	Design	The pressure vessel forming the chamber of the HRU must have been designed and built to a recognised international standard and be fit for the purpose of human occupancy Note: Any unit manufactured after 1 July 2014 must also be certified to the recognised international standard Note: The design standard, serial number, date of manufacture, etc. can often be found hard stamped on a suitable part of the unit, in an accessible position	A		
2.2	Minimum Diameter	Any chamber used for hyperbaric evacuation and manufactured after 1 January 2015 should have a minimum internal diameter of 69 inches if using imperial measurements or 1750 mm if using metric measurements Chambers manufactured before that date do not need to meet this size requirement	A		
2.3	Volume	It is important that the volume of the chamber is accurately known to allow gas calculations to be carried out	A	Volume of chamber:	
2.4	Test Boundary	A pressure test procedure should be available showing the pressure boundary test sequence	A		
2.5	Pressure Vessel Testing *D 018, Sheet 25.1*	Visual examination within the last 6 months	A		
2.6		Thorough internal and external visual inspection plus a gas leak test at full working pressure in the last 2½ years	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
2.7		Internal overpressure test within the last 5 years (or other testing as agreed by an international classification society) plus a gas leak test at full working pressure Note: The competent person may consider wall thickness measurement if insulation has been in place for a number of years	A		
3	**Viewports**				
3.1	Condition	Viewports must be free of cracks or scratches that could affect pressure integrity	A		
3.2	Protection	Where there is a risk of damage to a viewport from dropped objects or other physical impact, then suitable protection must be provided. This may be accomplished by the installation of plastic covers (or similar) over the viewports	B		
3.3	Identification	If the serial number or other identifying mark for each viewport is not visible when fitted in situ then it should be prominently marked on the outside of the chamber adjacent to each viewport	B		
3.4	Viewport Testing *D 018, Sheet 25.2*	Manufactured in accordance with recognised standard and fit for purpose. Further information in IMCA D 047	A		
3.5		Overpressure tested to 1.25 times maximum rated working pressure when new or other testing to establish structural integrity as required by the ASME PVHO standard	A		
3.6		Visual examination in situ in the last 6 months	A		
3.7		Gas leak test as an integral part of the chamber they are fitted to in the last 2½ years	A		
3.8		Internal overpressure test as an integral part of the chamber they are fitted to in the last 5 years (or other testing to establish structural integrity as required by the competent person)	A		
3.9		Complete renewal within the last 10 years. That is from the date of fabrication	A		
4	**Firefighting** – *Note: This section refers to firefighting facilities external to the chamber. Separate arrangements need to be made for inside the chamber (see 6.30 below)*				
4.1	Availability	Suitable firefighting arrangements must be made for the area around the HRU. This may be by means of permanent ship or platform provided equipment or by means of portable extinguishers etc. It should be capable of dealing with any type or size of foreseeable fire hazard	A		
4.2	Firefighting Testing *D 018, Sheet 15 & 16*	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		
4.3		If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
4.4		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
4.5		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
4.6		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
5	**Chamber External**				
5.1	Paintwork	Paintwork must be in good condition and the chamber free from serious corrosion	A		
5.2	Insulation	Insulation (if fitted) should be clean and in good condition	B		
5.3	Seals	Seals on mating faces must be clean, undamaged and covered lightly in silicone grease. If the sealing area is painted then this must be in good condition	A		
5.4	Hollow Penetrators	All hollow penetrators (other than the bores of medical locks) must be fitted with protection valves or other devices to stop catastrophic pressure loss	A		
5.5	Electrical Penetrators	All electric penetrators must be certified by a competent person (IMCA D 018 category 3 or 4) as fit for purpose	A		
5.6	Penetrator Marking	All penetrators must be clearly marked to show their function	A		
5.7	Valves	Valves must be free of corrosion and should move freely through their full range of operation	A		
5.8	Valve Marking	All valves must be clearly marked with their function	A		
5.9	Valve Securing	All external valves should be secured in either the open or closed position to avoid accidental operation during launching. This securing can be by tape or light wire to allow easy operation of the valves by the surface crew if needed	B		
5.10	Valve Accessibility	All external valves should be accessible to the surface crew (if relevant)	A		
5.11	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		
5.12	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
5.13	Medical Lock Interlock	A safety interlock system must be fitted to the clamping mechanism securing the lock outer door. This interlock must make it impossible to open the mechanism/door if there is still pressure inside the lock and impossible to obtain a gas tight seal on the lock if the door/mechanism is not properly closed	A		
5.14	Interlock Pipework Testing *D 018, Sheet 24.1, 24.2 & 34*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
5.15		Visual examination and function test in the last 6 months	A		
5.16		Gas leak test at maximum working pressure of the system in the last 2 years	A		
5.17	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6	**Chamber Internal**				
6.1	Paintwork	Paintwork must be in good condition and the chamber free from serious corrosion	A		
6.2	Seals	Seals on mating faces must be clean, undamaged and covered lightly in silicone grease. If the sealing area is painted then this must be in good condition	A		
6.3	Hollow Penetrations	All hollow penetrators (other than the bores of medical locks) must be fitted with protection valves or other devices to stop catastrophic pressure loss (see also 5.4 above)	A		
6.4	Penetrator Marking	All penetrators must be clearly marked to show their function	A		
6.5	Valves	Valves must be free of corrosion and should move freely through their full range of operation	A		
6.6	Valve Marking	All valves must be clearly marked with their function	A		
6.7	Valve Securing	Valves should be secured in either the open or closed position to avoid accidental operation during rough seas. This securing can be by tape or light wire to allow easy operation of the valves if needed	B		
6.8	Valve Accessibility	All valves should be accessible to the occupants	A		
6.9	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		
6.10	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
6.11	Exhausts	Any open ended exhaust orifice must be fitted with guards to prevent suction hazard	A		
6.12	Inlets	Any gas inlet pipework should be fitted with some form of diffuser	B		
6.13	Life Support to HRU Chamber Communications	Prior to launch there must be a dedicated hard wire two-way voice communication system between life support control on the mother vessel and the divers inside the HRU	A		
6.14	HRU Crew Communications	There must be two-way voice communications between the divers inside the chamber and the surface crew outside at the HRU life support control point	A		
6.15	Secondary Communications	A secondary (back up) communication system (such as a sound powered phone) should exist between the divers inside the chamber and the surface crew outside at the HRU life support control point	B		
6.16	Communication Testing *D 018, Sheet 6*	Examination and function test plus check condition of batteries (if applicable) in the last 6 months	A		
6.17	BIBS	There should be one BIBS connection and mask for each intended occupant plus one spare	A		
6.18	Overboard Dump	BIBS should be overboard dump type with exhausts piped both outside the chamber and outside the enclosed surface crew compartment in the case of an HRU with such a compartment	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.19	BIBS Testing *D 018, Sheet 5.2*	Visual examination and function test (including communications if fitted) in the last 6 months	A		
6.20	Illumination	There must be sufficient internal lighting to allow valves and controls to be operated safely. It must also be sufficient to allow surveillance from outside	A		
6.21	Doors	Consideration should be given to having a means of securing doors in the closed position to avoid inadvertent flooding by sea water at shallow depths	C		
6.22	Door Opening	All manway doors must be capable of being opened from either side. This is particularly important if any dogging mechanism is fitted	A		
6.23	Door Securing	All doors should be able to be secured in the open position	B		
6.24	Pressure Equalisation	Doors should be fitted with a means of pressure equalisation	B		
6.25	Sanitary Facilities	Suitable toilet facilities must be available consistent with the length of time the occupants are expected to be in the chamber	A		
6.26	Toilet	If a flush type toilet is fitted then it must have sufficient interlocks to stop it being flushed while occupied	A		
6.27	Safety	One seat belt restraint should be fitted for each occupant	B		
6.28	Head Protection	Protective headgear should be provided for the occupants	B		
6.29	Unconscious Diver	A suitable means should be fitted to assist an unconscious diver in to the HRU. If this is by a pulley system then the length must be sufficient for the length of trunking involved	B		
6.30	Firefighting	There must be a suitable means fitted to extinguish a fire in the chamber	A		
6.31	Firefighting Testing *D 018, Sheet 15 & 16*	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		
6.32		If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
6.33		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
6.34		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
6.35		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		
6.36	Medical Equipment	There should be medical equipment present to the level specified in the diving contractor's manuals. As a minimum this should comply with the requirements of DMAC 15 (or as agreed with company medical adviser) unless local regulations prohibit any of the contents	A		
6.37	Medical Container	The equipment should be in a suitable protective container clearly marked with a white cross on a green background	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.38	Validity	The equipment should have been checked for integrity within the last 6 months with the date the next check is due clearly marked on it	A		
6.39	Thermal Balance	Occupants must be maintained in thermal balance. This is a function of the number of occupants and the likely ambient external temperature. Detailed guidance on the assessment of such requirements is available from IMCA however many diving contractors work on a 'worst case' scenario. In that case, heating (or cooling) must be provided for the maximum number of occupants for cooling and the minimum number of occupants for heating	A		
6.40	Heating/Cooling Duration	If heating (or cooling) is powered by mechanical means (an HRU engine for example) then this should be capable of running for a minimum of 72 hours continuously	B		
6.41	Survival Bags	If heat retention is intended by means of survival bags, then these must be a suitable quantity of an appropriate type, correctly packaged and in good condition	A		
6.42	Survival Bag Testing *D 018, Sheet 33*	Visual examination of survival packs and check condition of passive scrubber charge (if relevant) in the last 6 months	A		
6.43		Packs must be unpacked, checked and repacked or returned to the suppliers for overhaul within the last 3 years	A		
6.44	Carbon Dioxide	A suitable means must be available to remove carbon dioxide from the atmosphere for at least 72 hours for the maximum number of occupants	A		
6.45	ECU	If an environmental control unit is fitted then it must meet the following:			
6.46	Gas Discharge	Have a clear passage for discharge of gas	A		
6.47	Large Bore Piping	If an external ECU with large bore piping, be fitted with a non-return valve on the inlet and flow fuse on the exhaust, either internally or externally at the hull penetration. This can be in place of the protection valve at that point (see 5.4 & 6.3)	B		
6.48	Provision	Be capable of providing heating/cooling/CO_2 scrubbing/humidity control	B		
6.49	ECU Testing *D 018, Sheet 13*	Visual examination and function test within the last 6 months	A		
6.50	Pipework and Valve Testing *D 018, Sheets 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
6.51		Visual examination within the last 6 months	A		
6.52		Gas leak test at maximum working pressure in the last 2 years	A		
6.53	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
6.54	Depth Indication	A gauge or other means of indicating depth should be provided showing the occupants what their depth is	B		
6.55	Gauge Calibration *D 018, Sheet 19*	All gauges must have been visually examined and checked against a certified test instrument to the required accuracy in the last 6 months	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
7	**HRU Life Support Control**				
There should be a life support control point *In many HRUs this will be situated external to the chamber but internal to a lifeboat hull* *In other types of HRU a modified life support control may be fitted inside the chamber to allow the divers some control over their environment*					
7A	**HRU Without External (Surface) Life Support Control**				
The occupants of the chamber should have the following facilities:					
7A.1	Gas Control	Sufficient valves and fittings to allow pressurisation gas and exhaust control	A		
7A.2	Pressure Regulation	Consideration should be given to regulating the pressure of gas supplies externally to a maximum of 30 bar over the maximum internal pressure of the chamber	C		
7A.3	Oxygen Control	Sufficient valves and fittings to allow make up of metabolic oxygen	A		
7A.4	Oxygen Regulation	The externally carried oxygen supply must be fitted with a means whereby it is regulated to a low pressure before it enters the chamber. HP oxygen must not be available inside the chamber	A		
7A.5	Oxygen Flow Limiting	The oxygen coming in to the chamber must be fitted with a system which limits either the rate of flow or the volume which can enter in order to minimise the risk of excess O_2 building up in the chamber	A		
7A.6	Gauges	Gauges indicating gas supply pressures and depth inside the chamber	A		
7A.7	Oxygen Analysis	A means of analysing oxygen levels in the chamber	A		
7A.8	CO_2 Analysis	A means of analysing carbon dioxide levels in the chamber	A		
7A.9	Documentation	A copy of the emergency procedures and any other relevant procedures or manuals Note: The auditor is not being asked to confirm the adequacy of these procedures, merely that they are present	A		
7A.10	Pipework Testing *D 018 Sheets 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
7A.11		Valves and pipework need to have been visually examined in the last 6 months	A		
7A.12		Valves and pipework need to have had a gas leak test to maximum working pressure in the last 2 years	A		
7A.13	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
7A.14	Communication Testing *D 018, Sheet 6*	All communications links must have been examined and function tested in the last 6 months. The condition of the batteries should have been checked (if applicable)	A		
7A.15	Gauge Calibration *D 018, Sheets 18, 19 & 20*	All gauges must have been visually examined, function tested in situ, calibrated and/or tested (as relevant) to the required accuracy in the last 6 months	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
7A.16	Analysis/Analyser Testing *D 018, Sheets 1 & 2*	Analysers must be examined, function tested and calibrated in situ within the last 6 months OR (if relevant) Examination and function test of pump plus check expiry date of tubes within the last 6 months	A		
7B	**HRU With External (Surface) Life Support Control**				
The life support control should have the following facilities:					
7B.1	Procedures	A copy of the emergency procedures and any other relevant procedures or manuals must be available at the life support control point. This must include any plans for reception of the HRU onshore or at another location Note: The auditor is not being asked to confirm the adequacy of these procedures, merely that they are present	A		
7B.2	Access	There must be a level of access available around the control point and any other areas necessary for the operation of the HRU, sufficient to allow life support personnel to safely and efficiently carry out their duties	A		
7B.3	Signs	Safety warning signage (such as electrical hazard etc.) must be clearly displayed at the control point; the signage shall comply with international/national safety signs requirements	A		
7B.4	Lighting	There must be a level of lighting available at all times around the control point and any other areas necessary for the operation of the HRU, sufficient to allow life support personnel to safely and efficiently carry out their duties	A		
7B.5	Emergency Lighting	Emergency lighting should be available in all the above areas to allow personnel to operate safely	B		
7B.6	Communications Life Support to HRU Surface Crew	Prior to launch there must be a means of two-way voice communication between life support control on the mother vessel and the personnel inside the surface crew compartment of the HRU	B		
7B.7	HRU Crew Communications	There must be two-way hard wired voice communications between the divers inside the chamber and those outside at the HRU life support control point	A		
7B.8	Secondary Communications	A secondary (back up) communication system (such as a sound powered phone) should exist between the divers inside the chamber and those outside at the HRU life support control point	B		
7B.9	Communication Testing *D 018, Sheet 6*	All communications links must have been examined and function tested in the last six months. The condition of batteries should have been checked (if applicable)	A		
7B.10	Control Point	The life support personnel must be provided with a control panel (or similar) to allow them to properly control and monitor the conditions inside the pressurised chamber	A		
7B.11	Gauges	Life support personnel must have available to them enough suitable gauges so that they are aware of the depth of the chamber and of the supply pressures of each breathing supply	A		
7B.12	Pressure Limiting	A pressure limiting device may be fitted to avoid gauges being over pressurised	C		

Item	Description	Requirement	Need	Response	Certificate Issue Date
7B.13	Depth	These are gauges used to provide information for operational and decompression control The scale must be appropriate to the duty, i.e. large enough to be read easily and accurately. They should normally operate in the range 25 to 75% of full scale deflection although they will need to operate in the 0 to 25% range during decompression. If used for the final stages of decompression they must have scale divisions of no more than 0.5 msw/2 fsw	A		
7B.14	Unit Marking	All depth gauges should be marked in the same unit system (imperial or metric). Dual scale marking is acceptable	A		
7B.15	Contractor's Tables	The unit marking system of the gauges (imperial or metric) should correspond to the units used in the contractor's diving tables	A		
7B.16	Digital Gauges	If the gauge is digital then the display must be large and clear enough to be read in all conditions. It must be clearly marked on the unit whether it reads in feet or metres and it should display the reading to one decimal point. (If further information is required, refer to AODC 059)	A		
7B.17	Gas Source/Supply	These are gauges that indicate pressure but are not directly used for life support			
7B.18	Gauge Position	They must be positioned to show the line pressure of sources coming in to the panel and also of any supplies leaving the panel. A system must be in place to ensure that incorrect readings cannot happen in certain valve positions	A		
7B.19	Scale Divisions	They must meet the requirements for depth gauges above except that they may be much smaller and with larger scale divisions. They are not calibrated as depth gauges	A		
7B.20	Cross-over Valves	Great care must be taken if cross-over valves are fitted with the result that any gauge can possibly read more than one thing. Cross-over valves should either be fixed in one position (the handles may be removed to avoid accidental changes) or should indicate very clearly what supply they are connected to. In any event any gauge fitted with a cross-over valve must indicate very clearly at all times exactly what it is reading	A		
7B.21	Gauge Calibration *D 018, Sheets 18, 19 & 20*	All gauges must have been visually examined, function tested in situ, calibrated and/or tested (as relevant) to the required accuracy in the last 6 months	A		
7B.22	General	The life support personnel must be provided with sufficient valves and fittings to allow gas and exhaust control plus make up of metabolic oxygen	A		
7B.23	Ease of Operation	All valves must be free of corrosion and should operate easily	A		
7B.24	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
7B.25	Valve Marking	The function of all valves must be clearly marked	A		
7B.26	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
7B.27	Exhaust Venting	Exhaust pipework must not vent in to an enclosed space Note: Panel PRVs, medical lock vents and sampling for analysis do not constitute exhaust pipework	A		
7B.28	Accessibility	Gas pipework, particularly in panels and at connection points, must be accessible for maintenance and repair	B		
7B.29	O_2 Make Up	There must be a flow indicator at the control point on the downstream side of the chamber O_2 make-up line to indicate that O_2 is flowing in to the chamber	B		
7B.30	Pipework Testing *D 018 Sheets 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
7B.31		Valves and pipework need to have been visually in the last 6 months	A		
7B.32		Valves and pipework need to have had a gas leak test to maximum working pressure in the last 2 years	A		
7B.33	Relief Valves	Pressure relief valves may or may not be fitted within the control area. If they are fitted then they should comply with the testing requirements detailed below			
7B.34	Relief Valve Testing *D 018, Sheet 24.3*	Visual examination in the last 6 months	A		
7B.35		Function test at required relief setting followed by leak test at maximum working pressure in the last 2½ years. Normally the leak test is carried out integral with the pipework	A		
7B.36	Electrics	All electrical equipment must be securely installed with all power leads and wiring secured in such a way that it is protected from accidental damage	A		
7B.37	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
7B.38	Firefighting	Suitable firefighting arrangements must be made for the control area. This may be by means of fixed equipment or by means of portable extinguishers etc. It must be capable of dealing with any type or size of foreseeable fire hazard	A		
7B.39	Firefighting Testing *D 018, Sheets 15 & 16*	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		
7B.40		If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
7B.41		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
7B.42		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
7B.43		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		
7B.44	First Aid	A suitable first aid kit should be available at the control area to treat minor injuries sustained by the surface crew	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
7B.45	Marking	The equipment should be in a suitable protective container clearly marked with a white cross on a green background	B		
7B.46	Examination	This equipment must have been checked for integrity within the last 6 months with the date the next check is due clearly marked on it	A		
7B.47	Surveillance	The life support personnel must be able to have sight of the divers inside the chamber. If this is not possible through an easily accessible viewport, then a CCTV system must be provided	B		
7B.48	Environmental Control	There must be a means of measuring the various environmental parameters inside the chamber. In the case of some parameters this requires both primary and secondary (back up) capabilities. The parameters to be monitored are:	A		
7B.49	Oxygen Primary	Oxygen – Primary analysis	A		
7B.50	Oxygen Secondary	Oxygen – Secondary analysis	B		
7B.51	CO_2 Primary	Carbon dioxide – Primary analysis	A		
7B.52	CO_2 Secondary	Carbon dioxide – Secondary analysis	B		
7B.53	Temperature	Temperature	A		
7B.54	Control Point Analysis	An oxygen analyser with high and low alarm should be fitted to detect changes in the oxygen level ambient to the control point as a result of possible gas leaks	A		
7B.55	Maintenance Analysis	An oxygen analyser with high and low alarm should be fitted to warn maintenance personnel of an incorrect oxygen level when the chamber is at atmospheric pressure prior to them entering the chamber	B		
7B.56	Analyser and Alarm Testing *D 018, Sheets 2 & 34*	Analysers must have been examined, function tested and calibrated in situ within the last 6 months	A		
7B.57		Alarms must have been function tested within the last 6 months	A		
7B.58	Chamber Temperature Control	A means should be available to allow the life support personnel to control the temperature inside the chamber	B		
7B.59	Surface Crew Compartment Temperature Control	A means should be available to allow the life support personnel to control the temperature inside the surface crew compartment	B		
8	**Batteries**				
8.1	Hazard	Batteries can give off potentially explosive fumes when being charged. This can even be the case with 'sealed' batteries. All necessary precautions and maintenance must be included in the documented maintenance system for the HRU	A		
8.2	Ventilation	If batteries are being charged for use in connection with the HRU then there should be good ventilation in the vicinity	B		
8.3	Atmosphere Monitoring	Consideration should be given to the installation of a gas analyser to permit continuous monitoring for explosive gas (typically hydrogen) in any enclosed space	C		

Item	Description	Requirement	Need	Response	Certificate Issue Date
8.4	Off –Site Charging	Consideration may be given to removal of batteries from an HRU for charging off site, but only if a second set, fully charged, is installed in the HRU	B		
8.5	Warning	A warning sign should be fitted in the vicinity of any batteries which are trickle charged for use in or on the HRU	B		
8.6	Location	Batteries should be located outside the pressurised chamber of an HRU and physically isolated from the atmosphere inside any life support (surface crew) compartment by means of a water tight compartment	B		
8.7	Venting	When batteries are charged inside the non-pressurised section of an HRU, the battery compartment must be actively ventilated by means of vent lines to the open atmosphere outside the HRU. A safe fan (brushless type) or other appropriate means of positively venting the compartment should be used in such a way that the compartment atmosphere is expelled through one opening, while fresh air enters by another route. Such a system may be activated automatically whenever the batteries are charged	B		
8.8	Fan Failure	An automatic cut-out should be fitted such that battery charging stops if the ventilation fan fails. Such a cut-out should trigger an alarm within the main life support control of the diving system	A		
8.9	Condition Monitoring	A means should be fitted to ensure that the batteries are charged when the voltage drops but are not overcharged	B		
8.10	Maintenance	The PMS should include regular checks on battery voltage, output of charger, correct operation of any cut-outs, alarms work correctly, etc.	A		
9	**Gas Supplies**				
9.1	Mixed Gas	A minimum quantity of mixed gas must be carried sufficient to compensate for the use of the food lock and to allow for minor leakage. This quantity should be as specified by the diving contractor in their risk assessment	A		
9.2	Oxygen	Sufficient oxygen must be carried to allow for metabolic consumption by the maximum number of divers for 72 hours. This quantity should be as specified by the diving contractor in their risk assessment	A		
9.3	Oxygen Injection	The oxygen supply must be fitted with a device where it is injected at a controlled rate. Typically this will be a flowmeter or similar device	B		
10	**Gas Cylinders**				
10.1	Marking	All cylinders must be colour coded and marked with the name and chemical symbol of their contents in line with IMCA D 043 or a recognised local national standard	A		
10.2	Cylinder Condition	Each cylinder should be in good condition and free from serious corrosion	A		
10.3	Test Date	The last test date stamp on each cylinder should be painted over with a small patch of distinctive coloured paint to aid location. If this is inaccessible then the cylinder serial number should be visible or else stencilled in a visible location	B		
10.4	Securing	Cylinders should be adequately secured for the operating conditions that the HRU may encounter	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
10.5	Isolating Valves	Each cylinder should be fitted with a valve allowing the cylinder to be isolated from the rest of the system. This valve should be easily accessible to the surface crew (if relevant)	A		
10.6	Charging Point	Suitable arrangements should exist to allow the cylinders to be re-charged or topped-up at regular intervals	B		
Note: Most cylinders associated with use in or on an HRU either are or can be exposed to considerable moisture externally. They therefore require a specific examination and testing schedule which is detailed in IMCA D 018 detail sheet 10.3 (points 10.7 to 10.9 below)					
10.7	Cylinder Testing *D 018, Sheet 10.3*	External visual examination within the last 6 months	A		
10.8		Thorough external visual examination plus gas leak test to maximum working pressure within the last 2 years. If the competent person deems it necessary, a hydraulic overpressure test may be required	A		
10.9		Thorough internal visual examination plus hydraulic overpressure test to 1.5 times maximum working pressure (or the factor required by the design code or standard if different) plus the 2 yearly tests above within the last 4years	A		
11	**Location Devices** – *Note: Every HRU designed to enter the water must be fitted with devices to assist its location by rescuers*				
11.1	Radar Reflector	Should be fitted with radar reflector	B		
11.2	Strobe Light	Should be fitted with strobe light	B		
11.3	Radio Location	Should be fitted with EPIRB or similar	A		
In addition to the above, an HRU with a surface crew should have the following to allow them to contact rescuers and establish their position:					
11.4	Radio	Should be fitted with marine VHF radio	A		
11.5	GPS	Should be fitted with GPS receiver or similar	A		
11.6	Satellite Phone	Consideration should be given to the provision of a satellite phone	C		
11.7	Device Testing *D 018, Sheet 34*	All such devices (if provided) should have been visually examined and function checked within the last 6 months Note: The function test is not required if the device is sealed and subject to regular manufacturer servicing	A		
12	**Consumables** – *Note: Under the SOLAS regulations a lifeboat must contain certain items. An HRU must therefore contain all of the following that are relevant to the type of HRU:*				
12.1	Water	There should be adequate supplies of drinking water for the maximum number of divers under pressure (plus surface crew) and designed duration of the life support of the HRU. This quantity should be as specified in the diving contractors procedures. Under the SOLAS requirements this is a minimum of 3 litres of drinking water per occupant for the maximum number of occupants, stored in watertight containers	A		
12.2	Food	There should be adequate supplies of food for the maximum number of divers under pressure (plus surface crew) and designed duration of the life support of the HRU. This quantity should be as specified in the diving contractors procedures. Under the SOLAS requirements this is a minimum of 10,000 kJ per person for the maximum number of occupants. Food to be packed in airtight packs kept in a watertight container	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
12.3	Ladle	A rustproof dipper/ladle with lanyard	B		
12.4	Drinking Vessel	A rustproof graduated drinking vessel	A		
12.5	Tin Openers	Three tin openers	B		
12.6	Seasickness and Waste	There should be adequate supplies of seasickness medication and metabolic waste collection bags for the maximum number of divers under pressure (plus surface crew) and designed duration of the life support of the HRU. This quantity should be as specified in the diving contractors procedures. Under the SOLAS requirements this is a minimum of six doses of anti sea sickness medicine and one seasick bag per occupant, all for the maximum number of occupants	B		
Note: In addition to the above items, where minimums are set by SOLAS (the diving contractor's procedures may specify higher quantities) a number of other consumables are required, specific to the hyperbaric situation					
12.7	CO_2 Absorbent	There should be adequate supplies of CO_2 absorbent for the maximum number of divers under pressure and designed duration of the life support of the HRU. This quantity should be as specified in the diving contractors procedures and stored in watertight containers	A		
12.8	Other Absorbent	There should be adequate supplies of absorbents of other contaminants for the maximum number of divers under pressure and designed duration of the life support of the HRU. This quantity should be as specified in the diving contractors procedures	B		
13	**Towing**				
13.1	Towing Line	All HRUs should be fitted with a suitable towing point and towing line or bridle	B		
13.2	Towing Test	A test should have been carried out to demonstrate that the towing arrangement is adequate and that the HRU can be safely towed through the water	A		
14	**Compliance with Standard Interfaces**				
An HRU manufactured after 1 July 2014 should meet the common interface standards laid out in IMCA D 051. Units manufactured before that date may not meet these standards or may partially meet them. The Response sections below should be completed to indicate whether the relevant standard is complied with and if not, what alternative arrangements are in place. The auditor will normally rely on paperwork provided to him rather than being required to carry out physical measurements					
14.1	Manufacture	When was the HRU manufactured			
14.2	Towing	Is the towline fitted, attached and stowed as per the requirement. One possible configuration is shown in Appendix A of IMCA D 051	B		
14.3	Lifting Bridle	Is the HRU fitted with a lifting bridle as per Appendix A of IMCA D 051	B		
14.4	Location	Does the HRU have the location arrangements fitted as shown in Appendix B of IMCA D 051	A		
14.5	Flange Position	Is the bottom mating flange of the HRU on the centre-line of the HRU as shown in Appendix G of IMCA D 051	A		
14.6	Flange Profile	Is the bottom flange of the profile as shown in Appendix D of IMCA D 051	A		
14.7	Sacrificial Ring	Is the bottom flange fitted with a sacrificial ring as shown in Appendix E of IMCA D 051	A		
14.8	Service Connections	Is the HRU fitted with the service connections as shown in Appendix H of IMCA D 051	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
14.9	Mating Trials *IMCA D 052, section 5.6*	Actual mating trials should have taken place with the intended HRF. This need only be carried out once, unless modifications are made to either the HRU or the HRF in which case the mating trials need to be repeated	A		

Section 15.4 – HRU Launch and Recovery System

Note: The subject of HRU launch/recovery systems is complex and may impinge on other international requirements such as SOLAS.

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**General**				
1.1	Capacity	Launch/recovery systems must have a safe working load which is at least that of the HRU when fully manned and laden (including consumables). This should take account of any modifications or extra equipment since the HRU was first installed	A		
1.2	General	There must be a detailed, installation specific, written procedure for the launching of the HRU which identifies clearly who is responsible for each part of the operation	A		
1.3	Availability	Laminated copies of the relevant sections of the launch procedures should be available at the launch point	A		
2	**Dedicated Launch System (including SOLAS type)**				
2.1	Specification	Manufactured to SOLAS requirements OR with specified and approved deviations. Fit for purpose	A		
2.2	Fall Length	Falls should be long enough to allow the HRU to be fully supported in the water when the vessel is at its lightest draft and at the worst angle of list (15 degrees) and trim	B		
2.3	Release Hooks	On-load release hooks should have been evaluated by the Flag State for compliance with IMO requirements by 1 July 2013. If they do not comply then they must be replaced at the first dry docking after 1 July 2014 and at all events by 1 July 2019	A		
2.4	Launch System Testing *D 018, Sheet 32.1*	On installation, overload tested in accordance with IMO guidance at full outboard position	A		
2.5		Thorough visual examination for deterioration within the last 6 months	A		
2.6		Practice deployment within the last 6 months	A		
2.7		Function test within the last 12 months	A		
2.8		Falls replaced within the last 5 years	A		
3	**Non Dedicated Launch System**				
3.1	Specification	Manufactured to a recognised international Standard or Code OR built in accordance with manufacturer's specification. Fit for purpose	A		
3.2	Emergency Removal	If the HRU is meant to float in water but is not self-propelled then there must be a plan in place to ensure it is removed from the area of the abandoned vessel. There must be clear directions in the Emergency Procedures as to how this will be effected giving due consideration to weather and sea conditions	A		
3.3	Launch System Testing *D 018, Sheet 32.2*	Practice deployment within the last 6 months	A		
3.4		Thorough visual examination and static load test at 1.25 times maximum SWL within the last 6 months	A		
3.5		Function test at SWL within the last 6 months	A		
3.6		Static Load Test at 1.5 times maximum SWL plus NDE of critical items within the last 12 months	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
4	**Practice Deployment** *Notes:* *When carrying out practice deployments, the HRU chamber should be pressurised and unmanned* *As far as possible any practice should simulate operational conditions* *Practice deployments should normally only be carried out in sheltered calm waters*				
4.1	Regularity	A practice deployment of the HRU should have been carried out within the last 6 months	A		
4.2	Incomplete Lowering	If the practice deployment stops short of sea level, then the lift wire release mechanism must be demonstrated by other means	A		
4.3	Secondary Means	Where a secondary means of launch is provided (such as stored energy) then practical deployment of the HRU using the secondary system must be carried out under the same conditions and frequency as the primary system	A		
4.4	Once Only Systems	'Once only' systems or systems which require the replacement of major components after use need not be practised at the intervals given above but evidence should be available that a practice deployment has taken place within the last 5 years	B		
5	**Firefighting**				
5.1	Availability	Suitable firefighting arrangements must be made for the launch and recovery area. This may be by means of permanent ship or platform provided equipment or by means of portable extinguishers, etc. It should be capable of dealing with any type or size of foreseeable fire hazard	A		
5.2	Firefighting Testing *D 018, Sheets 15 & 16*	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		
5.3		If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
5.4		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
5.5		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
5.6		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		
6	**Communications**				
6.1	Life Support to Launch Point	There must be a dedicated hard wire two-way voice communication system between life support control on the mother vessel and the HRU launch point	A		
6.2	Bridge to Launch Point	There must be a means of two-way voice communication between the vessel bridge (or other central control point) and the launch point	B		
6.3	Life Support to Clamp	There must be a means of two-way voice communication between life support control on the mother vessel and the external HRU trunking exhaust point/clamp release point	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.4	Clamp to Launch point	If the clamp release point and the launch point are not adjacent then there must be an agreed means of communication between these two points. This may be by voice or hand signals	B		
6.5	Crew and Launch Point	There must be a means of communication between the HRU launch point and the HRU surface crew (if relevant). This may be by line of sight, voice communication, radio or other means	B		
6.6	Communication Testing *D 018, Sheet 6*	The communications must have been examined and function tested in the last 6 months in addition to normal pre-dive checks	A		

Section 16 – Life Support Package (LSP)

The life support package is an emergency facility that functions in a similar manner to the overall life support system on an offshore saturation system. The exact detail of the LSP will be dependent on the planning and risk assessment for the method of recovering the HRU and carrying out the decompression. In some circumstances the LSP may be already built in to a specialised recovery vessel and in other cases may be needed only to provide support during transport of the HRU from the recovery site to a nominated HRF

The LSP needs to be capable of providing all necessary life support and control for the period of time taken to locate the HRU and LSP to an HRF or if required, to carry out a full decompression. It should therefore meet the requirements detailed below, subject to variations due to its type as mentioned above

Item	Description	Requirement	Need	Response	Certificate Issue Date
1	**Classification Society**				
1.1	General	The LSP may or may not be certified by a recognised classification society Note: The next point will only apply if the LSP is certified			
1.2	Conditions	If there are any conditions attached to the certification associated with the LSP then these should be clearly identified to those operating the system	A		
2	**Systematic Assessment**				
2.1	General	A systematic assessment of the LSP and its sub-systems should be available confirming that the equipment provided is both adequate and fit for its intended use. This assessment should take the form of a formal risk assessment, which may consist of a detailed risk assessment, HAZOP or an FMEA (IMCA D 039 provides guidance) to provide a systematic assessment for the identification of potential failure modes, to determine their effects and to identify actions to mitigate the failures Note: The auditor is not being asked to confirm the adequacy of this assessment, only that it has been carried out.	A		
3	**Documentation** – *The following documentation should be available as part of the LSP*				
3.1	Load Out List	A load-out list to check that all components/supplies are present	A		
3.2	Manuals	All relevant manuals including as a minimum, diving and equipment normal and emergency operating procedures, decompression tables and contacts list Note: The auditor is not being asked to confirm the adequacy of these procedures, merely that they are present	A		
3.3	Tapping Code	A tapping code card	A		
3.4	Quick Start Guide	A quick start guide – typically two pages on how to get the unit running quickly	B		
3.5	Valve Check Lists	Valve check lists for both LSP control and HRU	A		
4	**General Safety**				
4.1	General Access	There must be a level of access available around the LSP and its components sufficient to allow operational personnel to safely and efficiently carry out their duties	A		
4.2	Safety of Access	Consideration shall be given to the safety of personnel operating around the LSP in terms of such things as slip and trip hazards, access steps, hand rails, etc. Consideration should also be given to adjacent activities and equipment which could interfere with the LSP or HRU	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
4.3	Signs	Safety warning signage (such as electrical hazard, use of PPE, etc.) must be clearly displayed at all relevant locations; the signage shall comply with international/national safety signs requirements	A		
4.4	Sea Fastening (Design of)	If mounted on a vessel, the LSP should be appropriately sea fastened and there should be supporting documentation available from a competent person attesting that the necessary calculations and checks have been completed Note: This requirement may be different for a fixed installation Note: The auditor is not being asked to confirm the adequacy of these calculations and checks, only that they have been carried out	A		
4.5	Sea Fastening (Installation)	If sea fastening is required, any welded fixtures should have NDE reports available confirming these welds were satisfactorily tested by a competent person	A		
5	**Lighting**				
5.1	General	There must be a level of lighting available at all times within and around the LSP sufficient to allow personnel to safely and efficiently carry out their duties. This should have both primary and secondary power supplies for these lights	A		
5.2	Emergency Lighting	Automatic emergency lighting should be available in all internal critical areas to allow personnel to move around safely	B		
5.3	External Lighting	For an LSP that is not situated in a well lit area, portable external lighting for night working should be available. This should include a facility for emergency lighting (battery powered) in the event of power failure	B		
6	**Electrical Power**				
6.1	Schematic	Electrical schematics for the LSP should be available	A		
6.2	Power Requirements	An assessment is required to identify the electrical power required by the LSP in normal operational mode	A		
6.3	Primary Power	Primary power supply is assumed to be by connecting to vessel or shore based main supply. This connection should be by isolating transformer	B		
6.4	Emergency Power Requirements	The LSP must be able to continue operating in the event of loss of primary power. This will normally be by connection to an emergency generator. If a UPS is used as emergency support for critical low powered electrical apparatus (such as communications and analysis equipment), an assessment should be available detailing its duration under load against the time necessary to provide emergency power	A		
6.5	Transformers	Two transformers with variable input and providing outputs of 220/110V ac and 24/12V dc should form part of the LSP	A		
6.6	Supply Points	As a minimum there should be electrical supply points inside the container (or control area) available for 4 off 110V ac, 1 off 32A 3-phase and 1 off 16A single phase	A		
6.7	Electrics	All electrical equipment must be securely installed with all power leads and wiring secured (as far as is practical in the circumstances) in such a way that it is protected from accidental damage	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
6.8	Protection	A certificate should be available confirming that RCDs are fitted wherever possible to protect against electrical failures and that all components and any containers are correctly earthed	A		
6.9	Electrical Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
6.10	Emergency Power Testing	A test should have been carried out within the last 6 months to demonstrate the functioning and adequacy of emergency electrical power supplies The testing should include checks that power continues to be supplied in normal circumstances even if a UPS fails and that the visual indication of such failure works correctly	A		
7	**Container** – *Note: The section below applies where the LSP uses container(s) to house the control area and equipment. If the LSP is permanently built in to a ship or similar then this section does not apply*				
7.1	Rating	Containers should be suitable for offshore use in terms of lifting arrangements, strength, etc. Unless intended for use within a 'zoned' area they do not need to meet offshore electrical zoning requirements Note: If the LSP is not intended to go on a vessel or offshore then it does not need to meet this requirement	A		
7.2	Dividing Wall	If the control area and machinery are in the same container there should be a dividing wall between them	B		
7.3	Insulation	There should be thermal and sound insulation on walls and roof in control area	B		
7.4	Access Door	The access door to the control area should be capable of being opened from both sides	A		
7.5	Penetrator Panel	Penetrator panel for incoming/outgoing electrical and other supplies should not be sited in the immediate vicinity of the regular access door	A		
7.6	Heating	Where ambient temperatures are likely to be low there is a need to have heating inside the container. This will provide suitable and stable temperatures for the equipment/machinery and also a suitable working environment for the control area	A		
7.7	Cooling	Where ambient temperatures are likely to be high, there is a need to have cooling inside the container. Again, this will provide suitable and stable temperatures for the equipment/machinery and also a suitable working environment for the control area	A		
8	**Control Area** – *Note: The following section will apply to the control area whether inside a container or permanently built in to a ship or similar*				
8.1	Heating	Where ambient temperatures are likely to be low there is a need to have heating inside the control area	A		
8.2	Cooling	Where ambient temperatures are likely to be high, there is a need to have cooling inside the control area	B		
8.3	Breathing Apparatus	Emergency breathing apparatus fitted with communications must be available for the supervisor and one other person so that they may perform their duties in a smoky or polluted atmosphere	A		
8.4	Umbilical Supply	If umbilical supplied from a compressor then the air intake for the compressor must be situated in a pollution free zone. A BA set should also be available in case of umbilical supply failure or to allow escape	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
8.5	BA Testing *D 018, Sheet 5.1 & 9.1*	Visual examination and function test (including communications) in the last 6 months. Check made at the same time that cylinder is fully charged	A		
8.6		External visual examination of cylinder plus gas leak test to maximum working pressure in the last 2½ years	A		
8.7		Internal and external visual examination of cylinder plus gas leak test to maximum working pressure in the last 5 years (possible overpressure test)	A		
8.8	HRU Communications	There must be two-way hard wired voice communications between the divers inside the chamber and those outside at the LSP control point. This should include a helium unscrambler	A		
8.9	Secondary Communications	A secondary (back up) communication system (such as a sound powered phone) should exist between the divers inside the chamber and those outside at the LSP control point	B		
8.10	Communication Testing *D 018, Sheet 6*	All communications links must have been examined and function tested in the last 6 months, in addition to any standard pre-dive checks. Check condition of batteries (if applicable)	A		
8.11	Control Point	The life support personnel must be provided with a control panel (or similar) to allow them to properly control and monitor the conditions inside the pressurised chamber	A		
8.12	Gauges	Life support personnel must have available to them enough suitable gauges so that they are aware of the depth of the chamber and of the supply pressures of each main or back-up breathing supply	A		
8.13	Pressure Limiting	A pressure limiting device may be fitted to avoid gauges being over pressurised	C		
8.14	Depth	These are gauges used to provide information for operational and decompression control. The scale must be appropriate to the duty, i.e. large enough to be read easily and accurately. They should normally operate in the range 25 to 75% of full scale deflection although they will need to operate in the 0 to 25% range during decompression. If used for the final stages of decompression they must have scale divisions of no more than 0.5msw/2 fsw	A		
8.15	Unit Marking	All depth gauges should be marked in the same unit system (imperial or metric). Dual scale marking is acceptable	A		
8.16	Contractor's Tables	The unit marking system of the gauges (imperial or metric) should correspond to the units used in the contractor's diving tables	A		
8.17	Digital Gauges	If the gauge is digital then the display must be large and clear enough to be read in all conditions. It must be clearly marked on the unit whether it reads in feet or metres and it should display the reading to one decimal point. (If further information is required, refer to AODC 059)	A		
8.18	Gas Source/Supply	These are gauges that indicate pressure but are not directly used for life support			
8.19	Gauge Position	They must be positioned to show the line pressure of sources coming in to the panel and also of any supplies leaving the panel. A system must be in place to ensure that incorrect readings cannot happen in certain valve positions	A		
8.20	Scale Divisions	They must meet the requirements for depth gauges above except that they may be much smaller and with larger scale divisions. They are not calibrated as depth gauges	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
8.21	Cross-over Valves	Great care must be taken if cross-over valves are fitted with the result that any gauge can possibly read more than one thing. This is particularly the case if a depth gauge can read the depth of more than one compartment. Cross-over valves should either be fixed in one position (the handles may be removed to avoid accidental changes) or should indicate very clearly what supply they are connected to. In any event any gauge fitted with a cross-over valve must indicate very clearly at all times exactly what it is reading	A		
8.22	Gauge Calibration *D 018, Sheets 18, 19 & 20*	All gauges must have been visually examined, function tested in situ, calibrated and/or tested (as relevant) to the required accuracy in the last 6 months	A		
8.23	General	The life support personnel must be provided with sufficient valves and fittings to allow gas and exhaust control plus make up of metabolic oxygen	A		
8.24	Ease of Operation	All valves must be free of corrosion and should operate easily	A		
8.25	Oxygen Service	All valves and pipework must be cleaned for oxygen service when used for gas mixes containing more than 25% oxygen. This may be demonstrated by means of a suitable procedure to ensure cleanliness which is applied when any components are new or after there has been any significant alteration	A		
8.26	Valve Marking	The function of all valves must be clearly marked	A		
8.27	Quarter Turn Valves	Valves carrying oxygen (or mixes containing more than 25% oxygen) at a pressure higher than 15 bar must not be quarter turn Note: Due to the depths involved in saturation diving, the pressure of such gases will often require to be above 15 bar	A		
8.28	Exhaust Venting	Exhaust pipework must not vent in to an enclosed space. Typically the exhaust should be piped to vent to atmosphere Note: Panel PRVs, medical lock vents and sampling for analysis do not constitute exhaust pipework	A		
8.29	Accessibility	Gas pipework, particularly in panels and at connection points, must be accessible for maintenance and repair	B		
8.30	O_2 Make Up	There must be a flow indicator at the control point on the downstream side of the chamber O_2 make-up line to indicate that O_2 is flowing in to the chamber.	B		
8.31	Pipework Testing *D 018 Sheets 24.1 & 24.2*	Internal pressure test of all valves, pipework, fittings, etc. to 1.5 times maximum working pressure when new	A		
8.32		Visual examination of all pipework, valves, fittings, etc. within the last 6 months	A		
8.33		Valves and pipework need to have had a gas leak test to maximum working pressure in the last 2 years	A		
8.34	Relief Valves	Pressure relief valves may or may not be fitted within the control area. If they are fitted then they should comply with the testing requirements detailed below			
8.35	Relief Valve Testing *D 018, Sheet 24.3*	Visual examination in the last 6 months	A		
8.36		Function test at required relief setting followed by leak test at maximum working pressure in the last 2½ years. Normally the leak test is carried out integral with the pipework	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
8.37	Electrics	All electrical equipment must be securely installed with all power leads and wiring secured in such a way that it is protected from accidental damage	A		
8.38	Electrical Testing *D 018, Sheet 11*	All electrical equipment should have been visually examined and function tested (including protective devices) plus continuity and resistance tests of all cables within the last 6 months	A		
8.39	Surveillance	The life support personnel must be able to have sight of the divers inside the HRU chamber. If this is not possible through an easily accessible viewport, then a CCTV system must be provided	B		
8.40	Environmental Control	There must be a means of measuring the various environmental parameters inside the chamber. In the case of some parameters this requires both primary and secondary (back up) capabilities. The parameters to be monitored are:	A		
8.41	Oxygen Primary	Oxygen – Primary analysis	A		
8.42	Oxygen Secondary	Oxygen – Secondary analysis	B		
8.43	CO_2 Primary	Carbon dioxide – Primary analysis	A		
8.44	CO_2 Secondary	Carbon dioxide – Secondary analysis	B		
8.45	Temperature	Temperature	A		
8.46	Humidity	Humidity	A		
8.47	Control Point Analysis	An oxygen analyser with high and low alarm should be fitted to detect changes in the oxygen level ambient to the control point as a result of possible gas leaks	A		
8.48	Analyser and Alarm Testing *D 018, Sheets 2 & 34*	Analysers must have been examined, function tested and calibrated in situ within the last 6 months	A		
8.49		Alarms must have been function tested within the last 6 months	A		
8.50	Chamber Temperature Control	A means should be available to allow the life support personnel to control the temperature inside the chamber	B		
8.51	Chamber Humidity Control	A means may be available to allow the life support personnel to control the humidity inside the chamber	C		
8.52	VHF Radios	A minimum of four hand-held VHF radios should be available for use by the LSP personnel	A		
8.53	Phone	A mobile phone working on the local system (if applicable) or a permanent land line should be available Note: If the LSP is onboard a vessel then the communications systems onboard that vessel would normally be sufficient	B		
8.54	Satellite Phone	Dependent on location and difficulty of local communications, it may be useful for a satellite phone to be available	C		
8.55	Function Testing *D 018, Sheet 34*	Any item above that is not subject to a specific testing regime should have been examined and function tested within the last 6 months, unless a sealed unit subject to regular manufacturer servicing	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
9	**HRU Chamber Environment Heating and Cooling**				
9.1	Provision	The LSP should be able to provide the level of flow and temperature of coolant and heating effect required by the HRU as demonstrated during the thermal balance testing. This should be adequate from the likely environmental parameters to be encountered and both the minimum and maximum number of divers that could be evacuated	B		
9.2	Redundancy	There should be 100% redundancy, i.e. two complete heating and cooling systems so that the failure of one does not alter the capability to provide the heating or cooling required	A		
9.3	Function Testing *D018,Sheet 13*	Visual examination and function test within the last 6 months (this may require recalibration of the control system) should have been carried out	A		
10	**Gas Sources/Supplies and Consumables**				
As the gas mixes and volumes required will be entirely dependent on a number of factors such as the depth of the saturated divers; their number; whether the LSP is only being used as a temporary (perhaps very short term) support while the HRU is moved to the HRF; whether it may have to support the HRU for an extended period or even that it is intended to support full decompression, a list of detailed requirements will need to be prepared for each specific work site. In particular various different mixes may be required if the LSP is intended to support full or partial decompression. *It may not be practical or possible for the LSP to contain all of the required gas and consumables for a full decompression, or unforeseen events which may take place, and there may only be sufficient consumables present for the initial phase. In such a circumstance, part of the planning should include details of nearby locations which could supply extra consumables, details of the transport requirements to move these to the LSP and a likely timescale*				
10.1	Quantities	Exact quantities and composition of gas required (including back-up and spare) should be specified in the diving contractor's site specific procedures Note: The auditor is not being asked to confirm the adequacy of what is specified, only that they are specified	A		
10.2	Main Chamber Gas	A minimum of two input sources of main chamber gas	A		
10.3	Oxygen Supply	A minimum of one oxygen supply	A		
10.4	BIBS Supply	A minimum of one supply for BIBS	A		
10.5	Calibration Gas	Suitable calibration gas available	A		
10.6	Sodasdorb	A minimum quantity of sodasorb or similar calculated on the basis of a usage of 6Kg of sodasorb per man per day and the length of time anticipated for LSP support	A		
10.7	Extra Supplies	If there are not sufficient consumables or gas present at the LSP to cover the full intended duration of its use, are details of nearby locations which could supply extra consumables, details of the transport requirements to move these to the LSP and a likely timescale available	A		
11	**Supplies to the LSP** – *The following list of minimum supplies required is prepared assuming an LSP which is not permanent or built in to a ship. For permanent or built in LSPs, some of the following will not be relevant*				
11.1	Pressure Reduction	Ability to reduce pressure before control panel (normally at quads) if required by the specific HRU. This will require a minimum of five gas regulators which should all be suitable for oxygen or high oxygen mixes. That is one each for main gas/BIBS mix/O_2 and two spares to be carried in the LSP for fitting to gas quads	A		

Item	Description	Requirement	Need	Response	Certificate Issue Date
11.2	Gas Hoses	Five hoses (three for gas and two for O_2, which gives one spare of each type) to connect to the gas quads. Minimum length 15 metres (5 metres for oxygen hoses) but risk assessment should identify possible distance to quads if this may be greater. Hoses to be ½" diameter with No 8 JIC end fittings. Hoses to be O_2 cleaned as required. Hoses to be correct type for the service, i.e. if for O_2, then should be specific O_2 hoses	A		
11.3	Main Power Cable	A minimum 20m length of main power cable capable of being connected to a supply from shore/ship/generator. Detail of connections should be available from the planning process	A		
11.4	Water Connection	Sufficient hoses and connectors to connect LSP to water supply. Detail should be available from the planning process and may need to include a submersible pump and filter if water is to be sourced from a harbour or similar	B		
11.5	Hose Component Testing *D 018, Sheet 28*	When new, hydro test to 1.5 times maximum working pressure or as recommended	A		
11.6		Visual examination and function test in the last 6 months	A		
11.7		Pressure leak test to maximum working pressure in the last 2 years	A		
12	**Umbilical for Connection to HRU**				
12.1	Umbilical	The normal means of connecting the HRU to the LSP will be by the use of an umbilical between the two. This may be a composite umbilical or a taped up bundle	B		
12.2	Length	Minimum length of 50 metres	A		
12.3	End Fittings	Hoses and cable ends to have the correct fittings and plugs to connect to the standard IMCA panel as detailed in IMCA D 051	A		
12.4	Water Hoses	Normally only two water hoses being an inlet and outlet as these can be used for either hot or cold water	A		
12.5	Extra Hoses	Separate hot and cold water hoses (i.e. four in total) may be provided	C		
12.6	Electrical Component Testing *D 018, Sheet 11*	Visual examination, function test (including protective devices) plus continuity and resistance tests of all cables and electrical equipment within the last 6 months	A		
12.7	Hose Component Testing *D 018, Sheet 28*	When new, hydro test to 1.5 times maximum working pressure or as recommended	A		
12.8		Visual examination and function test in the last 6 months	A		
12.9		Pressure leak test to maximum working pressure in the last 2 years	A		
13	**HRU Handling**				
13.1	Lifting Plan	A lifting plan should be available detailing how the HRU is to be lifted and handled if it is to be removed from the water. This should identify any rigging, spreader beam or other lifting equipment needed	A		
13.2	Lifting Equipment	The rigging, spreader beam or other lifting equipment identified in the lifting plan should be available	A		
13.3	Support	If the HRU is to be lifted out of the water, a means should be available of safely supporting it while connected to the LSP. Normally this will be a custom designed cradle or similar	B		

Item	Description	Requirement	Need	Response	Certificate Issue Date
14	**Firefighting**				
14.1	Availability	Suitable firefighting arrangements must be made for the LSP and surrounding area. Such equipment must be available inside the control area as well as outside. This may be by means of permanent equipment or by means of portable extinguishers etc. It should be capable of dealing with any type or size of foreseeable fire hazard	A		
14.2	Firefighting Testing *D 018, Sheet 15 & 16*	Whether fixed or portable it should be in accordance with manufacturer's specification and fit for the purpose it will be used for	A		
14.3		If it is a portable system then it must have had an external visual examination and check that any indicating device reads within the acceptable range within the last 6 months	A		
14.4		If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A		
14.5		If this is a fixed system it must be function tested to demonstrate operation of the system OR had a simulated test using air or gas as the test medium in the last 12 months	A		
14.6		If an automatic detection/activation system is fitted then a function test to demonstrate correct operation must have been carried out in the last 12 months	A		
15	**Pressure Relief Valves**				
15.1	Identification	It must be possible to identify all PRVs for the unit serial number, unit location, set pressure, reset pressure; the date last tested/due test date	A		
16	**Medical Equipment**				
16.1	Provision	There should be a list in place detailing what type of medical equipment is available with the LSP. As a minimum this should comply with the requirements of DMAC 15 (or as agreed with company medical adviser) unless local regulations prohibit any of the contents	B		
16.2	First Aid	There should be facilities available for the provision of treatment of minor injuries. This may be by means of a local first aid kit, a nearby sick bay, or similar	B		
16.3	Medical Container	The medical equipment should be in a suitable protective container clearly marked with a white cross on a green background	B		
16.4	Content Checking	This equipment should have been checked for integrity within the last 6 months with the date the next check is due clearly marked on it	A		
17	**Maintenance**				
17.1	Requirement	A system should be in place whereby all items of plant and equipment are subject to regular maintenance	A		
17.2	Schedule	A schedule should exist indicating the frequency and content of each task. This should take into account the manufacturers' instructions and it should also meet the requirement of the relevant IMCA D 018 detail sheet	A		
17.3	Records	Records (written or electronic) should be available demonstrating that the plant and equipment has been subject to regular planned maintenance	A		