

# SM1 DX300 Saturation Diving System



## DESCRIPTION

Year Built	: 2009
Manufacturer	: Divex Asia Pacific
Classification Society	: Lloyds Register
Compliance Standards	: IMCA D018 & D024 Rev.1
Design Standard	: Lloyds Rules & Regulations for the Construction & Classification of Submersibles & Underwater Systems, December 1989
Capacity	: 12 man
Depth Rating	: 300 msw
Design Pressure	: 30 bar
Design Temperature	: -18 to +66 deg C

### DIVE CONTROL

Housed within a purpose Built 7m x 3m x 3m insulated with air conditioned container comprising of;

- Dive Gas Supply Panel.
- Diver Gas Reclaim control panel.
- Analox G22 O2 and G30 CO2 monitoring systems. Bell Control Systems.
- Bell hot water monitoring system.
- Bell and Diver Video & unscrambler communications systems. OTS Through Water Emergency communications systems.
- Bell and Diver audio/ video recording suite. Fixed and Portable Breathing Apparatus.
- Equipped with Emergency Lights, Smoke/ Heat Detectors & Portable Fire Extinguishers. Safe-Ox oxygen monitoring system with audio visual alarm.
- 3 KVA UPS Power Supply Units.

### LIFE SUPPORT CONTROL

- Located in a partitioned section within common container as Dive Control and comprising of;
- Gas Distribution Systems. Chamber control systems.
- Chamber depth and atmosphere parameters monitoring systems. Chamber video and unscrambler communications systems.
- Fixed and Portable Breathing Apparatus.
- Equipped with Emergency Lights, Smoke/ Heat Detectors & Portable Fire Extinguishers.
- 3 KVA UPS Power Supply Units.

### LIFE SUPPORT MACHINERY

- Electrical switchboard, transformers and power change over unit.
- 4 x Environmental Control Units Model CMU-2. 2 x Divex Divers Hot Water Units Model WHE-3.
  - 2 x Divex Potable Water Pump Units Model PWS-01.
  - Gasmizer Reclaim System with 6 x Haskel AGD-4 gas Booster Pumps.
  - Haskel AGD-30 Gas Transfer Pump.
  - Equipped with Emergency Lights, Smoke/ Heat Detectors & Portable Fire Extinguishers.
  - Safe Ox ambient oxygen monitoring system with audio visual alarm

### 3 MAN DIVING BELL

- Bell internal volume: 5m<sup>3</sup>
- 3 Diver 'MARA' Bell Gas Management Panel 2 Diver Gasmizer Bell Reclaim System
- 2 x Bell CO2 Scrubber Model DH-21S Bell/ Diver Communications System.
- OTS Through Water Emergency communications. Onboard Emergency Gas Cylinders.
- Bell Emergency Power Battery. Internal & External lights.

### SURFACE COMPRESSION CHAMBERS

- DDC 1 - 6 man Twin Lock Living Chamber (EL Volume: 20.0 m3, ML Volume: 20.0 m3)
- DDC 2 - 3 man Living Chamber (Volume: 16.0m3)
- DDC 3 - 3 man Twin Lock Living Chamber (EL Volume: 8.3 m , ML Volume: 12.0 m )
- Medical Locks and Bell clamp with mechanical interlock system.
- Chamber internal outfitted with BIBS, HCU, scrubbers and lighting.
- Supplied with PPO2 meters and lung scrubbers.

### HYPERBARIC RESCUE CHAMBER

- Dedicated HRC hydraulic A-frame deployment and recovery system. HRC internal volume: 16m3
- Gas Distribution Control Panel. Onboard Emergency Gas Cylinders. HRC Emergency Power Battery.
- Chamber internal outfitted with BIBS, HCU, scrubbers and lighting.
- Supplied with PPO2 meters, EPIRB, strobe lights, survival suits, lung scrubbers and food ration.

### LAUNCH & RECOVERY SYSTEM

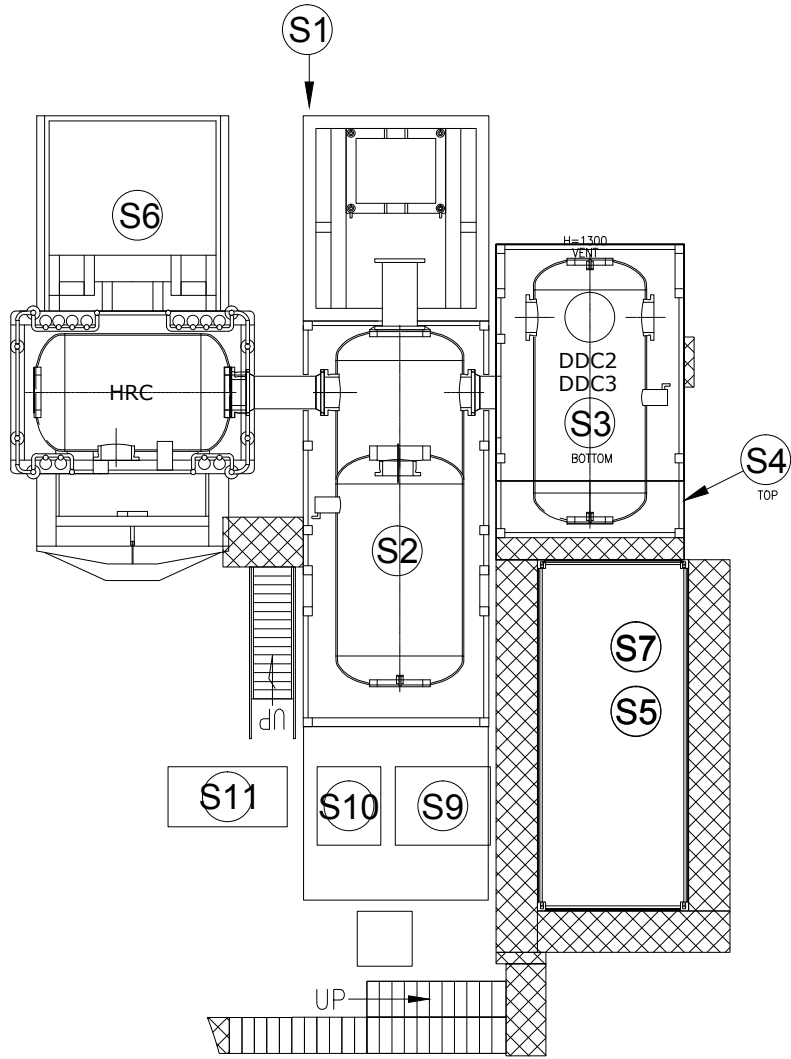
- Hydraulic A-frame configuration.
- 12T Man Riding Hydraulic Main Winch with 250m non-rotating wire.
- 7.5T Double Reeved Man Riding Hydraulic Clump Weight Winch with 450m non-rotating wire.
- 366m Cortland Fibron sheated Umbilical with dedicated hydraulic constant tension winch. Line out meters at LARS operator and Dive Control Panel.

### OTHER EQUIPMENT

- HES Fly-Away Package.

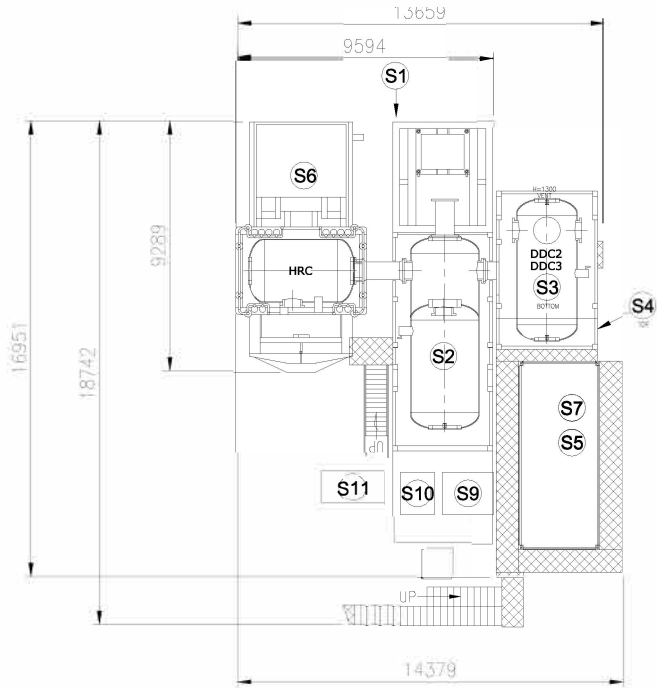
### POWER & SERVICES REQUIREMENT

- Portable Water : 26 L/Min Sea Water : 196 L/Min LP Air : 420CFM @ 7Bar
- Electric Supply Main : 440v/3ph/60hz/720amps Electric Supply Standby : 440v/3ph/60hz/720amps



SAT SPREAD ( DIVEX )				
ITEM	DESCRIPTION	DIMENSION	WEIGHT	QUANTITY
S1	SDC (BELL)	3.7(L)x3.3(W)x3.8(H)	10.52 T	1
S2	DDC-1 - BOTTOM	8.7(L)x3.7(W)x3.6(H)	27 T	1
S3	DDC-2 - BOTTOM	5.2(L)x3.7(W)x3.6(H)	24 T	1
S4	DDC-3 - TOP	6.4(L)x3.7(W)x3.6(H)	22 T	1
S5	SAT/DIVE CONTROL VAN - TOP	7.0(L)x3.0(W)x3.0(H)	8.9 T	1
S6	HRC	4.9(L)x3.3(W)x3.5(H)	16.8 T	1
S7	MACHINERY VAN - BOTTOM	7.0(L)x3.0(W)x3.0(H)	14.2 T	2
S9	MAIN HYDRAULIC POWER UNIT	1.9(L)x1.57(W)x2.4(H)	3.9 T	1
S10	STANDBY HYDRAULIC POWER UNIT	1.275(L)x1.57(W)x2.4(H)	2.5 T	1
S11	DIESEL HYDRAULIC POWER UNIT	2.21(L)x1.2(W)x2.3(H)	2.8 T	1

# SM1 DX300 SATURATION DIVING SYSTEM

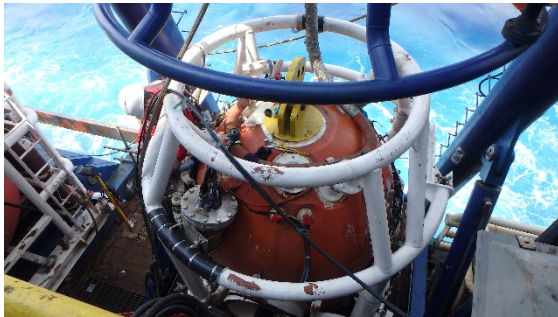


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ITEM	DESCRIPTION	DIMENSION	WEIGHT	QUANTITY
S1	SDC (BELL)	3.7(L)x3.3(W)x3.8(H)	10.52 T	1
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S3	DDC-2 - BOTTOM	5.2(L)x3.7(W)x3.6(H)	24 T	1
S4	DDC-3 - TOP	6.4(L)x3.7(W)x3.6(H)	22 T	1
S5	SAT/DIVE CONTROL VAN - TOP	7.0(L)x3.0(W)x3.0(H)	8.9 T	1
S6	HRC	4.8(L)x3.3(W)x3.5(H)	16.8 T	1
S7	MACHINERY VAN - BOTTOM	7.0(L)x3.0(W)x3.0(H)	14.2 T	2
S8	TECH STORE - BOTTOM	3.44(L)x2.425(W)x2.133(H)	10 T	1
S9	MAIN HYDRAULIC POWER UNIT	1.9(L)x1.57(W)x2.4(H)	3.9 T	1
S10	STANDBY HYDRAULIC POWER UNIT	1.275(L)x1.57(W)x2.4(H)	2.5 T	1
S11	DIESEL HYDRAULIC POWER UNIT	2.21(L)x1.2(W)x2.3(H)	2.8 T	1

# SM1 DX 3000 SATURATION DIVING SYSTEM

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**12-MAN SATURATION DIVING SYSTEM SM1 DX-300 INSTALLED**



**IMCA 'DESIGN' D024 REV.2 AUDIT REPORT**

AUDIT REPORT #	DATE	LOCATION	AUDITOR
PC1418- -SAT Audit-SM1- -0615	17 <sup>th</sup> to 21 <sup>st</sup> May & 19 <sup>th</sup> June to 2 <sup>nd</sup> July 2015	Western Yard & On Tow - Bintulu to Angsi Field, Malaysia	

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## **FOREWORD**

Auditor is an independent consultancy company specialising in Offshore Diving, ROV, system and Marine vessel audits and diving safety management. The company has been in operation since 2002 with extensive operations on behalf of the major oil and gas operating companies and contractors within the South East Asia, European, Middle East, Australasian, US and South American Regions. The company's auditors are trained in Safety Management Systems audits, Registered with the International Register of Certified Auditors, assessed under the IMCA requirements for equipment / company auditors and have suitable qualifications and experience within the offshore diving industry. auditor also have a competency assessment scheme in operation that grades auditors in line with the requirement of IMCA and International Register of Certified Auditors (IRCA).

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## 1.0 INTRODUCTION

Auditor was contracted by owner to carry out an IMCA DESIGN D024 Rev.2 audit on the Lloyd's Register Classified SM1 DX-300 saturation diving system installed onboard the Derrick Lay Barge, during the tow from Bintulu to the Angsi Field, Malaysia, and whilst on location undertaking pipe-lay.. A pre-mobilisation audit was also conducted on the system whilst located in the Western Yard, Malaysia.

The purpose of the audit was to review the saturation diving system operational and safety status in accordance with the requirements of the IMCA DESIGN D024 Rev.2 document and other listed audit criteria. The audit included a review of the system's equipment certification, equipment planned maintenance system and a physical inspection of the system.

An audit pre-start meeting was held with owner personnel onboard the barge on the morning of 20<sup>th</sup> June 2015, during which the audit process was discussed, in addition to the terms of reference that would be followed during the audit.

Key personnel present at the meeting were:

Prior to the meeting a walk-around of the SM1 DX-300 saturation diving system to show the location of the major components was provided.

Permission to take photographs was requested and given. All photographs taken are contained in Appendix 2 of this report and remain the property of the equipment owner.

### **Audit Scope**

The requirement of the audit was to review the status of the system and other related equipment in accordance with the relevant requirements of the IMCA D024 Rev.2 audit document, and to include where practical, additional observations based on other IMCA requirements and documentation as detailed in the audit criteria listed below.

The audit does not seek to confirm the authenticity of certification presented, nor does it include review of required documentation, only its availability.

The audit does not guarantee equipment operational reliability, but seeks to provide assurance that the equipment meets a level of compliance with recommended guidance criteria. Whilst the audit process seeks to consider the operational status, the findings are based on those findings that may reasonably be ascertained at the time of audit.

This audit report covers the observed status of the diving system equipment at the time of inspection. This report, and the accompanying DESIGN D024 audit checklists are not statements or warranties that the SM1 DX-300 saturation diving system is fit for purpose.

The audit of the equipment is a verification of compliance against the bench mark guidance and referenced documents at the time of the audit inspection.



### **Audit Limitations**

Any limitations, (e.g., time constraints, location, documentation, function and / or access), experienced during this audit are identified within the audit report and findings.

Specific limitations experienced for this IMCA DESIGN D024 audit were:

- ≈ Operational / function testing of the system was not conducted.
- ≈ The system was undergoing mobilisation and was not in a state of operational readiness to dive.
- ≈ The living chambers and HRU chamber were under pressure and not accessible during the barge phase of the audit.
- ≈ A detailed review of documentation, (procedures etc.,) was not conducted.
- ≈ Review of personnel competency used for the equipment certification was not carried out.

### **Audit Reference Documentation**

The audit inspection was carried out in accordance with, and in reference to, the latest revisions of the following documentation:

- ≈ IMCA D024 Saturation Bell Diving Systems DESIGN Document and Associated Documents
- ≈ IMCA D 014 IMCA International Code of Practice for Offshore Diving
- ≈ IMCA D 018 Code of Practice on the Initial and Periodic Examination, Testing and Certification of Diving Plant and Equipment
- ≈ IMCA D011 Diving System Audits
- ≈ IMCA D10-10 Competence of Auditors of Diving Systems and Diving Contractors
- ≈ Other Current IMCA (International Maritime Contractors Association), Publications, Documents, Information Notes and Safety Flashes
- ≈ Diving Medical Advisory Committee (DMAC) Guidance
- ≈ Oil and Gas UK (formally UKOOA) Publications

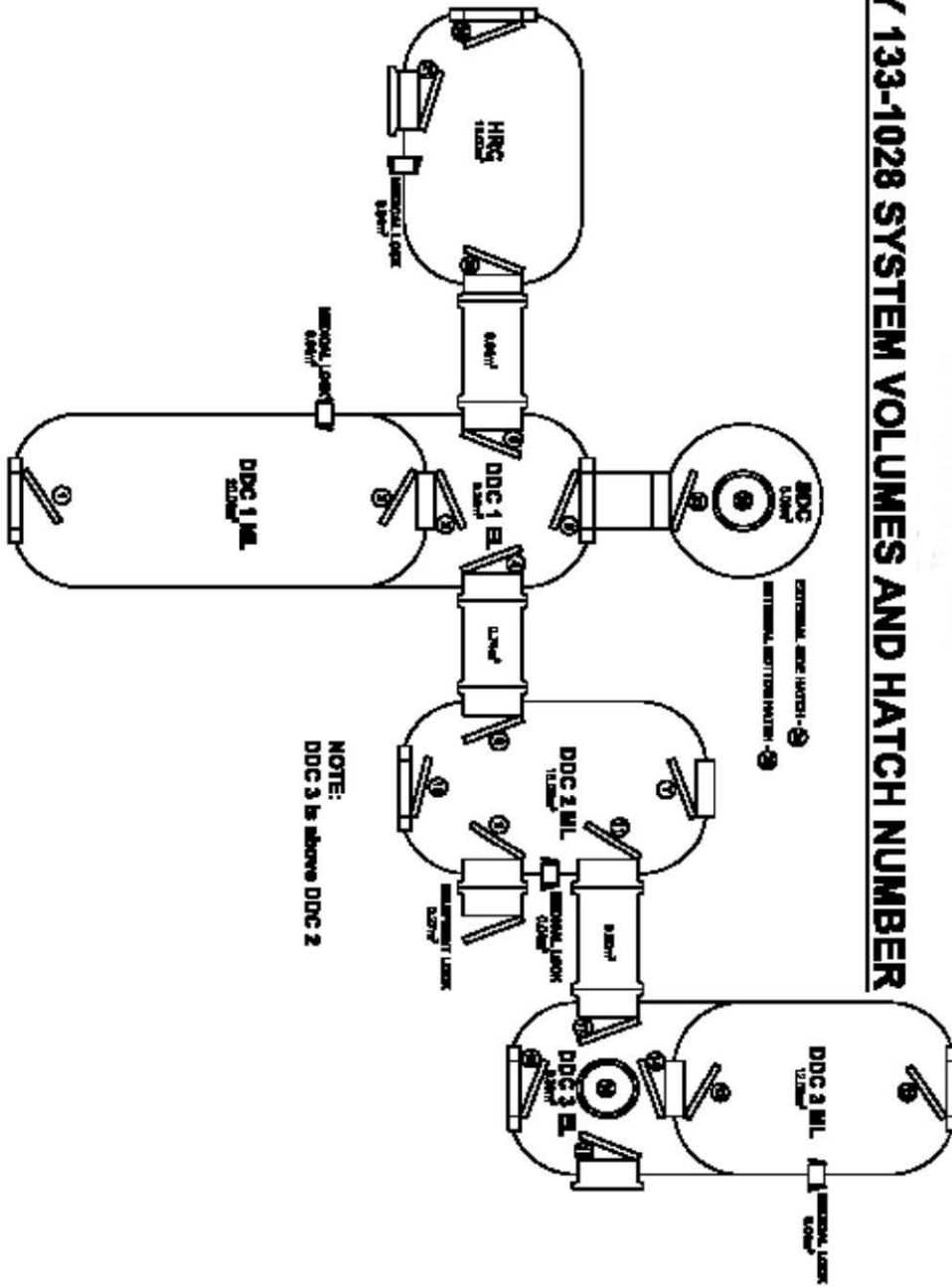
## 2.0 EXECUTIVE SUMMARY

The SM1 DX-300 saturation diving system comprises of the following main components:

- 1 x Combined dive control and life support control container
- 1 x Three man diving bell with dedicated hydraulically operated launch and recovery system
- 1 x Six man DDC-1 living chamber, complete with entry lock
- 1 x Three man DDC-2 living chamber
- 1 x Three man DDC-3 living chamber, complete with entry lock
- 1 x Twelve man HRU, with dedicated hydraulically operated launch system
- 3 x KM-17c Superlite helmets with Divex Jewel 601 reclaim regulators
- 1 x KM-28 band-mask
- 1 x KM-18 band-mask
- 1 x Main bell umbilical and winch handling system
- 1 x Emergency services umbilical
- 4 x Diving umbilicals
- 12 x assorted brand emergency breathing bail-out cylinders
- 4 x Sets of first stage regulators and emergency connections
- 4 x Environmental master control units
- 2 x Potable domestic water system
- 2 x Diver's hot water units
- 1 x Diver's gas reclaim system
- 1 x Gas booster / top-up transfer pump
- Assorted diver's personal equipment

SM1 DX-300 System General Arrangement

**SSY 133-1028 SYSTEM VOLUMES AND HATCH NUMBER**



The list contained herein is a summary of the findings of the IMCA DESIGN D024 audit of non-conformances that have been used for the development of this report.

<b>Dive System:</b>	SM1 DX-300 12-Man Saturation Diving System
<b>Location:</b>	Western Yard & Derrick Lay Barge
<b>Audit Type:</b>	IMCA 'DESIGN' D024 Rev.2 DESIGN Document Compliance Audit
<b>Auditor:</b>	
<b>Date:</b>	17 <sup>th</sup> to 21 <sup>st</sup> May (Western Yard) & 19 <sup>th</sup> June to 2 <sup>nd</sup> July 2015

**Note:** The non-conformance items have been grouped into three categories in order to assist readability:

**2.1 IMCA D024 Non-conformances:**

Pure non-conformances which will normally require specific action to close out

**2.2 IMCA D024 Mobilisation / Readiness non-conformances:**

Non-conformances noted at time of audit but which would usually be expected to be closed out in the normal course of mobilisation

**2.3 IMCA D024 Certification non-conformances:**

Non-conformances which involve certification only

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## **2.1 IMCA D024 NON-CONFORMANCES LIST**

Contained within this section are the Non-conformances identified from the audit which will need to be closed out in order to comply with the terms of reference.

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## **2.2 IMCA D024 MOBILISATION / READINESS NON-CONFORMANCES LIST**

Contained within this section are the Non-conformances identified from the audit which will need to be closed out in the normal course of the mobilisation or preparedness to dive.



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### **2.3 IMCA D024 CERTIFICATION NON-CONFORMANCES LIST**

Contained within this section are the non-conformances which involve certification and testing only.

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### 3.0 SUMMARY OF IMCA D024 AUDIT COMPONENTS

The audit standard used was revision 2 of the IMCA Diving Equipment Systems Inspection Guidance Note (DESIGN) document D024, along with previously mentioned audit reference documentation. This summation is based around the compliance, or otherwise, of each section and details the basic findings of the audit.

The use of the IMCA D024 document assists in achieving objective audit results, and will allow a third party evaluation of the audit if disputes on findings arise.

The DESIGN D024 document summary is divided into sixteen sections. These sections are as follows:

Section 1	General Safety
Section 2	Dive Control
Section 3	Surface Compression Chambers
Section 4	Bell Launch and Recovery System
Section 5	Diving Bell
Section 6	Life Support Control
Section 7	Main Bell Umbilical
Section 8	Diving Heating Systems
Section 9	Diver's Umbilicals
Section 10	Diver's Personal Equipment
Section 11	Compressors and Pumps
Section 12	High Pressure Gas Storage - (project gas not available during the audit)
Section 13	Diver's Gas Reclaim
Section 14	Chamber Gas Reclaim and Purification - (not applicable to this system)
Section 15	Hyperbaric Evacuation System
Section 16	Life Support Package

## **Section 1      General Safety**

An in-date certificate of classification for the SM1 DX-300 saturation diving system has been issued by Lloyd's Register, dated 31<sup>st</sup> January 2014, and is provided in the system certification register. The LR surveyor is due onboard to carry out annual survey upon completion of system mobilisation.

The system has the following operating restriction: The diving system is designed and constructed for a maximum operating depth of 300 msw; limited to 108 msw until tested for use at maximum depth of 300 msw.

Sea fastening documentation is available from when the system was first installed on the barge in 2011, nothing has changed and this is deemed acceptable:

- Drawing No 086005-1 Rev.0, HRC and Bell LARS Support Drawing dated 19-May-2011
- Drawing No 086005-2 Rev.0, SM1DX300 Sea-Fastening Onboard QP-2000 dated 19-May-2011
- Design Review Letter

The SM1 DX-300 diving bell will be deployed and recovered over the port side of the DLB with a dedicated and purpose built launch and recovery system. Under normal circumstances this should provide a safe and controlled means of deployment and recovery of the bell and its occupants.

Automatic emergency lighting is provided in critical internal areas, allowing personnel to move around safely in the event of a loss of power.

Suitable safety warning signage, such as electrical hazard and the use of PPE, is posted throughout the dive system and the barge.

A vessel general alarm repeater, complete with mute facility, is provided in the dive and life support control container.

Consideration has been given to the safety of personnel operating around the dive system, with safety barriers, railings and gratings etc. provided where required.

A DMAC 15 Rev.4 medical kit is provided with the system, shared with the CD-11 air diving system, stored in the air conditioned air dive control container in a suitably protected and marked container.

The DLB is equipped with a dedicated and well equipped clinic, (room 103), on the main deck level; a medic is provided onboard on a permanent basis.

Access, housekeeping, maintenance, supplies, hazards, lighting, general alarms, etc., relating to the system will all have to be considered prior to the start of diving operations. Where additional supplies and support, (such as fire protection), are involved, the capability and usage instructions will need to be fully addressed by the dive team.

### **Certification & Planned Maintenance System:**

The certification provided to the auditor was reasonably well presented and in an order which mirrors the D024 format, making referencing and recording information relatively easy, however, a detailed check should be conducted to ensure that all of the revision 2 requirements have been aligned and captured in the certification register.

A basic hard copy planned maintenance system / checklist system is in operation and consists of weekly maintenance tasks to be performed. There is also a D018 linked certification matrix, a computer based excel programme, which will flag when an item of equipment is approaching re-certification date.

The checklist system is conducted on a weekly basis, it was advised that manufacturer's scheduled maintenance instructions are taken into account, both in the checklists, and in the maintenance logs.

Planned maintenance records are provided for the equipment, demonstrating that the plant and equipment has been subject to previous planned maintenance.

**Inventory:**

An electronic inventory for the SM1 DX-300 saturation diving system is available, however, this was not reviewed during the course of the audit, so no assessment on the adequacy of spares and consumables was conducted.

An inventory check should be conducted upon completion of project mobilisation, in order to verify the availability of critical spares and sufficiency of consumables for the intended project duration.

**Failure Modes & Effects Analysis (FMEA) & Power:**

An FMECA is provided, conducted during commissioning in 2011, it appears that there have been no revisions made, a recommendation was made to determine if the FMEA has been reviewed on a regular basis.

A complete set of electrical schematics for the SM1 DX-300 system is available with the dive technicians.

Power assessments are available detailing the system's power requirements in normal and emergency modes for the dive system including bell LARS and for the divers in the chamber complex.

**Firefighting:**

A fixed firefighting water deluge system, connected into the barge fire hydrant system, is available around the chamber complex.

The DDC-1, DDC-2 and DDC-3 chambers are fitted with an internal water 'mist' deluge system which can be activated manually from inside the chamber, or from the fire alarm / deluge activation control panel in life support control.

Portable firefighting equipment, which was not in place during the course of the audit, is available; the extinguishers, a mixture of carbon dioxide and ABC dry powder type, are manufactured to internationally recognised design standards and are deemed fit for purpose.

Barge firefighting equipment, both portable and fixed hydrant type, is also provided in the vicinity of the diving system.

**Operational Documentation:**

Generic documentation is available, however, project specific procedures will need to be provided during mobilisation.

SM1 DX-300 dive system operating and emergency generic procedures are available. An AME Diving Safety Management System manual and Emergency Response Manual are available in dive control, it was advised that new manuals would be provided. During the course of the audit, a soft copy of the recently issued Saturation Diving Manual was received onboard.

Comprehensive equipment manufacturers operating and service manuals, in a mixture of hard and soft copy format, are available in the dive technician's work shop / office.

**Section 2 Dive Control**

Dive control is fitted in a purpose built steel container, shared with life support control, located on the port side of the vessel, aft stern quarter, above the machinery container on the second deck level of the system. The container is insulated and air conditioned, and provides good environmental protection for its occupants.

The diving supervisor has good access to all relevant areas of control and is able to read gauges and displays without difficulty.

Sufficient overhead fluorescent lighting is provided, emergency self-contained automatic lighting is also available, providing sufficient lighting to allow the supervisor and any other personnel to operate safely in an emergency.

CCTV coverage of the bell launch and recovery area is provided on one of monitors provided in dive control.

The dive panel controls are well laid out, the dive control gas panel has reasonable access from below, the reclaim panel from the side. The analysis panel and depth monitoring panels have reasonable access from behind, gained from above and from the small access hatch located behind the main life support control panel.

There are six analogue gauges fitted into the dive control panel, allowing the diving supervisor to be aware of the depths of Diver-1, Diver-2, Diver-3, Bell Internal, Bell External and the DDC-1 Trunking. Suitable pressure indicating gauges are provided for the main and back up breathing supply pressures. It was noted that the gauges were not within the required 0.25% accuracy over their full scale value.

The gas supplies to the panel are sufficient for normal bell diving operations; it was advised that three heliox mixes and a supply from the gas reclaim unit are provided.

An AMCOM III Model 2830A 3-Diver Amscram radio and two Divex CO363AY unscrambler radio units are provided for the required two way communications with the divers. A sound powered phone is available for secondary communications to the bell occupants, along with a through water communications unit.

The following means of communication are provided between dive control and the barge tower; vessel telephone system, Canford hard wired round-robin circuit intercom, barge telephone system, and hand held radios.

An H-264 real-time DVR black-box dedicated digital video recorder is provided, and two LG HDD/DVD recorders are also available for Diver-1 and Diver-2 recording for as-built project use.

It was advised that the black-box DVR unit is set up to record all divers, bell and top side communications, and that the recording duration exceeds 24 hours. Recording commences automatically, whenever the unit receives a signal from one of the inputs.

The recording system is fed from a UPS system, it was advised that a test has been conducted to confirm continued operation in excess of 30 minutes in the event of loss of main power.

Three non-dedicated sets of oxygen analysers and carbon dioxide analysers are built into the panel to monitor the diver's gas supply, reclaim gas supply and the bell environment via a patch-panel arrangement. An ambient oxygen monitor is also provided in the life support control area to warn the occupants of any rise or fall in oxygen levels in the container, outside pre-set parameters due to gas leakage.

A series of LIM, MCB and RCD devices are fitted into the dive control panel 19" racking, protecting the two bell external lighting circuits 'A' & 'B', the two bell 240 VAC supplies '1' and '2' on the switch panel, the bell voltage control panel and Diver-1 and Diver-2 camera and hat lights.

Two panel mounted monitoring units for the diver's hot water supply are provided, fitted with high and low audio and visual alarm, and an emergency stop button. Water temperature is controlled on the individual WHE-3 hot water units in the machinery container.

The diver reclaim panel is a Divex control console in the standard configuration of oxygen panel, control panel and make up panel.

Self-contained and umbilical supplied breathing apparatus is provided inside the dive control compartment, within easy reach of the diving supervisor.

An automatic Minerva Tyco fire detection system is fitted, with the dive control, life support control and the machinery container areas covered.

### **Section 3      Surface Compression Chambers**

Section three of the IMCA D024 document has been divided into five individual spreadsheets to allow for the audit to be carried out individually on the DDC-1 entry lock and main chambers, the DDC-2 main lock and the DDC-3 entry lock and main chambers.

The skid mounted chambers were manufactured in 2009 by Modular Engineering to the PD500:2003 Category 1, Lloyds Rules & Regulations for Submersibles & Diving Systems 1989 standards. The system consists of a six-

man DDC-1, a three-man DDC-2, a three-man DDC-3 and associated trunkings between the chamber and to the bell and HRU.

The outside of the chambers are clad in stainless steel, which is in good condition, the Armaflex insulation under the cladding cannot be inspected.

Viewports are provided in all of the chambers; they are in good undamaged condition and are suitably protected by externally fitted covers.

Door sealing faces, where inspected, are clean, unpainted, lightly smeared with silicon grease and appear in good condition.

No fixed mechanical means to secure the chamber doors in the open position is provided, it was advised that rope lanyards will be installed where deemed necessary.

All chambers are fitted with two way Divex communication units with call button, with sound powered phones provided for back-up.

The majority of gas and fluid chamber penetrators are fitted with either plugs or valves to prevent catastrophic pressure loss, however, hollow penetrators in the trunkings are not fitted with internal protection valves or other devices. All randomly checked valves operated through their full range, and are free of corrosion.

The main lock of DDC-1 is the dedicated DMAC 028 chamber; overall compliance to DMAC 28 was not determined during the course of the audit.

All chambers are fitted with caisson depth gauges, and humidity and temperature sensors.

A sufficient number of suitable quick connect / disconnect manifold fittings are provided in each chamber for each occupant plus a spare. A suitable quantity of BIBS, of the overboard dump type, are available and will be loaded out during project mobilisation.

There are four CMU units fitted in the machinery container; one CMU unit is dedicated to DDC-1, one to DDC-2, one to DDC-3 and one to the HRU chamber, which also provides the system redundancy.

Internal hyperbaric lighting is provided in each chamber, with a CCTV camera providing the video link to life support control. Individual bunks, complete with fitted bunk lights, are provided in the living chambers.

Both entry locks are fitted with sanitary equipment comprising a shower, hand basin, flush toilet, and hot and cold running water. A toilet, shower and wash basin are also fitted in one end of the DDC-2 chamber.

The three living chambers are fitted with service locks, all with compliant externally mounted interlock systems. Aiphone intercom communications between each service lock and life support control are provided. The equipment lock in DDC-2 is not fitted with dedicated communications, however, it was advised that the lock is not routinely used.

A hard piped fixed water sprinkler deluge system is installed above and around the chambers, portable fire extinguishers are also available.

The chamber is fitted with an internal deluge system, (LR type approved), which can be activated manually from inside the chamber, or from the fire alarm and deluge activation detection control panel in life support control.

#### **Section 4 Bell Launch and Recovery System (LARS)**

The bell launch and recovery system is of gantry type configuration, with the horizontal load bearing cross-beam supporting the wire sheaves and umbilical roller deployment system.

A trolley is built into the gantry skid; once the bell trunking clamp is opened, the bell is locked off the system and trolleyed out to a stop point, directly under the A-frame cross beam. The bell is raised off the trolley pins and the telescopic bell stand-off frame is deployed and locked. The bell is then raised into the catcher and the weight taken on the hydraulically actuated hooks. The A-frame is then boomed outboard, bell weight taken on the main wire, hooks released, and the bell is launched.



There are two electrically driven bell LARS HPU's and one diesel driven HPU, (dedicated for the HRU launch system), provided with the system. All three HPU's are plumbed into a cross-over manifold and are capable of independently providing the required hydraulic power for the bell launch and recovery system. The system appears to be well maintained and there are no obvious leaks of hydraulic oil.

The HPU's are installed on the main deck level within the system 'footprint', in an area that is well protected from the likelihood of normal physical damage.

The system is provided with a clump weight winch; the wire is double reeved through two sheave wheels mounted on the clump weight. The clump weight provides a means to restrict excessive lateral and rotational movement when the bell is deployed at depth. The clump weight is also used for the secondary means of recovering the diving bell up into the bell hooks in the case of main winch or wire failure.

Both the clutch-less bell main lift winch and the clump weight winches are fitted with automatic chain driven level-wind systems, primary and secondary hydraulic drive motors, and are fitted with the following automatically activated mechanical fail-safe braking systems:

- 2 x wet disc failsafe drive brakes
- 1 x dry failsafe band brake

The bell launch and recovery controls are located in a purpose built winch control cabin located on the winch skid, providing suitable protection for the winch operator from the environment, and physical hazards.

Suitable round robin communications are fitted between dive control, the LARS winch control cabin and the bell deployment area.

Operating procedures are posted in the winch control cabin including the actions necessary if power is lost, in clear view of the operator.

The bell and clump weight wire ropes were newly installed in May 2015 and were pressure lubricated when the wires were installed.

Digital line-out indicators for the main bell umbilical winch, main lift winch and clump weight lift wires are provided on the winch control panel.

The winch drums have sufficient capacity so that there is clear space between the outside of the top layers of wire and the edges of the drum flanges of at least two and a half times the wire diameter.

Guards are not fitted to the winches, however, physical access to the winch platform is restricted, and the winches are operated remotely under normal circumstances by the dive technicians from the protection of the 'dog' house. Side stand-off guards have been fitted to the winch drums in way of their external band brakes.

When the bell trunking is pressurised a pressure switch is activated which electrically locks out the hydraulic bell handling system in the control cabin. A trunking pressure interlock manual override button is provided on the dog house control console; however, it was advised that standard operating procedures are that this is not used during routine operations. The bell clamp is also fitted with a clamp 'fully open' proximity contact switch.

## **Section 5      Diving Bell**

The insulated bell was built by Modular Engineering in 2009 to the PD500:2003 Category 1, Lloyds Rules & regulations For Submersibles & Diving Systems 1989 design code.

The bell is side mating, with an internal volume of five cubic metres, in compliance with the IMCA volume requirement for three man bell runs, and is externally pressure rated to a water depth of 300 msw.

The bell main lift attachment point is a double pad eye arrangement with three lifting eyes; a 'Delta Plate', also with three individual lifting eyes, is fitted to the centre pad eye lifting eye, providing a suitable stand-off to accept the main lift wire spelter socket. The outer lifting eyes of the 'Delta Plate' are suitable for the secondary lifting attachment assembly. The main bell lift wire socket is attached with a load pin secured with a locking nut and split pin.

A telescopic stand-off frame is fitted, deployed when the bell is launched, designed such that the divers can freely exit and re-enter the bell in an emergency scenario if it is resting on the seabed.

An emergency umbilical services manifold is fitted on the upper side of the bell, near the circumferential bumper bar, comprising connections for hot water supply, bell internal depth and gas supply. The communications line can be wet mated to the oil filled junction box via the Diver-3 communications connection. The manifold is painted yellow in colour for easy identification.

The JW Fisher SFP-1 single frequency pinger bell location is fitted on the bell, and the PR-1 receiver unit is stored in dive control.

The bell is fitted with internal and external hydraulically assist manually operated bottom doors, and manually operated inner and outer side doors for mating with the DDC-1 entry lock trunking.

Four viewports are provided, they appear in good undamaged condition and are fitted with protective covers internally and externally.

Two lights and two carbon dioxide scrubber units, (one scrubber unit removed for service during the course of the audit), are provided, one of each can be powered independent of surface supplies by the bell onboard battery.

A Divex 'Bell Gas Management Panel' or 'MARA' panel is provided, however, during the course of the audit it was undergoing maintenance and was not fitted inside the bell.

The bell diving supervisor has control of the bell blow down from the surface supply at all times subject to the correct internal bell valve orientation. Bell blow down is on a separate supply from the diver's gas supply; operation of the blowdown does not interfere with the gas supply to the working divers outside the bell.

Eight onboard high pressure heliox gas cylinders are provided, distributed in three separate banks, and one onboard high pressure oxygen cylinder.

A sufficient supply of breathing gas is carried onboard the bell, assuming the cylinders are fully charged, to support each working diver plus the bellman outside the bell for 30 minutes at a breathing rate of 40 litres per minute at a maximum depth of 172 metres.

All of the external onboard gas cylinders are correctly colour coded, marked with the name of their contents, and have their last hydrostatic test date stamps suitably highlighted.

The onboard oxygen cylinder contents are regulated externally by a Tescom dome loader to less than 30 bar over ambient pressure, prior to entering the bell interior. The onboard heliox cylinders contents are not regulated, high pressure gas is supplied in the bell.

Oxygen is regulated into the bell via a system which limits the flow that can enter the bell; two needle valves are positioned in line prior to a flow meter.

Hot water, for heating the bell atmosphere and the divers, is supplied from the machinery container via a manifold arrangement. The bell heater can be isolated via a series of valves which bypass the hot water directly to the diver's hot water manifold / overboard dump valve. A thermometer is fitted to the manifold in the bell enabling the bellman to monitor the water temperature being supplied.

Lung powered scrubbers and survival suits are available in the dive technician's store, however, they were not loaded-out in the bell during the course of the audit.

A Divex gas reclaim system is fitted; the water trap is readily accessible to the bellman.

There are four external lights installed, two on the lower part, and two on the upper part of the bell. It was advised that these provide suitable illumination. There are two independent circuits for the lights, wired such that failure of one light will not cause failure of all of the others.

A flood-up valve is provided enabling the bell to be partially flooded, (quarter bell flood-up), by opening a single quarter turn valve on the pipe end, which is suitably guarded for finger protection.

There are three drop-down seats with restraining lap-belts fitted. A means of restraining the bellman from falling into the open manway, either as a result of a slip or of losing consciousness, is not provided.

The bellman's umbilical is stored on the outside of the bell; an appropriately designed umbilical stowage rack is provided on the exterior of the bell with suitable stowage points to allow it to be fastened back to avoid damage during launch and recovery.

The bellman's external stowage rack has a single pull release mechanism whereby the umbilical can be quickly released in an emergency.

Sacrificial anodes are fitted on the external bell frame; they appear in reasonable condition, with average depletion, and are not painted over.

The bell was not fully fitted out in a state of readiness to dive at the time of audit; survival suits, analysers, tools, medical kit etc., will need to be installed prior to the commencement of diving operations.

## **Section 6 Life Support Control**

Life support control is fitted in a purpose built steel container, shared with dive control, located on the port side of the vessel, aft stern quarter, above the machinery container on the second deck level of the system. The container is insulated and air conditioned, and provides good environmental protection for its occupants.

The life support panels are suitably laid out, with good access to the controls. Clear access to the rear and underside of the panels is provided. All exhaust lines on the panels vent into a common line which is routed to atmosphere outside the life support control container.

The life support personnel have adequate access to all relevant areas of control and are able to read all gauges and displays on the panels without difficulty.

A single ECU faulty light indicator is mounted on the bulkhead between dive and life support control.

Sufficient overhead fluorescent lighting is provided in the life support control compartment. Emergency self-contained automatic lighting is also provided; however, only one light was operational when tested.

Analogue depth gauges, indicating pressure gauges and digital reference gauges are provided, allowing the life support personnel to be aware of the depth of each compartment of the chamber complex, and of the supply pressures of each main and back up gas supply. The requirement for gauge scale divisions of not more than 0.5 msw for decompression is not met; the analogue gauge divisions are 1 msw.

Primary and secondary chamber gas supplies are separate from the bell and diver supplies, the supplies are suitably arranged such that if one line fails, then this does not interfere with the supply to the other lines.

It was advised that three independent blowdown supplies are available to each panel when the system is operational, each chamber panel is provided with an 'LP Air' supply, however, it was advised by the life support supervisor that air is not connected to the system when operational. The supplies are suitably arranged so that if one of the mixes fails, an alternative may be switched over immediately.

The chamber oxygen make up system is manual; oxygen is injected using manually operated needle valves, through a 'Dwyer HFB-1-002' in line flow meter, complete with flow indicator, fitted on each lock panel.

Four oxygen and carbon dioxide analysers are provided on the analysis panel, marked Analysis Bank-1, Bank-2, Bank-3 and Bank-4. Quick connect / disconnect bulkhead fittings on the panel allows any compartment or any gas supply to be analysed.

CCTV surveillance of each internal compartment of the chamber complex is available; viewed by life support personnel on flat screen monitors installed above each chamber panel.

Two C0363AY Divex Helium Speech Unscrambler units provide the two way voice communications between life support personnel and personnel inside any compartment of the chamber complex. A sound powered phone is also fitted, common to all the chambers, providing the secondary means of communication.

An Aiphone TD-12H multi-station unit is provided in life support control; TD-12H slave units are installed at each chamber service lock.

The Canford communications system provides the two-way voice communications between life support control and the launch location of the HRU chamber.

An automatic Minerva Tyco fire detection system is fitted, with the dive control, life support control and the machinery container areas covered.

A digital Divex CEC-3 controller is provided on each panel which displays the chamber compartment temperature and humidity levels.

It was advised that two BIBS mixes are always on line during diving operations, either one can be supplied to the single BIBS supply line to each of the chambers; it is possible to easily change between the two mixes being supplied.

Self-contained and umbilical supplied breathing apparatus is provided inside the container, within easy reach of the life support personnel.

### **Section 7 Main Bell Umbilical**

The main bell umbilical is a sheathed DMU-0079 type, 366 metres in length when new in 2009, manufactured by Cortland Fibron BX, Ltd., in the United Kingdom.

The bell umbilical is deployed and recovered using a dedicated, hydraulically powered constant tension umbilical winch, complete with a chain-driven level wind system, providing a suitable means of handling the umbilical such that it is not normally exposed to damage.

The umbilical winch is fitted with a hydraulically operated automatically activated external dry failsafe band brake, which prevents the umbilical from paying out under load.

A purpose designed roller system is mounted on the top of the gantry system, ensuring that the bend radius of the umbilical is not compromised during deployment and recovery.

The umbilical is attached to the bell by means of a Chinese Finger / Kellums Grip arrangement, and subsequently neither the individual components of the umbilical or the bell penetrations are subject to load.

A Cortland Fibron BX emergency umbilical, 200 metres in length, comprising a hot water hose, a gas hose, a pneumo hose and a power / communications cable is available, stowed on a purpose built rack. It was advised that the quick connect / disconnect hose ends are compatible with the emergency services manifold panel fittings on the exterior of the bell.

The emergency services umbilical is stored on a stand-alone umbilical rack on top of the pipe rack, away from risk of damage and such that minimum bend radius of components is not compromised. It was advised that the umbilical will be stored on dedicated horns on the DDC-2 skid during diving operations.

### **Section 8 Diver Heating System**

Two Divex WHE-3 hot water units are provided, located in the machinery container on the main deck level. The system provides primary and secondary diver heating and pumping capability, albeit from a common seawater source.

Each unit utilises a pressurised boiler for the direct heating of seawater, which, after being heated to the required temperature, is pumped, via an electric driven pump, to the bell hot water manifold, via the main bell umbilical, where it can be distributed to the three divers, the bell heater and / or a bell overboard dump valve as required.

Two IR Carel controllers are provided on the panel which display the hot water temperature being supplied to the bell / divers from System-1 and System-2 hot water units. An audible and visual alarm, complete with test and mute function is provided on each controller, an emergency stop push button is also fitted. Water temperature is controlled on the individual WHE-3 hot water units.

An automatic Minerva Tyco fire detection system is fitted; the machinery container is monitored in the life support control room.

### **Section 9 Diver's Umbilicals**

Four spiral wound type umbilicals are provided with the system, (one bellman and three excursion); they are in generally good condition, robust and made up from suitable components that appear to be fit for purpose.

Two excursion umbilicals are stored in the bell, the bellman's umbilical is stored on the outside of the bell, and the spare excursion umbilical is suitably coiled on horns on the main deck; all away from the risk of damage and such that minimum bend radius of components is not compromised.

The three in-use umbilicals are fitted with 'D' rings and stainless steel screw-gate carabineers allowing them to be securely fastened to the diver's safety harness without putting any strain on the individual whip ends.

The umbilicals are marked with black and red tape band markings at five metre intervals, as per the colour scheme detailed in Diving Operations Manual.

### **Section 10 Diver's Personal Equipment**

Three Kirby Morgan KM-17c diving helmets fitted with Jewel 601 reclaim, one KM-18 band-mask and one KMB-28 band-mask are provided. The helmets and band-masks appear in good condition, with no obvious defects noted.

The KM-17c's are fitted with the KM positive lock latch system on the neck dams, the KM-18 and KMB-28 are fitted with band keepers and captive hoods.

Previous records of maintenance are provided in hard copy format in the dive technician's air conditioned workshop.

Three Faber brand twin 7 litre, three Beaver brand 12 litre and three Luxfur brand 11 litre bail-out cylinders are provided; they are all correctly colour coded and marked with their contents, with no obvious major defects noted.

Four sets of suitable connections, fittings etc., are provided to allow the bail-out cylinder to supply emergency breathing gas to the diver's helmet / band-mask if required.

All whips, first stages and contents gauges appear in adequate condition, with no obvious major defects and of suitable type and pressure rating for the purpose.

Divex harnesses are provided, each fitted with full body harness straps, and they appear to be fit for purpose.

Each harness is provided with a manufacturer's ID tag where the serial number, date first put into service and discard date is readily identifiable. A photograph has been taken of each ID tag and is included within the D024 register.

### **Section 11 Compressors and Pumps**

The system machinery is located in the machinery container on the main deck level. The following equipment is provided:

- 2 x Diver's hot water units
- 1 x Divex gas reclaim unit
- 1 x Haskel bail-out / OBG cylinder charging air driven gas booster pump
- 2 x Chamber hot and cold potable water units
- 4 x Chamber conditioning units

The SM1 DX-300 system was built to, and is under Lloyd's Register Classification; subsequently the system components have been verified during the build and installation phase as being acceptable and in accordance with the manufacturer's approved specifications, and fit for purpose.

Solenoid 'local' safety switches are fitted to the majority of equipment, some equipment, such as the diver's gas reclaim unit, and CCU's are fitted with remote alarms in dive control.

All pipe work, valves, fittings etc., appears to be suitable for the purpose, properly installed and adequately protected from damage.

Manufacturers operating manuals for the machinery are available with the dive technicians, in a mixture of hard and soft copy.

All electrical supplies observed appear to be properly connected using suitable equipment.

Suitable access to the equipment is provided for personnel, both for routine maintenance and in an emergency situation.

## **Section 12 High Pressure Air and Gas Storage**

Project gas was not provided with the SM1 DX-300 system.

## **Section 13 Diver Gas Reclaim**

A Divex diver gas recovery system is provided in the machinery container, comprising the following elements; bulkhead reprocessing unit, Haskel AGD-4 air driven gas booster unit and a ten cylinder HP storage bank.

The diving helmets are equipped with Jewel 601 regulators, specifically designed for gas reclaim purposes.

The reclaim oxygen make-up system has in-built means to limit the flow of oxygen such that it cannot grossly exceed the rate of metabolic consumption of the divers. The reclaim panel has a solenoid controlled oxygen injection orifice fitted, with a means by which it will close if there is a power failure, thus preventing a potential dangerous build-up of oxygen levels within the reclaim system.

Dive control is fitted with a Divex control panel, which provides the diving supervisor with full control of the reclaim system. Suitable alarms and reclaim gas analysis capability is provided.

A Divex two diver control panel is fitted in the bell, complete with water trap.

Operating instructions are provided in dive control, and comprehensive operating, set up and maintenance manuals are available in the dive technician's workshop.

## **Section 14 Chamber Gas Reclaim and Purification**

A chamber gas recovery system is not provided with the SM1 DX-300 system.

## **Section 15 Hyperbaric Evacuation System**

The insulated HRU chamber was built by Modular Engineering in 2009 to the PD500:2003 Category 1, Lloyds Rules & regulations For Submersibles & Diving Systems 1989 design code.

The HRU is a type (a) system; a pressure chamber adapted for use in an evacuation, designed with an A-frame designated launch system, and capable of being lifted-off the vessel, and provides the hyperbaric rescue facility for up to twelve divers.

The chamber is insulated with Armaflex, covered in glass fibre matt resin and orange gel. In areas where there is no insulation fitted, such as around viewports and door flanges, the paintwork is in good condition, with no serious corrosion to the chamber plating noted.

The HRU is marked in accordance with the IMCA D027 recommendations, with the exception that no patches of reflective material are provided to assist its location at night, and two of the three emergency stickers are faded.

Two viewports are installed; both were found in good, undamaged condition, fitted with external protective covers.

There are no onboard means of cooling the HRU once it has been locked off the system and launched. Cooling, and other life support equipment, is fitted into a dedicated life support control container, which, after being connected to a suitable power supply and to the HRU, is capable of providing services in excess of 72 hours.

The chamber is fitted with a Divex HCU3/4 unit for carbon dioxide removal, cooling and humidity control, and a Divex CCU-06 assembly for external cooling air flow distribution. Three Divex DH-21 emergency scrubber units are also provided for the removal of carbon dioxide.

The dedicated HRU launch winch can be powered by either the diesel powered dedicated HPU or the bell LARS primary and secondary electrically driven HPU's.

The exterior of the HRC is fitted with eight high pressure onboard gas cylinders and four cylinders of high pressure oxygen, they are suitably colour coded and marked with the name of their contents.

A Dwyer 0-30 litres per minute flow meter is provided in the HRU chamber to control the rate of oxygen injection.

An HRC Thermal & Environmental Test Report on the HRC, reference DVX-SYS133-TT-PE007-09, conducted by auditor in January 2010 is available. This report covers the ability of the system, together with the emergency life support package, to control the environment when tested against given loads as per the guidance document D02/06.

A 'float and tow test' on the fully laden HES was conducted by Divex in January 2010, witnessed by Lloyd's Register, as per the report contained in the system's certification pack. A float test was also performed in December 2013 as part of the Lloyd's Register Major Survey.

A HRC battery endurance test was performed in February 2013. The results determined that the onboard battery pack is sufficient to run emergency equipment for a period greater than 72 hours.

The service lock is protected by an interlock system that makes it impossible to open the door whilst the lock is pressurised, and to obtain a gas tight seal if the clamp is not properly closed.

The HRU to DDC-1 entry lock clamp is protected by an interlock system that makes it impossible to open the door whilst the lock is pressurised, and to pressurise the trunk if the clamp is not properly closed.

Two overhead hyperbaric lights provide sufficient internal lighting for the chamber occupants to operate and control valves in safety, and to allow clear surveillance in life support control, via the internally mounted camera.

Where appropriate, valves have been secured in the 'open' or 'closed' positions using light duty tie-wraps.

The HRU was not fully fitted out in a state of readiness to dive at the time of audit; survival suits, portable fire extinguishers, analysers, tools, medical kit, portable toilet, chemicals and consumables etc., will need to be installed prior to the commencement of diving operations.

## **Section 16 Life Support Package**

The LSP main components are housed in a steel container, the container is not divided into control and machinery areas, and air conditioning has not been fitted.

A systematic assessment of the LSP and its sub-systems confirming that the equipment is both adequate and fit for its intended use, and to identify potential failure modes, to determine their effects and to identify actions to mitigate the failures is not provided.

A quick start guide is provided for the chiller unit in the LSP container. Valve check lists are available for both the LSP control and the HRU chamber.

A life support panel is provided allowing the life support personnel to control and monitor the conditions inside the pressurised HRU chamber.

Electrical schematics are provided in the LSP container, however, an assessment to identify the electrical power required by the LSP in normal operational mode is not available.

The panel is well laid out and the gas distribution tram lines are easy to follow. Suitable access to the underside and back of the life support panel is provided for maintenance and repair to the gas pipework.

One analogue depth gauge, one digital depth gauge, and pressure indicating gauges are provided on the panel in order for the life support personnel to be aware of the depth of the chamber, and of the chamber / BIBS and oxygen make-up supply pressures.

The following supplies are provided into the panel:

- BIBS Treatment Supply 1 & 2
- Mix Supply 1 & 2
- LP-Air Supply
- Oxygen Make-Up

Oxygen is injected using a manually operated rising stem needle type valve. A Dwyer 0-10 litres per minute flow meter is provided downstream of the oxygen supply needle valve and regulator; this provides the indication that oxygen is flowing.

Suitable means are provided to monitor the chamber content for oxygen and carbon dioxide content, however, there is no provision to monitor the chamber temperature or humidity on the control panel; this is done via a combined hygrometer / thermometer mounted in the HRU chamber adjacent to one of the viewports.

An Amcom II Model 2825 R with Amscram provides the required two way means of communication with the LSP control point and the divers inside the chamber, when the services umbilical is connected, a sound powered phone is provided as back-up.

The HRU chamber is fitted with two small viewports which provide the means for the life support personnel to have sight of the chamber occupants. A CCTV link between the chamber and life support control is also available.

There are no means to analyse the control cabin atmosphere, however, it was advised that the life support control is designed to be operated with the container doors open.

Fire-fighting equipment, medical equipment and breathing apparatus are not provided.



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## 4.0 CONCLUSION

The Executive Summary in Section 2 of this document lists any ‘pure’ non-conformances that are required to be addressed and closed out, mobilisation and readiness non-conformances that would usually be expected to be closed out during the course of mobilisation, and certification non-conformances involving certification only.

There may be some non-conformances which are not possible to address and close out due to engineering and design issues. These and any others remaining open will need to be risk managed with procedures and assessments that are implemented with the approval and acceptance of the Client.

On conclusion of the audit non-conformances being closed-out and accepted by the Client, providing the equipment is managed, supervised and operated by competent personnel, it would be expected that the equipment forming the SM1 DX-300 saturation diving system described herein can be operated in accordance with the IMCA requirements and guidelines.



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## APPENDIX 1

### IMCA DESIGN D024 AUDIT CHECK LIST

The check-list contained herein is the D024 audit checklists used to capture all the findings for the process of this report.

<b>Dive System:</b>	SM1 DX-300 12-Man Saturation Diving System
<b>Location:</b>	Western Yard & Derrick Lay Barge
<b>Audit Type:</b>	IMCA 'DESIGN' D024 Rev.2 DESIGN Document Compliance Audit
<b>Auditor:</b>	
<b>Date:</b>	17 <sup>th</sup> to 21 <sup>st</sup> May (yard) & 19 <sup>th</sup> June to 2 <sup>nd</sup> July 2015

The IMCA DESIGN requirements are listed:-

- 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 signifies a requirement which is considered as necessary but can be met in more than one way. It is left up to the discretion of the competent person as to whether the requirement is being suitably met.
- C** This refers to a requirement which is optional.

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## **APPENDIX 2**

### **SYSTEM PHOTOGRAPHS**

To support the findings and conclusions of this report, photographs were taken. All photographs taken are contained herein, with auditor retaining none other than these. The information contained in the photographs remains the property of the owner. Any reproduction should be with the written consent of the equipment owner.



Diving Equipment Systems Inspection Guidance Note (DESIGN)  
for Saturation (Bell) Diving Systems  
IMCA D024 Rev. 2 - Record Sheets









**Vessel particulars**







Name of vessel:	12-Man Saturation System SM1 DX-300 (SY133)		
Brief description of diving system:	6-Man DDC1, 3-Man DDC2, 3-Man DDC3, 3-Man SDC, 12-Man HRC, Bell LARS, Dive Control / Life Support Control Container,		
	20' Clean Workshop / Stores Container, 20' LST Pantry / Stores Container, 2 x Electric HPU's, 1 x Diesel HPU, 4 x Diver's Umbilicals,		
	1 x 10' LSP Container, Machinery Van Containing 2 x Diver's Hot Water Units, 1 x Diver's Reclaim Unit, 2 x Potable Water Units, 4 x ECUs, 1 x Gas Transfer Pump		

**Last audit/inspection**











Carried out by:		
Date:	Previous: 17th to 21st May & 19th June to 2nd July 2015	Close-out: 22nd July 2015
Location:	Previous: Western Yard, Pasir Gudang, Johor, Malaysia & During Transit from Bintulu to Anqsi Field, Offshore KSB, Malaysia	











**Non-conformances/points noted**









Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
3 - DDC1-ML	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	The majority of hollow penetrators are fitted with either plugs or valves to prevent catastrophic pressure loss. N/C: Hollow penetrators in the system trunkings are not fitted with internal protection valves or other devices: this is common throughout the chamber complex and is raised as a non-conformance in this section only. Note: The following is transcribed from Information Note IMCA D 04.15 issued in January 2015: "A diving contractor who decides not to provide internal isolation valves or diffusers in trunkings should be ready to demonstrate to clients and DESIGN auditors, (by means of a detailed risk assessment) that they have sufficient engineering and procedural control measures in place to reduce the possible hazard created by the absence of these safeguards to an acceptable level."	Risk Assessment is available "Saturation Divers transferring to other Chamber or to the Diving Bell via truckings that have no internal fittings installed".	10/7/2015	CLOSED  RA provided as evidence.	 A member of IMCA 
3 - DDC1-ML	6.6	Valve Marking	All valves must be clearly marked with their function	A	The majority of the individual quarter turn valve handles are marked, needle valves and unmarked quarter turn valves are in close proximity to the penetrators, all of which are marked; their function is clear. N/C: The equalisation valves/penetrators fitted to the doors are not marked. Common for all chambers, except DDC-3 EL.	Valve Labeled - Closed	10/7/2015	CLOSED  Photograph provided as evidence.	 A member of IMCA 
3 - DDC1-ML	6.2	Securing	All doors should be able to be secured in the open position	A	N/C: No mechanisms are provided to secure the doors in the 'open' position. Common for all chambers, except DDC-3 EL.	Door brackets have been fabricated. Closed	10/7/2015	CLOSED  Photograph provided as evidence.	 A member of IMCA 
3 - DDC1-ML	6.37	Secondary System	A secondary system should also be available for controlling the internal environment of the chamber. This must remove excess CO <sub>2</sub> , provide heating/cooling and control humidity	A	The main lock is fitted with two Divex DH-21 emergency scrubber units for CO <sub>2</sub> removal. N/C: No secondary HCU for providing heating / cooling and humidity control is available, however, the following mitigation was offered: • The HCU motors can easily be changed-out during a saturation, spare motor was available. Note-1: This is common with the three living chambers and is raised as a non-conformance in this section only. Note-2: The HRC ECU serves as a spare unit via the cross-over valves installed to the van.	As any modifications to the system will require manufacturers and class societies involvement and approval, the current mitigation is to lock in a spare motor in the event of a failure of the HCU motor.  *all IMCA / DMAC revisions after Pan Malaysian Contract - 'T & I of Offshore Facilities for year 2014 - 2016' - will be closed out prior to next full audit. Not to be considered in current SM1 audit*	10/7/2015	OPEN  29 July 2015: Owners are planning to complete this upgrade prior to the next full audit.	 A member of IMCA 













Non-conformances/points noted									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
3 - DDC1-ML	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	DDC-1 ML is designated for this facility. The medical bunk is clearly marked and is located near the EL end towards the DDC-2 side. There are two hinged perspex sections which provide the means to raise both ends to 30°. A moveable light is available which can be connected to the bunk light connector. The area has good access to sanitary facilities, a suitable medical lock and communications. Ample room for movement is provided beside the medical bunk. N/C: Additional requirements as per DMAC 028 Rev.2 were not available, which may include a patient monitoring system (for blood pressure, ECG, pulse, temperature, SAO2) etc. Note-1: There is no chamber configuration diagram in sat control which shows the location of the medical bunk. Note-2: No document was sighted detailing which aspects of DMAC 028 Rev. 2 can be satisfied. A risk assessment should be produced mitigating the unfulfilled specific requirements.	The client has confirmed there is no requirement for a Vitalink system to be installed.  An emergency treatment bunk location drawing is available and has been posted in Sat Control.  A gap assessment on the DMAC 028 Rev 2 has been conducted.	10/7/2015	A Manufactures Chamber Diagram was provided as evidence but the "Medial Bunk" is not identified on this diagram. have raised a GAP assessment that identifies the Medical Bunk as being in Chamber1 opposite the medical lock. This bunk has been marked as such in the chamber.  A DMAC 28 Rev 2 Compliance GAP review has been drafted and provided by .  29 July 2015: A Diagram identifying the medical bunk in the chamber has been sighted.  A Vitalink system is planned to be purchased and installed after this project.	 KB Associates Pte Ltd A member of IMCA 
4 - Bell Launch & Recovery Sys	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	N/C: A load test procedure is available, which covers individual winch motor and brake testing, however, a diagram of critical areas that are subject to non destructive testing is not provided. Note: The procedure is not Company approved; it has not been assigned a document number, neither is it dated.	The signed and dated load test procedure is available.  The requirement for the drawing indicating the critical areas subject to NDE has since been produced detailing the areas that were NDE during this recent load test. However this is at a draft stage as it will be required to be reviewed by a competent person.  (Awaiting issuance of MPI certification)		CLOSED  Certificate provided as evidence.	 KB Associates Pte Ltd A member of IMCA 
4 - Bell Launch & Recovery Sys	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	The weight of the bell in air, (fully loaded), and the weight in water, (when fully loaded & submerged), are provided, (information supplied by Divex). • The weight of the fully equipped bell in air, including a 10% contingency is recorded at: 9,572kg • The weight of the fully equipped bell in water, including a 10% contingency is recorded at: 1,737kg. N/C: The requirement states that the weights shown above "should have been physically checked in the last 12 months by weighing. This will be both in water when fully submerged and in air." This requirement is also applicable to the clump weight.	Bell weight tested on the Air & in the water.	10/7/2015	CLOSED  Photograph provided as evidence. Bell weight in air= 10 tonne Bell weight in water = 2 tonne	 KB Associates Pte Ltd A member of IMCA 
4 - Bell Launch & Recovery Sys	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	N/C: No document was sighted to verify this requirement has been met.	Requirement can only be conducted with sufficient team of personnel onboard. At present there is no sat diving operations and this will be conducted prior to the start of diving operations with sufficient personnel onboard.	10/7/2015	<b>OPEN</b>  To be done upon full mobilisation	

























Non-conformances/points noted									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
4 - Bell Launch & Recovery Sys	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	N/C: An assessment is not available which details the minimum electrical requirements for operating the individual hydraulic pumps on the LARS unit. Note: The normal and emergency operating modes require the same supplies as detailed above.	Assessment is available on the maximum hydraulic power required. Doc.: SKAMSB-III-DE-SM1-SDS-ETI-017-Rev1	10/7/2015	CLOSED  Photographic evidence is provided showing the "Power Failure During Bell Recovery Procedure" and the Hydraulic Power Supply system diagram posted.	 KB Associates Pte Ltd A member of IMCA  <input type="text"/>
4 - Bell Launch & Recovery Sys	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	The LARS winch control cabin is fitted with an umbilical supplied Interspiro Divator BA mask (S/N: 0919080) via a quick connect / disconnect female bulkhead fitting; complete with wired communications. N/C: No SCBA escape sets were sighted for the winch operator or lead diver on deck.	Dedicated SCBA is now in place.	2/7/2015	CLOSED  Testing certificates provided for two sets of SCBA c/w cylinder. Photographic evidence shows two sets of hose supplied BA sets.	 KB Associates Pte Ltd A member of IMCA  <input type="text"/>
5 - Bell Diving	5.3	Paint Work	Paintwork must be in good condition and the bell free from serious corrosion	A	N/C: The battery vessel labelled "14 Batt Pod PRV. & Elect. Conn" exhibited severe corrosion; particularly around the flange & penetrators. All other paintwork appeared in adequate condition and free from serious corrosion.	Primer Coating Completed on Battery Pod	10/7/2015	CLOSED  Photographic evidence shows the battery pack freshly painted with red paint.	 KB Associates Pte Ltd A member of IMCA  <input type="text"/>
5 - Bell Diving	5.8	Valves	Valves must be free of corrosion and should move freely through their full range of operation	A	All randomly checked valves function easily through their full range of operation. N/C: The handle is missing from the OBG Bank-2 charging valve.	Handle has been installed.	2/7/2015	CLOSED  Photographic evidence show that a new valve handle has been installed.	 KB Associates Pte Ltd A member of IMCA  <input type="text"/>
5 - Bell Diving	5.9	Valve Marking	All valves must be clearly marked with their function	A	Some valves were not marked. N/C: Several of the ball valves and rising stem needle valves were remote from any penetrator marking. Therefore, having the penetrator labelled is irrelevant.	All valves have since been marked for function.	3/7/2015	CLOSED  Photographic evidence has been provided showing that all valve handles have been marked with their function.	 KB Associates Pte Ltd A member of IMCA  <input type="text"/>









Non-conformances/points noted									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
5 - Bell Diving	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	The onboard O2 is pressure reduced by a dome loaded regulator before it enters the bell. N/C: The OBG Bank-1, Bank-2 and Bank-3 are not reduced externally prior to entering the bell.	Compliance to this requirement requires a review and discussion with both manufacturer and class society to ensure this meets their approval.  *all IMCA / DMAC revisions after Pan Malaysian Contract - 'T & I of Offshore Facilities for year 2014 - 2016' - will be closed out prior to next full audit. Not to be considered in current SM1 audit*	10/7/2015	OPEN  29 July 2015: are planing to complete this upgrade prior to the next full audit.	 KB Associates Pte Ltd A member of IMCA 
5 - Bell Diving	6.8	Valve Marking	All valves must be clearly marked with their function	A	Most valves were marked with their valve number Where valves were labelled with their function some of these labels were falling off. N/C: The requirement at left states: "...marked with the function." Which was not immediately obvious by the number.	Completed valve marking - Closed	10/7/2015	CLOSED  Photographic evidence has been provided showing that all valve handles have been marked with their function.	 KB Associates Pte Ltd A member of IMCA 
5 - Bell Diving	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	A quarter turn valve and a bent section of drilled open ended pipe is installed in the bell, in an easily accessible and clearly visible position. N/C: The flood up valve requires an additional valve installed, as per the requirement.	Flood up valve is at bottom with drill tubing which needs to flood valve with out causing any damages to electrical equipment	10/7/2015	CLOSED  Photographic evidence has been provided showing that the flood-up penetrator is in the lower half of the Bell and that there is only a short piece of piping is used. Therefore the flooding of the bell would stop at the level of the penetrator and the Bell would not fully flood as would be the case if the penetrator was on top of the bell.	 KB Associates Pte Ltd A member of IMCA 
6 - Life Support Control	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	Each of the chambers is controlled by an individual panel. On each panel there is an analogue 0-360 msw / 0-1,200 fsw gauge with 1 msw / 4 fsw divisions / 0.25% accuracy. N/C: The requirement for depth gauge scale divisions of not more than 0.5 msw for decompression are not met.	Digital gauges dedicated for each chamber compartment are available and has since been recalibrated. The requirement is met.	10/7/2015	CLOSED  Photographic evidence provided of the recalibrated digital gauges (x 4).	 KB Associates Pte Ltd A member of IMCA 
6 - Life Support Control	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	One emergency battery powered lighting unit is provided, for the life support supervisor to operate safely in an emergency situation. N/C: Only one of the two fitted lights worked when tested.	Both lights are now working.	10/7/2015	CLOSED  Photographic evidence provided of both emergency lights working.	 KB Associates Pte Ltd A member of IMCA 


Non-conformances/points noted									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
11 - Compressors, Pumps etc.	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	The filters on the diver's gas reclaim system are marked: • Filter Changed / Checked: 26-01-14 N/C: The filters are not marked when the next service is due.	Filters have been marked.	10/7/2015	CLOSED  Photographic evidence is provided showing the Last checked date and that the next inspection is due in 200 working hrs. There should be a Log Book onsite to record the working hrs for each filter.	 KB Associates Pte Ltd A member of IMCA 
15.2 - HRU Interface with Dive	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	N/C: A venting test as detailed in the requirement opposite was not sighted in the provided D024 register. Note: It was advised that a venting test will be conducted after completion of the system pressure test.	Venting test conducted upon completion of chamber overpressure testing.	2/7/2015	CLOSED  Certificate provided as evidence. SM1-15.2-HRU-006	 KB Associates Pte Ltd A member of IMCA 
15.2 - HRU Interface with Dive	7.5	Hose Venting	A means should be provided to allow all flexible gas hoses to be closed and exhausted prior to disconnection	B	N/C: No means of allowing the flexible gas hoses to be closed and exhausted prior to disconnection are provided. Note: The hoses are provided with quick connect / disconnect fittings.	Compliance to this requirement is to be reviewed as it may require modification to the system.  *all IMCA / DMAC revisions after Pan Malaysian Contract - "T & I of Offshore Facilities for year 2014 - 2016" - will be closed out prior to next full audit. Not to be considered in current SM1 audit*	10/7/2015	OPEN  29 July 2015: planning to complete this upgrade prior to the next full audit.	 KB Associates Pte Ltd A member of IMCA 
15.3 - Hyperbaric Rescue Unit	1.4	Marking	The HRU must be marked in accordance with international recommendations. These can be found in IMCA D 027	A	The HRU is marked in accordance with the following IMCA D027 recommendations: • The barge is clearly marked, which will be visible when floating. • The maximum fully laden weight of the HRU in air is stencilled on the HRU in a clearly visible location. • The main lifting point, (spreader beam), is easily identified, (wire sling with master link waiting on delivery). • The floatation of the HRU is painted International Distress Orange in colour. The HRU is not marked in accordance with the following IMCA D027 recommendations: N/C #1: No patches of reflective material are provided on the HRU to assist its location at night. N/C #2: Emergency markings are provided on the HRU, however the markings on the top and one side are worn / unreadable.	These items will be provided and changed out as required.  - *all IMCA / DMAC revisions after Pan Malaysian Contract - "T & I of Offshore Facilities for year 2014 - 2016" - will be closed out prior to next full audit. Not to be considered in current SM1 audit*		OPEN  The auditor states that: 1. No reflective patches are installed 2. Emergency markings need to be re-painted  29 July 2015: planning to complete this upgrade prior to the next full audit.	 KB Associates Pte Ltd A member of IMCA 

Non-conformances/points noted									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
15.3 - Hyperbaric Rescue Unit	6.6	Valve Marking	All valves must be clearly marked with their function	A	The majority of valves are labelled. N/C: A pressurisation valve on the end of the BIBS supply line is not marked.	Valve is now marked.	10/7/2015	CLOSED  Photographic evidence provided showing all valved handles are marked.	 KB Associates Pte Ltd A member of IMCA 
15.3 - Hyperbaric Rescue Unit	6.23	Door Securing	All doors should be able to be secured in the open position	B	N/C: No means is provided to secure the doors in the open position.	Door hold back brackets have been fabricated and in place.	10/7/2015	CLOSED  Photographic evidence provided.	 KB Associates Pte Ltd A member of IMCA 
15.3 - Hyperbaric Rescue Unit	13.1	Towing Line	All HRUs should be fitted with a suitable towing point and towing line or bridle	B	N/C: No towing line is fitted.	Towing bridle has been installed.	10/7/2015	CLOSED  Photographic evidence provided.	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	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, 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	N/C: A systematic assessment of the LSP and its sub-systems confirming that the equipment is both adequate and fit for its intended use, and to identify potential failure modes, to determine their effects and to identify actions to mitigate the failures is not provided.	FMEA for SM 1 onboard  *all IMCA / DMAC revisions after Pan Malaysian Contract - "T & I of Offshore Facilities for year 2014 - 2016" - will be closed out prior to next full audit. Not to be considered in current SM1 audit*	10/7/2015	OPEN  No evidence provided  29 July 2015: are planing to complete this FMECA prior to the next full audit.	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	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	A ceiling mounted twin tube fluorescent strip light is provided in the control container, which provides sufficient internal lighting to allow personnel to safely and efficiently carry out their duties inside the container. N/C #1: The container is supplied with a single power supply; a secondary power supply is not provided. N/C #2: Lighting around the LSP is to be determined when the system has been mobilised to its operational location.	Secondary power supply to be ordered and placed within LSP container. As mitigation for now, deck torch lights will be made available.  Lighting around the LSP is subject to where it will be located.	10/7/2015	CLOSED  Photographic evidence provided of both emergency lights working.	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	6.2	Power Requirements	An assessment is required to identify the electrical power required by the LSP in normal operational mode	A	N/C: An assessment to identify the electrical power required by the LSP in normal operational mode is not available.	(To draft assessment) ONGOING		CLOSED  Assessment letter provided as evidence. Advise that this be put into the LSP manual.	 KB Associates Pte Ltd A member of IMCA 

Non-conformances/points noted									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
16 - Life Support Package	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	N/C: The LSP is provided with a single power supply, there is no switch-over unit and a UPS system, (with assessment), is not provided.	As this is a new requirement, specifications of a secondary power supply and UPS suitable for the LSP will be reviewed and procured.  *all IMCA / DMAC revisions after Pan Malaysian Contract - 'T & I of Offshore Facilities for year 2014 - 2016' - will be closed out prior to next full audit. Not to be considered in current SM1 audit*		<b>OPEN</b>  29 July 2015: planning to complete this upgrade prior to the next full audit.	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	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	A single transformer provides 220V ac power, a transformer provides 24V dc power. N/C: 110V ac and 12V dc is not provided.	The LSP does not utilise 110V and 12V supplies. There are no appliances within the LSP that has this requirement.		<b>CLOSED</b>  As per comments	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	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	N/C: Electrical supply points for 4 x 110V ac & 1 x 32A 3-phase are not provided.	The LSP does not utilise 110VAC. Furthermore 110VAC is not common for appliances within this region.		<b>CLOSED</b>  As per comments	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	7.2	Dividing Wall	If the control area and machinery are in the same container there should be a dividing wall between them	B	N/C: The control area and machinery are in the same container; there is no dividing wall between them.	The LSP does not have a partition dividing the control and machinery. This will require further review and modification, possibly even reconfiguration of the container, all of which cannot be addressed at this point.  *all IMCA / DMAC revisions after Pan Malaysian Contract - 'T & I of Offshore Facilities for year 2014 - 2016' - will be closed out prior to next full audit. Not to be considered in current SM1 audit*		<b>OPEN</b>  As stated in Comments  29 July 2015: planning to complete this upgrade prior to the next full audit.	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	7.3	Insulation	There should be thermal and sound insulation on walls and roof in control area	B	N/C: No insulation is fitted.	The LSP does not have a partition dividing the control and machinery. This will require further review and modification, possibly even reconfiguration of the container, all of which cannot be addressed at this point.  *all IMCA / DMAC revisions after Pan Malaysian Contract - 'T & I of Offshore Facilities for year 2014 - 2016' - will be closed out prior to next full audit. Not to be considered in current SM1 audit*		<b>OPEN</b>  As stated in Comments  29 July 2015: planning to complete this upgrade prior to the next full audit.	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	7.4	Access Door	The access door to the control area should be capable of being opened from both sides	A	N/C: Access is via the double cargo doors, which if closed cannot be opened from the inside.	The LSP does not have a partition dividing the control and machinery. This will require further review and modification, possibly even reconfiguration of the container, all of which cannot be addressed at this point.  *all IMCA / DMAC revisions after Pan Malaysian Contract - 'T & I of Offshore Facilities for year 2014 - 2016' - will be closed out prior to next full audit. Not to be considered in current SM1 audit*		<b>OPEN</b>  As stated in Comments  29 July 2015: are planning to complete this upgrade prior to the next full audit.	 KB Associates Pte Ltd A member of IMCA 

Non-conformances/points noted									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
16 - Life Support Package	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	N/C: The normal geographical working area of the SM1 system is in warm climates; an air conditioning unit is not fitted.	The LSP does not have a partition dividing the control and machinery. This will require further review and modification, possibly even reconfiguration of the container, all of which cannot be addressed at this point.  *all IMCA / DMAC revisions after Pan Malaysian Contract - 'T & I of Offshore Facilities for year 2014 - 2016' - will be closed out prior to next full audit. Not to be considered in current SM1 audit*		<b>OPEN</b>  As stated in Comments  29 July 2015: planning to complete this upgrade prior to the next full audit.	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	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	The panel has provision for a single smoke mask. N/C: Breathing apparatus, (2 x sets), was not sighted during the course of the audit. Compliance to this requirement & Item 8.4, (umbilical supply from a pollution free zone), to be determined.	2 x SCBA sets have been installed.	6/7/2015	<b>CLOSED</b>  Photographic evidence provided of two SCBA sets.	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	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	A 'Divex' depth gauge, (S/N: 110555W1S2), 0-360 msw / 1 msw increments / 0.25% accuracy, is provided, securely mounted on the panel fascia. A 'Red Lion brand Model CUB-5 digital gauge is also provided; large enough, (11.7 mm high red LED digits), to be clearly read in both day and night time conditions and clearly marked 'MSW'. The gauge reads to two decimal points, and has 0.01 msw scale divisions. A label is posted beside the digital gauge which reads "Uncalibrated do not use". N/C: The requirement for depth gauge scale divisions of not more than 0.5 msw for decompression is not met.	Digital gauge has since been re-calibrated. This complies to the requirements for decompression purposes.	10/7/2015	<b>CLOSED</b>  Photographic evidence provided of the working gauge with the gauge show a depth to two decimal points.	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	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	N/C: No ambient O2 analyser is provided in the LSP control container. Note: The container is designed to operate with the doors open.	Closed		<b>CLOSED</b>  Photographic evidence provided of a portable O2 analyser in place.	 KB Associates Pte Ltd A member of IMCA 
16 - Life Support Package	8.52	VHF Radios	A minimum of four hand-held VHF radios should be available for use by the LSP personnel	A	N/C: Hand-held VHF radios were not sighted in the LSP control container during the course of the audit.	2 in LSP Package	10/7/2015	<b>CLOSED</b>  Photographic evidence provided	 KB Associates Pte Ltd A member of IMCA 







Non-conformances/points noted									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
16 - Life Support Package	9.2	Redundancy	There should be 100% redundancy, i.e. two complete cooling systems so that the failure of one does not alter the capability to provide the cooling required	A	A Champion brand chiller unit, model ICE039 M 460/3/60, is available in the container. The chiller unit provides cooling only. N/C: A single chiller unit is provided in the LSP control container.	The LSP does not have a secondary chiller unit. This will require further review and modification, possibly even reconfiguration of the container, all of which cannot be addressed at this point.  *all IMCA / DMAC revisions after Pan Malaysian Contract - 'T & I of Offshore Facilities for year 2014 - 2016' - will be closed out prior to next full audit. Not to be considered in current SM1 audit*	10/7/2015	OPEN  As stated in Comments.  29 July 2015: planning to complete this upgrade prior to the next full audit.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1793 310 1923 334" type="text"/>
16 - Life Support Package	11.2	Gas Hoses	Five hoses (three for gas and two for O <sub>2</sub> , 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 <sub>2</sub> cleaned as required. Hoses to be correct type for the service, i.e. if for O <sub>2</sub> , then should be specific O <sub>2</sub> hoses	A	Assorted hoses are available, although the exact details were not ascertained. N/C: A hose register is not available; hose sizes and length etc., was not determined during the course of the audit.	Hose register is available and in place.	10/7/2015	CLOSED  An extensive hose register was provided as evidence	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1793 558 1923 583" type="text"/>
16 - Life Support Package	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	N/C: No list of medical equipment for the LSP was sighted.	List of Medical Equipment for the LSP is available.	10/7/2015	CLOSED  A signed and stamped Medical Inventory for (Water Tight Bag inside SAT HRC) provided as evidence.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1793 846 1923 870" type="text"/>
16 - Life Support Package	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	N/C: No medical equipment for the LSP was sighted. Compliance to this requirement & item 16.4 below, (content checking), to be determined.	Medical equipment for the LSP has been checked and is complete.	10/7/2015	CLOSED  A signed and stamped Medical Inventory for (Water Tight Bag inside SAT HRC) provided as evidence.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1793 1114 1923 1138" type="text"/>

 **Diving Equipment Systems Inspection Guidance Note (DESIGN)**  
for Saturation (Bell) Diving Systems  
IMCA D024 Rev. 2 - Record Sheets









<b>Vessel particulars</b>	
Name of vessel:	12-Man Saturation System SM1 DX-300 (SY133)
Brief description of diving system:	6-Man DDC1, 3-Man DDC2, 3-Man DDC3, 3-Man SDC, 12-Man HRC, Bell LARS, Dive Control / Life Support Control Container, 20' Clean Workshop / Stores Container, 20' LST Pantry / Stores Container, 2 x Electric HPU's, 1 x Diesel HPU, 4 x Diver's Umbilicals, 1 x 10' LSP Container, Machinery Van Containing 2 x Diver's Hot Water Units, 1 x Diver's Reclaim Unit, 2 x Potable Water Units, 4 x ECUs, 1 x Gas Transfer Pump







<b>Last audit/inspection</b>	
Carried out by:	Previous: Darren Curtis & Simon Turner Close-out: Darren Brunton / Carlos Kennerley
Date:	Previous: 17th to 21st May & 19th June to 2nd July 2015 Close-out: 22nd July 2015
Location:	Previous: Western Yard, Malaysia & During Transit from Bintulu to Anqsi Field, Offshore KSB, Malaysia









**Ready to Dive - Items available but to be in place for diving (non-conformance)**





Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
1 - General System Safety	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	It was advised that during the last test the UPS provided emergency battery power for essential diving services for a minimum period of 48 minutes, and essential life support services for a minimum period of 65 minutes. Additionally, a diesel driven HPU was available for bell recovery and HRC deployment. N/C Mob: The secondary power supply, (emergency deck generator), was not onboard during the course of the audit, compliance to this requirement to be determined.	Emergency generator has since been mobilised onboard and function tested.  (Photo required for close out)	10/7/2015	CLOSED  29 July 2015: Photographic evidence provided	 A member of IMCA 
2 - Dive Control	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	An AME Emergency Response Manual is available in dive control. It was advised that new manuals will be provided under the ' ' company name. Note: A laminated A4 sheet titled 'Bell Emergency Recovery Procedures SM1 DX-300' was sighted in dive control; these bullet point procedures briefly outline the following scenarios: • Loss of hydraulics • ROV unable to connect emergency bell recovery sling • Loss of bell main lift wire • Loss of clump weight • Trapped bell N/C Mob: emergency procedures and project specific addendums to be available in dive control. Compliance to be verified on mobilisation.	There is no planned diving activities for the . All procedures and project specific documentation will be sent out should there be any diving operations.	10/7/2015	CLOSED  29 July 2015: Photographic evidence provided	 A member of IMCA 
2 - Dive Control	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	N/C Mob: Compliance to this requirement to be verified on mobilisation, when the bell can be launched and deployed at depth.	Compliance to this can only be verified with divers in the bell and during the first bell run. At present there are no planned saturation diving activities and this will be addressed when the time arises.	10/7/2015	CLOSED  29 July 2015: Photographic evidence provided of testing on the deck in a large bucket of water. Then refitted to the Bell.	 A member of IMCA 

















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Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
3 - DDC1-ML	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	There are seven BIBS supply and exhaust QC/OD connections available. N/C Mob: No BIBS installed in chamber. Compliance to the requirement to be verified on mobilisation, common to all chambers, this is raised as a non-conformance in this section only.	As there are no planned diving activities for the system, the BIBS will only be installed prior to operations. Installing the BIBS now would result in deterioration of the BIBS due to the heat.	10/7/2015	CLOSED Photographic evidence provided.	 KB Associates Pte Ltd A member of IMCA  <input type="text"/>
4 - Bell Launch & Recovery Sys	4.2	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	The clump weight wire will be attached to the gantry dead-end pad eye with a spelter socket with the load pin secured with a castellated nut and split pin. Note: A Crosby CoC is available for the 1" diameter open spelter socket for the clump weight wire. N/C Mob: Compliance to this requirement to be verified on mobilisation.	(Techs to confirm, photo required for close out)		CLOSED Photographic evidence provided.	 KB Associates Pte Ltd A member of IMCA  <input type="text"/>
4 - Bell Launch & Recovery Sys	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	A laminated A4 sheet titled 'Bell Emergency Recovery Procedures SM1 DX300' was sighted in dive control. These bullet point procedures briefly outline the following scenarios: • Loss of hydraulics • ROV unable to connect emergency bell recovery sling • Loss of bell main lift wire • Loss of clump weight • Trapped bell N/C Mob: emergency procedures for recovering the bell to the deck and mating it in the event of a vessel emergency, to be available in dive control. Compliance to be verified on mobilisation.	There is no planned diving activities for the . All procedures and project specific documentation will be sent out should there be any diving operations.	10/7/2015	CLOSED 29 July 2015: Photographic evidence provided	 KB Associates Pte Ltd A member of IMCA  <input type="text"/>
4 - Bell Launch & Recovery Sys	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	A dedicated emergency generator will be available, which will be used as the secondary power supply for the SMI DX-300 saturation diving system. N/C Mob: The generator was not onboard during the course of the audit. Secondary power supply to be connected and tested. Compliance to this requirement to be verified on mobilisation.	Emergency generator has since been mobilised onboard and function tested.	10/7/2015	CLOSED 29 July 2015: Photographic evidence provided	 KB Associates Pte Ltd A member of IMCA  <input type="text"/>





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Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
5 - Bell Diving	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	Bell Internal: Divex, 0-360 msw, 2 msw divisions caisson gauge fitted; S/N: 91395W151. The bell external depth gauge had been removed for service. N/C Mob: Install bell external depth gauge. Compliance to be verified on mobilisation.	(Techs to confirm, photo required for close out)		CLOSED 29 July 2015: Photographic evidence provided	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 308 1921 332" type="text"/>
5 - Bell Diving	6.2	Survival Equipment	There should be a means provided, independent of surface supplies, to maintain the diver's body temperature and reduce CO <sub>2</sub> 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 <sub>2</sub> reduction requirement will apply in all circumstances	B	N/C Mob: The bell was not fully kitted-out at the time of the audit. Three lung powered scrubbers and survival suits will be required in the bell during diving operations. Compliance to be verified on mobilisation.	As there are no planned diving activities for the system, the bell would be loaded out prior to diving operations. Loading out these items would result in deterioration of due to the heat.	10/7/2015	CLOSED 29 July 2015: Photographic evidence provided of the equipment ready to be loaded into the Bell.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 573 1921 597" type="text"/>
5 - Bell Diving	6.23	Gas Monitoring	There must be a means by which the divers in the bell can analyse the atmosphere for O <sub>2</sub> and CO <sub>2</sub> independent of the surface	A	N/C Mob: No analysers were fitted in the bell at the time of the audit. It was advised that a Drager Accuro Pump, (S/N: F002), and an Analox G11-4, (S/N: AB017554), analyser will be supplied for CO <sub>2</sub> and O <sub>2</sub> monitoring. Compliance to be verified on mobilisation.	As there are no planned diving activities for the system, the bell would be loaded out prior to diving operations. Loading out these items would result in deterioration of due to the heat.	10/7/2015	<b>OPEN</b> To be closed out after full mobilisation and before start of and saturation diving operations.	
5 - Bell Diving	6.27	CO <sub>2</sub> Removal	There must be a powered scrubber unit to provide primary CO <sub>2</sub> removal from the atmosphere	A	One Divex DH-21 powered scrubber unit is provided for CO <sub>2</sub> removal from the bell atmosphere, with an empty bracket where another Divex DH-21 powered scrubber unit has been removed for service. N/C Mob: The second emergency CO <sub>2</sub> scrubber unit will be required in the bell during diving operations. Compliance to be verified on mobilisation.	(Techs to confirm if in place, photo required for close out)		CLOSED 29 July 2015: Photographic evidence provided of the equipment ready to be loaded into the Bell.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 1138 1921 1162" type="text"/>


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Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
5 - Bell Diving	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	N/C Mob: The Divex MARA panel has been removed for service. Compliance to this requirement, and item 6.29 below, (there should be an alarm fitted to alert the bellman if the diver(s) supply switches over to the onboard gas), to be verified on mobilisation.	(Techs to confirm if in place, photo required for close out)		CLOSED 29 July 2015: Photographic evidence provided of the equipment ready to be loaded into the Bell.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 308 1921 332" type="text"/>
5 - Bell Diving	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	N/C Mob: The Divex MARA panel has been removed for service. Compliance to this requirement and item 6.34 below, (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), to be verified on mobilisation.	(Techs to confirm if in place, photo required for close out)		CLOSED 29 July 2015: Photographic evidence provided of the equipment ready to be loaded into the Bell.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 560 1921 584" type="text"/>
5 - Bell Diving	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	No BIBS or connections were available in the bell at time of audit. N/C Mob: Install MARA panel and BIBS. Compliance to be verified on mobilisation.	As there are no planned diving activities for the system, the BIBS will only be installed prior to operations. Installing the BIBS now would result in deterioration of the BIBS due to the heat.	10/7/2015	CLOSED Photographic evidence provided.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 828 1921 852" type="text"/>
5 - Bell Diving	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	N/C Mob: The bell was not fully kitted-out at the time of the audit, the bell medical kit was not loaded out during the course of the audit. Compliance to this requirement and items 6.50, (suitable container), and 6.51, (provided with a check list), below to be verified on mobilisation.	As there are no planned diving activities for the system, the bell would be loaded out prior to diving operations. Loading out these items would result in deterioration of due to the heat.	10/7/2015	CLOSED 29 July 2015: Photographic evidence provided of the equipment ready to be loaded into the Bell..	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 1079 1921 1104" type="text"/>

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Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
5 - Bell Diving	6.56	Emergency Procedures	A copy of the relevant parts of the emergency procedures (preferably plasticised) must be available inside the bell	A	A set of emergency procedures is provided in the bell, however, these were badly water stained / faded. N/C Mob: Compliance to this requirement for emergency procedures, and item 6.57 below, (a list of valve positions to be adopted in an emergency), to be determined during mobilisation.	office to send out, Techs to laminate and post where applicable)		OPEN No evidence provided	
6 - Life Support Control	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	An AME Diving Safety Management System manual is available in dive control. It was advised that new manuals would be provided under the ' ' company name. N/C Mob: saturation and life support procedures, manuals and relevant emergency procedures to be available in the control area. Compliance to be verified on mobilisation.	There is no planned diving activities for the . All procedures and project specific documentation will be sent out should there be any diving operations.	10/7/2015	OPEN To be closed out after full mobilisation and before start of and saturation diving operations.	
11 - Compressors, Pumps etc.	5.2	Security	All flexible hoses other than charging whips must be appropriately supported and secured at intervals not exceeding 2m	A	N/C Mob: Mobilisation was ongoing during the course of the audit: this requirement for flexible hoses to be appropriately supported and secured at intervals not exceeding 2 metres to be determined upon completion of mobilisation. Note: The majority of hoses fitted during the course of the audit are appropriately supported and secured at intervals not exceeding 2 metres.	(Techs to confirm if in place, photo required for close out)		CLOSED 29 July 2015: Photographic evidence provided.	 KB Associates Pte Ltd A member of IMCA 
11 - Compressors, Pumps etc.	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	N/C Mob: A hose register is provided, however, during the course of the audit the register had not been updated with previous and due test dates.	(Techs to confirm if in place, photo required for close out)		CLOSED 29 July 2015: Scanned hose register provided as evidence.	 KB Associates Pte Ltd A member of IMCA 



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Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
11 - Compressors, Pumps etc.	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	N/C Mob: Mobilisation was ongoing during the course of the audit; this requirement for gas supply hoses to be secured at the connection point with whip-check devices attached to a secure fixed point to be determined upon completion of mobilisation. Note: The majority of hoses fitted during the course of the audit are fitted with spring type whip-check devices which have been secured to suitable strong points.	(Techs to confirm if in place, photo required for close out)		CLOSED 29 July 2015: Photographic evidence provided.	 A member of IMCA  <input data-bbox="1795 308 1921 332" type="text"/>
12 - High Pressure Gas Storage	1.1	Quantity	There must be sufficient supplies available to comply with the requirements of IMCA D 050	A	N/C Mob: No HP gas supplies/quads were available for audit, compliance to this requirement and Items 1.2 through 6.5 below to be determined during onsite mobilisation.	There is no planned diving activities for the . All gasses will be addressed should there be any diving operations.	10/7/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	
13 - Diver Gas Reclaim	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	There are three Analox G22 O2 and three Analox 5001 CO2 analysers fitted to the panel, each with an audio/visual & high/low alarm, with mute facility, set up with a patch panel arrangement, such that the three mixes available to the panel can also be analysed, and so that the analysers can be calibrated, (zero and span gas connections). The paired analysers are currently set-up as follows: • Analyser-1: Bell O2 - (G221249) & CO2 - (5K11223) • Analyser-2: Diver O2 - (G221296) & CO2 - (5K11222) • Analyser-3: Reclaim O2 - (G221235) & CO2 - (5K11302) N/C Mob: The analysers should be dedicated; a procedure should be posted on the panel stating that during diving operations the connecting hoses should not be removed from the divers, bell and volume tank analysis points.	(Techs to confirm if in place, require brief procedure or instruction, photo required for close out)		OPEN  No evidence provided. Notice needs to be provided stating "hoses should not be removed from the divers, bell and volume tank analysis points."	
15.1 - General - HES System	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	N/C Mob: Procedures had not been posted at all relevant locations; compliance to this requirement to be determined.	office to send out, Techs to laminate and post)		CLOSED 29 July 2015: Photographic evidence provided.	 A member of IMCA  <input data-bbox="1795 1226 1921 1250" type="text"/>

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Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
15.2 - HRU Interface with Dive	4.2	Trunk Exit	Consideration should be given to a means of surveillance of personnel exiting the trunking in to the HRU	C	N/C Mob: The CCTV link was not established during the course of the audit; it was not ascertained if the CCTV camera provided in the HRU main lock provides adequate surveillance of personnel exiting the trunking into the chamber, compliance to be determined.	(Techs to confirm if in place, photo required for close out)		CLOSED 29 July 2015: Photographic evidence provided.	 KB Associates Pte Ltd A member of IMCA 
15.3 - Hyperbaric Rescue Unit	6.17	BIBS	There should be one BIBS connection and mask for each intended occupant plus one spare	A	There are thirteen BIBS supply and exhaust QC/QD connections available. N/C Mob: No BIBS are fitted in the HRU. Compliance to be verified on mobilisation.	As there are no planned diving activities for the system, the BIBS will only be installed prior to operations. Installing the BIBS now would result in deterioration of the BIBS due to the heat.	10/7/2015	CLOSED 29 July 2015: Photographic evidence provided.	 KB Associates Pte Ltd A member of IMCA 
15.3 - Hyperbaric Rescue Unit	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	It was advised that a portable toilet will be provided. N/C Mob: To be installed in HRU. Compliance to be verified on mobilisation.	(Techs to confirm if in place, photo required for close out)		CLOSED 29 July 2015: Photographic evidence provided.	 KB Associates Pte Ltd A member of IMCA 
15.3 - Hyperbaric Rescue Unit	6.28	Head Protection	Protective headgear should be provided for the occupants	B	Twelve protective helmets are available in the store. N/C Mob: Load helmets in the HRU. Compliance to be verified on mobilisation.	As there are no planned diving activities for the system, the HRC would be loaded out prior to diving operations. Loading out these items would result in deterioration of due to the heat.	10/7/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	
15.3 - Hyperbaric Rescue Unit	6.3	Firefighting	There must be a suitable means fitted to extinguish a fire in the chamber	A	N/C Mob: A Divex Hy-Fex 7.5 litre non-toxic aqueous foam fire extinguisher is available, however, the unit had not been charged and fitted, compliance to this requirement to be determined. Note: The water deluge is also provided for when the HRU chamber is locked onto the system, refer to section 3 - DDC1 - ML Items 6.27 through 6.32 for compliance or otherwise to these fixed firefighting requirements.	As there are no planned diving activities for the system, the HRC would be charged and loaded out prior to diving operations.	10/7/2015	CLOSED 29 July 2015: Photographic evidence provided.	 KB Associates Pte Ltd A member of IMCA 
15.3 - Hyperbaric Rescue Unit	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	No survival packs are stored in the HRU. N/C Mob: Survival packs to be secured in-place prior to committing divers to sat. Compliance to be verified on mobilisation.	As there are no planned diving activities for the system, the HRC would be loaded out prior to diving operations. Loading out these items would result in deterioration of due to the heat.	10/7/2015	CLOSED 29 July 2015: Photographic evidence provided.	 KB Associates Pte Ltd A member of IMCA 


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15.3 - Hyperbaric Rescue Unit	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	N/C Mob: A calculation / risk assessment that the quantity of gas carried on the HRU is sufficient for the upcoming project, given the location of the LSP, water depth etc., was not sighted during the course of the audit, compliance to this requirement and item 9.2, (suitable amount of O2), to be determined.	There are no planned diving activities for the system. These documents will be provided once location and project details are available.	10/7/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	
15.3 - Hyperbaric Rescue Unit	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	N/C Mob: Mobilisation was ongoing during the course of the audit: drinking water is provided in the HRU chamber however, compliance to this requirement, and to items 12.2, 12.6, 12.7 & 12.8 below for sufficient quantities of water, food, seasickness tablets, CO2 absorbent and other absorbents to be determined.	(To confirm the quantities of the following) 1.) Water - min 3 litres per occupant 2.) Food rations - 10,000Kj per person 3.) Ladle - 1pc 4.) Drinking vessel - 1pc 5.) Tin openers - 3pcs 6.) Seasickness tablets - 6 doses/person 7.) Seasick waste bag - 1 per occupant		CLOSED  29 July 2015: Photographic evidence provided.	 A member of IMCA  <input data-bbox="1793 509 1927 542" type="text"/>
15.4 - HRU Launch and Recovery	1.3	Availability	Laminated copies of the relevant sections of the launch procedures should be available at the launch point	A	N/C Mob: Laminated copies of the relevant sections of the launch procedures are not available at the launch point.	( office to send out, Techs to laminate and posts where appropriate)		CLOSED  29 July 2015: Photographic evidence provided of the procedure.	 A member of IMCA  <input data-bbox="1793 716 1927 748" type="text"/>
15.4 - HRU Launch and Recovery	4.1	Regularity	A practice deployment of the HRU should have been carried out within the last 6 months	A	N/C Mob: A practice deployment of the HRU has not been carried out within the last 6 months Note: It was advised by that the HRU will be launched on both primary and secondary power supplies during project mobilisation.	Due to the insufficient number of personnel onboard, the deployment test is to be carried out prior to any sat diving operations. This is also part of the familiarisation for the crew.	10/7/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	
16 - Life Support Package	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	The following documents are available in the LSP container: • AME Saturation Manual C1 Rev.5 • Emergency Hyperbaric Evacuation Procedure for 2014 • Diving Services F14 & F23 Gas Fields N/C Mob: manuals required in the LSP control container. Compliance to this requirement to be determined on mobilisation.	There are no planned diving activities for the system. These documents will be provided once project specific details and ERP is available.	10/8/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	

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Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
16 - Life Support Package	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	N/C Mob: The LSP container is currently onboard , when the system is operational the LSP will be located elsewhere; compliance to these requirements to be determined when the system has been mobilised to its operational location.	There are no planned diving activities for the system. These documents will be provided once project specific details and ERP is available.	10/9/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	
16 - Life Support Package	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	N/C Mob: The LSP container is currently onboard when the system is operational the LSP will be located elsewhere; compliance to this requirement and item 4.5 below to be determined when the system has been mobilised to its operational location.	There are no planned diving activities for the system. These documents will be provided once project specific details and ERP is available.	10/10/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	
16 - Life Support Package	5.2	Emergency Lighting	Automatic emergency lighting should be available in all internal critical areas to allow personnel to move around safely	B	N/C Mob: An automatic emergency lighting unit is available in the LSP control container, however, the unit was not tested during the course of the mobilisation. Note: Cert SM1-16-LSP-000A dated 30-Jun-15 is provided in the D024 register.	(Techs to confirm, require photo for close out)		CLOSED  29 July 2015: Photographic evidence provided.	
16 - Life Support Package	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	N/C Mob: The LSP container is currently onboard , when the system is operational the LSP will be located elsewhere; compliance to these requirements to be determined when the system has been mobilised to its operational location.	There are no planned diving activities for the system. Compliance to this requirement will be provided once project specific details and ERP is available.	10/7/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	











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Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
16 - Life Support Package	8.4	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	The panel is usually provided with an Analox G22 O2 analyser, (S/N: G221354), fitted with an audio/visual & high/low alarm, with mute facility and an Analox 5001 CO2 analyser, (S/N: 5K11245), fitted with an audio/visual & high alarm, with mute facility. N/C Mob: The analysers were not fitted during the course of the barge audit: compliance to this requirement to be determined.	(Techs to confirm, require photo for close out)	10/7/2015	CLOSED  29 July 2015: Photographic evidence provided.	 A member of IMCA  <input data-bbox="1791 313 1927 337" type="text"/>
16 - Life Support Package	8.42	Oxygen Secondary	Oxygen - Secondary analysis	B	N/C Mob: No secondary means of O2 analysis is provided from the LSP control container, however, it was advised that portable PPO2 analysers are available and will be loaded out in the HRU chamber; compliance to this requirement to be determined during mobilisation.	As there are no planned diving activities for the system, the HRC would be loaded out prior to diving operations. Loading out these items would result in deterioration of due to the heat.	10/7/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	
16 - Life Support Package	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	N/C Mob: No HP gas quads, supplies or site specific procedures, were available for audit, compliance to this requirement and items 10.1 through 10.7, (suitable amounts of gas and chemicals), below to be determined during onsite mobilisation.	There are no planned diving activities for the system. Compliance to this requirement will be provided once project specific details and ERP is available.	10/7/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	
16 - Life Support Package	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	N/C Mob: A lifting plan for the HRU was not sighted during the course of the audit, compliance to this requirement and item 13.2, (rigging equipment to be available), below to be determined. Note: The lifting plan will be supplied with the project specific emergency response plan.	There are no planned diving activities for the system. Compliance to this requirement will be provided once project specific details and ERP is available.	10/7/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	





Ready to Dive - items available but to be in place for diving (non-conformance)									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
16 - Life Support Package	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	N/C Mob: The LSP container is currently located onboard when the system is operational the LSP will be located elsewhere; compliance to this requirement to be determined when the system has been mobilised to its operational location.	There are no planned diving activities for the system. Compliance to this requirement will be provided once project specific details and ERP is available.	10/7/2015	OPEN  To be closed out after full mobilisation and before start of and saturation diving operations.	









 **Diving Equipment Systems Inspection Guidance Note (DESIGN) for Saturation (Bell) Diving Systems**  
IMCA D024 Rev. 2 - Record Sheets







<b>Vessel particulars</b>	
Name of vessel:	12-Man Saturation System SM1 DX-300 (SY133)
Brief description of diving system:	6-Man DDC1, 3-Man DDC2, 3-Man DDC3, 3-Man SDC, 12-Man HRC, Bell LARS, Dive Control / Life Support Control Container, 20' Clean Workshop / Stores Container, 20' LST Pantry / Stores Container, 2 x Electric HPU's, 1 x Diesel HPU, 4 x Diver's Umbilicals, 1 x 10' LSP Container, Machinery Van Containing 2 x Diver's Hot Water Units, 1 x Diver's Reclaim Unit, 2 x Potable Water Units, 4 x ECUs, 1 x Gas Transfer Pump









<b>Last audit/inspection</b>	
Carried out by:	
Date:	Previous: 17th to 21st May & 19th June to 2nd July 2015 Close-out: 22nd July 2015
Location:	Previous: Western Yard, Malaysia & During Transit from Bintulu to Anqsi Field, Malaysia






<b>Non-conformances/points noted - Certification</b>									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
1 - General System Safety	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	N/C Cert: No certification was sighted in the provided D024 register. Note: The emergency generator was not onboard during the course of the audit.	Function test was conducted on Emergency power consisting of Diesel Genset, UPS in Dive Control & UPS in SAT Control. SM1-1-GS-001 (Genset) SM1-1-GS-002 (DC UPS) SM1-1-GS-003 (SAT UPS)	11/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA 
2 - Dive Control	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	• Indicating Gauges: AME Cert: SM1-2-DC-003A - S/N: G01 to G20 • Life Support Gauges: AME Cert: SM1-2-DC-003B - Diver-1 AME Cert: SM1-2-DC-003C - Diver-2 AME Cert: SM1-2-DC-003D - Diver-3 AME Cert: SM1-2-DC-003E - Bell Internal AME Cert: SM1-2-DC-003F - Bell External AME Cert: SM1-2-DC-003G - Bell Trunking N/C Cert: All of the gauges have depth readings that are outside the required accuracy, (maximum 0.25% of full scale value; 0.9 msw with these 0-360 msw gauges).	All gauges were re calibrated and found with in the 0.25% accuracy. Cert.: SM1-2-DC-003A (Indicate gauge) Cert.: SM1-2-DC-003B (Diver#1) Cert.: SM1-2-DC-003C (Diver#2) Cert.: SM1-2-DC-003D (Diver#3) Cert.: SM1-2-DC-003E (Bell Int) Cert.: SM1-2-DC-003F (Bell Ext) Cert.: SM1-2-DC-003G (Bell trunking)	4/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA 
3 - DDC1-ML	3.5	Firefighting Testing D 018, Sheet 15 & 16	If this is a fixed system then the nozzles, valves, pipework, etc. must have been visually examined in the last 6 months	A	A manually operated fixed fire system is provided on the chamber skids. N/C Cert: The certification provided in the D024 register, (Cert: SM1-3B-DDC-003A dated 28-Jan-14), is prior to the deluge system installation.	Closed. Cert.: SM1-3A-DDC-003B-1 Cert.: SM1-3B-DDC-003B Cert.: SM1-3C-DDC-003B	13/07/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA 
3 - DDC1-ML	3.6	Firefighting Testing D 018, Sheet 15 & 16	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	N/C Cert: The certification provided in the D024 register, (Cert: SM1-3B-DDC-003B dated 28-Jan-14), is prior to the deluge system installation.	Closed. Cert.: SM1-3A-DDC-003B-2 Cert.: SM1-3B-DDC-003C Cert.: SM1-3C-DDC-003C	13/07/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA 

Non-conformances/points noted - Certification									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
3 - DDC1-ML	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	N/C Cert: No certification was sighted in the D024 register for the chamber, (or bell), kits.	All medic kits were checked by DMT and certs made out. Cert.: SM1-3A-DDC-004 Cert.: SM1-3B-DDC-004 Cert.: SM1-3C-DDC-004	4/7/2015	CLOSED Certificates and provided as evidence.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 308 1921 332" type="text"/>
3 - DDC1-ML	6.15	BIBS Testing D 018, Sheet 5.2	Visual examination and function test (including communications if fitted) in the last 6 months	A	N/C Cert: No certification was sighted in the provided D024 register, this is common throughout the chamber complex and is raised as a certification non-conformance in this section only.	BIBBS connected and function tested. Cert.: SM1-3A-DDC-012A TO K Cert.: SM1-3A-DDC-012B TO E Cert.: SM1-3A-DDC-012A TO H	10/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 462 1921 487" type="text"/>





Non-conformances/points noted - Certification									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
4 - Bell Launch & Recovery Sys	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	N/C Cert: No certification was sighted in the provided D024 register.	Visual examination and function test conducted. ert.: SM1-4-LARS-008A-1 Cert.: SM1-4-LARS-008B-1	7/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 316 1921 341" type="text"/>
4 - Bell Launch & Recovery Sys	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	<ul style="list-style-type: none"> <li>Main Bell Winch N/C Cert #1: No certification was sighted in the provided D024 register, (scheduled to be conducted during mobilisation).</li> <li>Clump Weight Winch N/C Cert #2: No certification was sighted in the provided D024 register, (scheduled to be conducted during mobilisation).</li> </ul>	Full function test and load test was conducted. Cert.: SM1-4-LARS-001A (Main Winch) Cert.: SM1-4-LARS-003A (C/W Winch)	7/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 495 1921 519" type="text"/>
4 - Bell Launch & Recovery Sys	18.3	Overall Testing D 018, Sheet 22.1	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	<ul style="list-style-type: none"> <li>Main Bell Winch N/C Cert #1: No certification was sighted in the provided D024 register, (scheduled to be conducted during mobilisation).</li> <li>Clump Weight Winch N/C Cert #2: No certification was sighted in the provided D024 register, (scheduled to be conducted during mobilisation).</li> </ul>	Full function test and load test was conducted. Cert.: SM1-4-LARS-001B (Main Winch) Cert.: SM1-4-LARS-003B (C/W Winch)	7/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 706 1921 730" type="text"/>
5 - Bell Diving	6.22	Survival Pack Testing D 018, Sheet 33	Packs unpacked, checked and repacked in the last 12 months	A	N/C Cert: No certification was sighted in the D024 register for the survival suits.	to be sent off for recertification.		OPEN	
5 - Bell Diving	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	N/C Cert: No certificate sighted for the Hypergas unit calibration.	Hyper gas has to be sent of for re calibration.		OPEN	
5 - Bell Diving	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	N/C Cert: No certification was sighted in the provided D024 register.	All coms tested and certs made out. Cert.: SM1-5-SDC-014A Cert.: SM1-5-SDC-014B Cert.: SM1-5-SDC-014C	6/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 1250 1921 1274" type="text"/>

Non-conformances/points noted - Certification									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
5 - Bell Diving	6.62	Alarm Testing D 018, Sheet 34	Visual examination for damage or deterioration plus function test within the last 6 months	A	N/C Cert: No certification was sighted in the provided D024 register.	No alarm fitted to SDC. Only Hyper gas that is not fitted to bell at this moment. Hypergas unit to be sent off for calibration. However, upon reinstalling back into bell, the unit will not turn-on until diving operation take place.		OPEN	
6 - Life Support Control	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	<ul style="list-style-type: none"> <li>Life Support Gauges: Cert: SM1-6-LSC-002L-1 through 002L-6 - (chamber BBS downstream gauges) Cert: SM1-6-LSC-002M-1 &amp; 002M-2 - (chamber BA gauges)</li> <li>Depth Gauges: N/C Cert: All of the gauges have depth readings that are outside the required accuracy, (maximum 0.25% of full scale value: 0.9 msw with these 0-360 msw gauges).</li> </ul>	The following analogue gauges had been re-calibrated and found within spec except for the DDC 1 EL and HRC. However the chambers also have digital gauges which have been re-programmed and also with in 0.25% which should satisfy the requirement for gauges for each compartment. RF has been made out for two replacement analogue gauges for HRC and DDC 1 E/L Cert.: SM1-6-LSC-002C to 002K Cert.: SM1-6-LSC-002L-1 to 002L-6 Cert.: SM1-6-LSC-002M-1 & 002M-2	4/7/2015	CLOSED Certificates provided as evidence.	
15.1 - General - HES System	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	N/C Cert: No certification was sighted in the provided D024 register.	HRU Battery endurance test has been conducted. Cert.: SM1-15.1-HRU-001	11/7/2015	CLOSED Certificates provided as evidence.	
15.2 - HRU Interface with Dive	1.4	Testing D 018, Sheets 24.1 & 34	Gas leak test at maximum working pressure in the last 2 years	A	N/C Cert: No certification was sighted in the provided D024 register.	Gas leak test was conducted and certs made out. Cert.: SM1-15.2-HRU-001B	2/7/2015	CLOSED Certificates provided as evidence.	
15.2 - HRU Interface with Dive	5.19	Testing of Valves and Pipework D 018, Sheet 24.1	Gas leak test at maximum working pressure of the system in the last 2 years	A	N/C Cert: No certification was sighted in the provided D024 register.	Gauges calibration was conducted and found within acceptable range. Cert.: SM1-15.2-HRU-008	2/7/2015	CLOSED Certificates provided as evidence.	
15.2 - HRU Interface with Dive	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	N/C Cert: No certification was sighted in the provided D024 register.	Electrical function tested included checked continuity and resistance. Cert.: SM1-15.2-HRU-010	2/7/2015	CLOSED Certificates provided as evidence.	
15.2 - HRU Interface with Dive	7.1	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	N/C Cert: No certification was sighted in the provided D024 register.	Electrical function tested included checked continuity and resistance. Cert.: SM1-15.2-HRU-010	2/7/2015	CLOSED Certificates provided as evidence.	

Non-conformances/points noted - Certification									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
15.3 - Hyperbaric Rescue Unit	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	N/C Cert: No certification was sighted in the provided D024 register.	Full coms check was conducted, including SPP Cert.: SM1-15.3-HRU-009A Cert.: SM1-15.3-HRU-009B	10/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA 
15.3 - Hyperbaric Rescue Unit	6.19	BIBS Testing D 018, Sheet 5.2	Visual examination and function test (including communications if fitted) in the last 6 months	A	N/C Cert: No certification was sighted in the provided D024 register.	BIBS tested and cert made out. Cert.: SM1-15.3-HRU-010A to 010N	2/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA 
15.3 - Hyperbaric Rescue Unit	6.32	Firefighting Testing 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	N/C Cert: No certification was sighted for the hyperbaric fire extinguisher, in the provided D024 register.	Extinguisher was re filled and tested and certs made out. Cert.: SM1-15.3-HRU-011 Visual	2/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA 
15.3 - Hyperbaric Rescue Unit	6.43	Survival Bag Testing D 018, Sheet 33	Packs must be unpacked, checked and repacked or returned to the suppliers for overhaul within the last 3 years	A	N/C Cert: No certification was sighted in the provided D024 register.	Needs to be sent off for testing.		OPEN	
15.3 - Hyperbaric Rescue Unit	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	N/C Cert: It was advised that HRF mating trials have previously been conducted in 2014, however, no certification or paperwork was sighted in the D024 register.	Refer to Lloyds Certificate of Mating Trial. Lloyds Cert.: W03709941	10/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA 
15.4 - HRU Launch and Recovery	2.4	Launch System Testing D 018, Sheet 32.1	On installation, overload tested in accordance with IMO guidance at full outboard position	A	N/C Cert: No certification was sighted in the provided D024 register, (scheduled to be conducted during mobilisation).	2.2 overload test was conducted. Cert.: SM1-15.4-HRU-001B	11/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA 
15.4 - HRU Launch and Recovery	2.6	Launch System Testing D 018, Sheet 32.1	Practice deployment within the last 6 months	A	N/C Cert: No certification was sighted in the provided D024 register, (scheduled to be conducted during mobilisation).	Unable to conduct test due to insufficient number of competent personnel on-board. Test will be conducted prior to planned diving operations. This will also be a means of familiarization for the personnel involved with the HRC launching.		OPEN	
15.4 - HRU Launch and Recovery	2.7	Launch System Testing D 018, Sheet 32.1	Function test within the last 12 months	A	N/C Cert: No certification was sighted in the provided D024 register, (scheduled to be conducted during mobilisation).	1.25 x load test was conducted. Cert.: SM1-15.4-HRU-001E	8/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA 

Non-conformances/points noted - Certification									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
16 - Life Support Package	6.1	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	N/C Cert: No certification was sighted in the provided D024 register.	The requirement to have a UPS available within the LSP is being reviewed. Power supplies for the LSP are yet to be determined as there are no planned diving activities for the SM1 System. This will be confirmed prior to diving and captured within the project specific ERP.	11/7/2015	OPEN	
16 - Life Support Package	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	N/C Cert: No certification was sighted in the provided D024 register.	New sets received. Inspected and put in place. Cert.: SM1-16-LSP-002B-1	9/7/2015	CLOSED Certificates provided as evidence.	
16 - Life Support Package	8.6	BA Testing D 018, Sheet 5.1 & 9.1	External visual examination of cylinder plus gas leak test to maximum working pressure in the last 2½ years.	A	N/C Cert: No certification was sighted in the provided D024 register.	New sets received. Inspected and put in place. Cert.: SM1-16-LSP-002B-2	9/7/2015	CLOSED Certificates provided as evidence.	
16 - Life Support Package	8.7	BA Testing D 018, Sheet 5.1 & 9.1	Internal and external visual examination of cylinder plus gas leak test to maximum working pressure in the last 5 years (possible overpressure test).	A	N/C Cert: No certification was sighted in the provided D024 register.	New sets received. Inspected and put in place. Hydrostatic stamp on Cylinder still in Date. 11-2013  Lloyds Cert.: VNA 1300900/1	10/7/2015	CLOSED Certificates provided as evidence.	
16 - Life Support Package	8.1	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	N/C Cert: No certification was sighted in the provided D024 register.	Full coms check was conducted, including SPP  Cert.: SM1-16-LSP-003A Cert.: SM1-16-LSP-003B	10/7/2015	CLOSED Certificates provided as evidence.	
16 - Life Support Package	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	• Indicating Gauges Cert: SM1-16-LSP-004E • Depth Gauge Cert: SM1-16-LSP-004A N/C Cert: The gauge has depth readings that are outside the required accuracy, (maximum 0.25% of full scale value: 0.9 msw with this 0-360 msw gauge).	Depth gauge was re calibrated and found with in the 0.25% accuracy. Cert.: SM1-16-LSP-004A Cert.: SM1-16-LSP-004D Cert.: SM1-16-LSP-004E	4/7/2015	CLOSED Certificates provided as evidence.	



Non-conformances/points noted - Certification									
Sections	Item	Description	Requirement	Need	Remark	Close Out Comments	Date Resolved	Close Out Comment	Auditor Acknowledgement
16 - Life Support Package	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	N/C Cert: No certification was sighted in the provided D024 register.	Full function test was conducted. Cert.: SM1-16-LSP-009	11/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 308 1921 332" type="text"/>
16 - Life Support Package	11.5	Hose Component Testing D 018, Sheet 28	When new, hydro test to 1.5 times maximum working pressure or as recommended	A	N/C Cert: No certification was sighted for the LSP gas quad hoses in the provided D024 register.	Closed. DIVEX Cert.: SY133 "HRC Gas Interconnecting Hoses"	10/7/2015	CLOSED Certificates provided as evidence.	 KB Associates Pte Ltd A member of IMCA  <input data-bbox="1795 487 1921 511" type="text"/>