

Specification of SAT System

12 MEN SATURATION DIVING SYSTEM SPECIFICATION

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General Description

The saturation diving system is of modular construction, meaning that the major components of the diving system are built into individual crash frames which will also allow the system to be configured in different configurations to make maximum use of the space available on the barge or proposed dive ship. The saturation diving complex and associated equipment is capable of supporting a 12-man diving team in 1 x 4 plus, 1 x 3-man bunk & 12 sitting HRC & 1 x 6 men chambers to a maximum working depth of 200 meters. The design and certification for the diving system will be for a maximum design pressure of 200 meters.

The diving bell will be equipped for three divers. It will be used for saturation mode only. The bell has one side mating position. The bell will be handled by a simple 'A' Frame assembly, with two hydraulic rams and the trolley will bring the bell in to the side mating position. For deployment, the bell will be trolley out and will be hoisted in to the catcher deployment system, the 'A' Frame will be boomed out to the launch position.

The handling system for the bell will also incorporate a hydraulic bell winch and a Hydraulic driven clump weight winch. The hydraulic main bell winch will be the primary means of recovery and deployment. This will use the hydraulic motor as the primary means of operating the winch and the air motor will be the secondary means of operating the winch and the clump weight winch will act as another means of recovery. The operation of the hydraulic handling system and winches will be from the hydraulic control consul, which is situated on top of the living chamber (DDC 013) Skid package.

Summary of the Module Inventory

1. Single Lock Decompression Chamber (4-man) DDC 013
2. 6 Man Living Come Out Chamber (DDC023)
3. Diving Bell (3 man)
4. 12 x Man Hyperbaric Rescue Chamber with (1 x 3 bunk) living chamber (HRC)
5. TUP (Transfers under pressure) with spool four doors for chambers connection.
6. Four Environmental Control System (in Life Support Equipment Container)
7. Two Hot Water System-electric (in Life Support Equipment Container)
8. Saturation Control container with Potable Water System hot & cold-water supply to all chambers.
9. Bell Dive Control Container with client office.
10. Bell Umbilical Basket C/W 250m Main bell umbilical
11. Electrical Distribution Panel (in Sat / Bell dive Container)
12. HRC Trunk on TUP
13. Bell mating trunk on TUP.
14. DDC-013 mating trunk on TUP.
15. DDC-021 mating trunk on DDC-013.
16. Sanitary System
17. 'A' Frame Assembly with bell trolley assembly.
18. Clump Weight System
19. Hydraulic Bell Winch
20. Hydraulic Power Pack Module
21. Main Bell Umbilical hyd. Power Sheave
22. Hydraulic clump weight winch.
23. Workshop/Store Spares container
24. HRC control unit with chillier unite
25. Life Support Equipment Container Transit frame

Diving System Components

1. Three Men Diving Bell

The diving bell will be equipped for three divers, 72" dia. Fitted out for three-man bell run. Volume of the Bell is 5.5 m³. The Bell is fitted with internal & external bottom door. Bell man's umbilical is fitted externally. SDC is configured for Side Mating to TUP. It will be used for saturation mode only. The bell has one side mating position. The bell will be handled by a simple 'A' Frame assembly with two hydraulic rams and the trolley will bring the bell in to the side mating position.

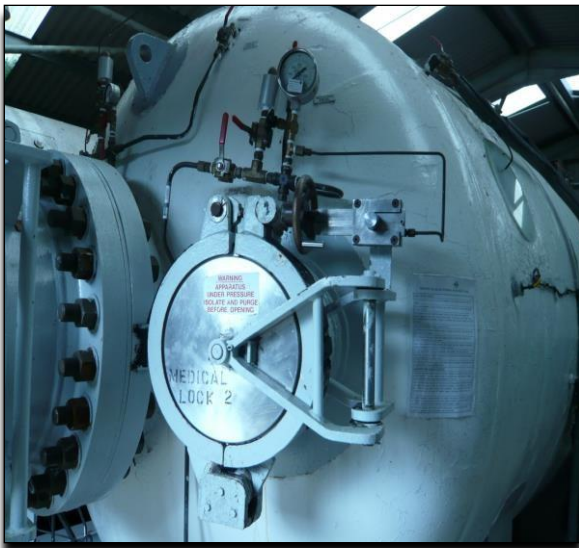


2. Single Lock Decompression Chamber (4-man) DDC-013

Four-man single lock living decompression chamber with TUP Trunk, having 4 bunks, medical lock and Man way to living decompression chamber DDC-021. This chamber was built in 1977 by Aqua Logistic and has an internal diameter of 2.2-mtr diameters, inside length 4.2 metres, internal volume 16,9 M3 and safe working depth 200 metres. The Design code BS1515 Part1-1965. Certifying authority Lloyds.

However, the chamber has been fully refurbished and recertified by ABS in March 2009 along with the complete spread. The chamber is mounted in a heavy-duty transit frame, which forms part of the base for the A-frame bell deployment system, winch package and hydraulic power pack.

Sr. no		Sr. no	
1	Pipe work and valves (JIC & NPT)	11	One caisson gauge
2	Electrical system 24V. DC	12	One temperature and humidity gauge
3	One internal conditioning system	13	Four bunks
4	Four CO2 scrubbers	14	Chamber aluminium flooring
5	One sound Power Phone	15	One temperature sensor
6	One Speaker Bull Horn	16	Medical lock with interlock
7	Four Call Buttons	17	One toilet system
8	Four Diver Personal Communication	18	One shower system
9	Four Hyperbaric Bunk Lights	19	One sink
10	Two Hyperbaric Chamber Light	20	Four overboard dump mask connection points, two manifold blocks and one tescom back pressure regulator



3. Single Lock Decompression Chamber (6-man) DDC-021

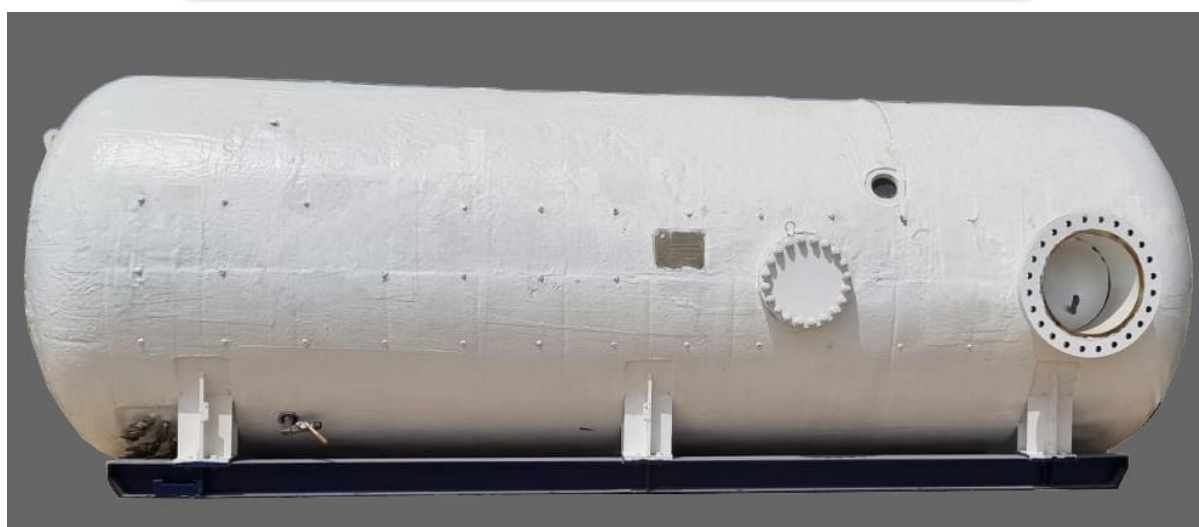
Six-man single lock living chamber with having 6 bunks, medical lock and Man way to living decompression chamber DDC-013. This chamber was built 1977 by Seaforth and has an internal diameter of 2.2-mtr diameters, inside length 7.6 metres, internal volume 36,8 M3 and safe working depth-200 metres. The Design code BS1515 Part1 1965. Certifying authority Lloyds. However, the chamber has been fully refurbished and recertified by ABS in March 2009 along with the complete spread. The chamber is mounted in a heavy-duty transit frame.

Sr. no		Sr. no	
1	Pipe work and valves (NPT)	11	One caisson gauge
2	Electrical system 24V. DC	12	One temperature and humidity gauge
3	Two internal conditioning system	13	Six bunks
4	Six CO ₂ scrubbers	14	Chamber aluminium flooring
5	One sound Power Phone	15	One temperature sensor
6	One Speaker Bull Horn	16	Medical lock with interlock
7	Six Call Buttons	17	One toilet system
8	Six Diver Personal Communication	18	One shower system
9	Six Hyperbaric Bunk Lights	19	One sink
10	Four Hyperbaric Chamber Light	20	Six overboard dump mask connection points, two manifold blocks and one tescom back pressure regulator

4. Single Lock Hyperbaric Rescue Chamber (12-man) HRC

1 x 3-man bunk & 12 sitting HRC chambers to a maximum working depth of 300 meters. Three-man single lock living chamber with having three doors for mating clamp and 3 bunks, medical lock and Man way to TUP. This chamber was built in 1982 by Aqua Logistic international ltd. and has an internal diameter of 2.2-mtr diameters, inside length 4.6 metres, internal volume 16,8 M3 and safe working depth 300mtrs. The Design code BS1515 Part1-1965. Certifying authority Lloyds. However, the chamber has been fully refurbished and re-certified by ABS in March 2009 along with the complete spread. The chamber is mounted in a heavy-duty transit frame and launching skid with HRC Bottom four wheels which allow HRC to slid itself into water.

Sr. no		Sr. no	
1	Pipe work and valves (JIC & NPT)	11	One caisson gauge
2	Electrical system 24V. DC	12	One temperature and humidity gauge
3	One internal conditioning system	13	Three bunks
4	Four CO ₂ scrubbers	14	Chamber aluminium flooring
5	One sound Power Phone	15	One temperature sensor
6	One Speaker Bull Horn	16	Medical lock with interlock
7	Three Call Buttons	17	One toilet system
8	Three Diver Personal Communication	18	One shower system
9	Three Hyperbaric Bunk Lights	19	One sink
10	Two Hyperbaric Chamber Light	20	Three overboard dump mask connection points, two manifold blocks and one tescom back pressure regulator



5. Single Lock TUP Chamber with four spool connection doors.

Single lock TUP chamber with having four spool connection doors, Man way to living decompression chamber DDC-013, Man way to HRC chamber, Man way trunk to Diving bell and top door closed & blanked from outside.

This chamber was built by Seafoth and has an internal diameter 1.7mtr, inside height 1.9 metre, internal volume 5.6 M3 and safe working depth-200 metres. The Design code BS1515 Part1-1965. Certifying authority Lloyds. However, the chamber has been fully refurbished and certified by ABS in March 2009 along with the complete spread. The chamber is mounted in a heavy-duty transit frame. Which forms part of the base for the A-frame bell deployment system, winch package and hydraulic power pack.

Sr. no		Sr. no	
1	Pipe work and valves (JIC & NPT)	8	Two Hyperbaric Chamber Light
2	Electrical system 24V. DC	9	One caisson gauge
3	One internal conditioning system	10	Chamber aluminium flooring
4	One CO ₂ scrubbers	11	One toilet system
5	One sound Power Phone	12	One shower system
6	One Speaker Bull Horn	13	One sink
7	One Call Buttons		

6. Environmental Control System (in Life Support Equipment Container)

This consists of four individual Kinergetic CMU units. The four units will be stacked in the life support equipment container complete with reservoir receivers mounted on the wall. These units will be configured as unit 1 and 2 as the primary operational units and unit 3 to be used as a stand-by unit. The system will maintain complete automatic control of the temperature and humidity in the chambers and will also remove CO₂ produced by the divers in the chamber. The system provides control of heating, cooling and dehumidification of the diver's Breathing gases. The pipe work from the reservoirs to the penetrate plates in the container will be hard plumbed with a series of pipe work and valves to interconnect all the CMU units. All the internal habitat control units (HCU) in the chamber are connected to the penetrator plate by suitable deck hoses.

7. Hot Water System-electric (in Life Support Equipment Container)

A single boiler/heater tank is supplied using a single pressure vessel with over pressurization devices. This heater unit will be electrically powered and capable of heating seawater and freshwater with a flow of 10 gpm @ 4 bar inlet water pressure, the unit should have a temperature range of 30°C to 70°C with +/- 2°C control.

A Grundfos pump is incorporated within the skid to boost this hot water supply to the divers at 27 bars. The hot water incorporates the following:

1. Inline water filtration.
2. Electrical isolation control.
3. Earth leakage trip system.
4. Low flow alarm.
5. High temperature alarm.
6. Pump motor start/stop delay.
7. Digital temperature control and display.

8. Saturation Control Container

The saturation control room has the following services included in the system:

1. Depth monitoring system DDC's, HRC and Trunks.
2. Pressurization and vent DDC's, HRC and Trunks.
3. Bib control panel DDC's and HRC.
4. CO₂ and O₂ analyser panel DDC's and HRC.
5. Calibration gas panel DDC's and HRC.
6. O₂ injection panel DDC's and HRC.
7. Environment control panel DDC's.
8. Temperature monitoring panel DDC's & HRC
9. Communication control panel to all compartments
10. Diver personnel communication system to all bunks in the chambers
11. On line gas storage panel (distribution).
 - Pressurization.
 - Bibs.
 - Treatment mix.
12. One B/A hose line connection.
13. Electric distribution Panel.

9. Bell Dive Control Container

The bell control room shall have the following services included in the system:

1. Depth monitoring system internal, external.
2. Depth monitoring system internal, diver 1 and 2.
3. Depth monitoring system internal, trunk to TUP.
4. Pressurization and vent of bell and trunk.
5. On line (gas supply) monitoring for divers.
6. CO₂ and O₂ analyser panel for divers and bell.
7. Gas calibration panel.
8. Communication panel for bell and divers.
9. On line mix gas distribution panel.
10. One B/A hose line connection.
11. Electric distribution panel and isolation panel for total bell system.

10. Electrical Distribution Panel (in Sat/Bell Container)

Isolation control boxes will be situated in bell control container; all electrical services from the diving system are terminated at a breaker panel alongside the main isolation panel and linked together. An earth leakage trip system is incorporated in the panel.

11. HRC Trunk

A HRC Trunk is supplied. This is connected to the TUP. The clamp will be an Hingetype hand-operated clamp. All penetrations for the pressurization, vent and depth monitoring are fitted to the trunk.

12. Potable Water System (in Life Support Equipment Container)

The potable water system supplies hot and cold water at 7 bars over the working pressure in continuous operation and consist of two systems including:

- Hot & Cold-water tanks
- Gas Panel
- Temperature and Pressure Indicators

13. Umbilical Module

A main bell umbilical is provided comprising of the following specification:

- 5 x ¼ Inch Pneumo
- 1 x ¾ Inch Hot Water Hose
- 1 x ¾ Inches Reclaim Hose
- 1 x ½ Inch Divers Gas Hose
- 1 x ½ Bell Blow Down
- 2 x Comms/TV & Power cables.

Close mesh polythene monofilament over braid. An umbilical storage basket is provided. The storage basket will be of steel construction with four lifting lugs and a four-point lifting sling.

14. Spool Piece between Chambers (DDC013 & DDC 021)

A spool piece between the DDC-1 and DDC2 incorporates pressurization, vent and depth monitoring in the trunk. The other spool piece will connect the TUP & DDC-013 living chamber.

15. Spool Piece between TUP & Chamber (DDC 013)

A spool piece between the DDC-1 and TUP incorporate pressurization, vent and depth monitoring in the trunk. The other spool piece connects the TUP & HRC living chamber.

16. Spool Piece between HRC & TUP.

A spool piece between the DDC-1 and HRC mating clamp incorporates pressurization, vent and depth monitoring in the trunk. The other spool piece will connect the TUP & BELL mating clamp.

17. Spool Piece TUP to Diving Bell mating clamp

The spool piece between the diving bell mating clamp and TUP is positioned on the side man way on the TUP. This incorporates a hydraulically operated type clamp with safety interlock. This spool piece also equipped with:

1. Pressure and vent penetrator
2. Depth sensor line penetrator

18. Sanitary System

The DDC's sanitary system has a connection to connect to the ships sanitary system via a holding tank with all necessary valves and safety devices situated on the main skids.

19. 'A' Frame Assembly

a) The 'A' boom frame is constructed of 290 x 260 mm heavy-duty I beam steel and fabricated with ladder runs up the 'A' Frame to assist with the maintenance and inspection of the unit. A main bell lift wire sheave is located under the top/centre section of the "A" frame and in association with this there are pulley and stop-end for use with the clump weight and clump weight wire.

b) The 'A' boom davit is powered by two hydraulic rams which move the bell over the ship's side.

20. Clump Weight System

A guide wire system is fitted to provide stability to the bell. This system also acts as a secondary means of recovery of the bell to the interface and a means of supporting the bell clear of the bottom. The system consists of: -

- a) One hydraulic winch rated at 7-ton load / 13.6 ton pull
- b) 450 meters of 28mm spin resistant wire
- c) One clamp weight.

21. Hydraulic Bell Winch

The winch itself is a hydraulic man riding winch and is situated over the TUP & Single lock living chamber upper skid.

The winch has a spooling device for the wire rope to prevent any over-laying of wire. The pneumatic air motor with gearbox and chain drive will give twice the full load capacity to safely retrieve the bell in the event of electric power failure. Air auxiliary drives 10 tons at 6m/min. Air consumption 350 cfm at 80 psi. installation of the hydraulic system is geared to be of the shortest duration with all fittings of quick (Aero quip) disconnect type.

22. Newly build Hydraulic Power Pack Module

The hydraulic power pack utilizes 2 x 50 KW (100 HP) 3 Phase electric motor. This power pack provides sufficient power to run the system. The power pack delivers hydraulic pressure to the bell winch, the main 'A'-Frame rams, trolley rams, umb. Sheave and to clamp weight winch.

23. Main Bell Umbilical Power Sheave

This consist of a 1.5-meter dia steel fabricated sheave to accommodate the main bell umbilical. The sheave is driven through Lucas type reduction gear box and driven by an independent hydraulic motor. This unit is mounted on a pedestal so it can be positioned alongside the main bell umbilical and 'A' Frame to deploy and recover the main bell umbilical with the bell movements. The controls for this power sheave are located with the bell handling system controls above the main DDC Package.

24. Workshop/Spares Container

This will contain spares and tools for the saturation system.

25. Flyaway Pack (Life Support Package)

This 10ft container is fitted with a decompression panel including depth gauges, O2 and CO2 Analysers, communication system. Container is placed on vessel/barge which is in close vicinity to the mothership, where saturation diving is taking place.

70mtr Emergency connection umbilical and an Electrically Powered Sheave is placed in such a way inside container that make pay-in or pay-out of Emergency umbilical at ease.

Air cooled Chiller is placed inside the container for controlling Temperature inside HRC at safe haven.

26. Certification

All documentation and certification are in accordance with the H.S.E. & IMCA. (Code of Practice on the Initial & Periodic Examination, Testing and Certification of Diving Plant & Equipment DO18), IMCA D-O24.

