CHAPTER 5

Saturation Diving

5.1 GENERAL

Saturation diving is based on the theory that when the duration of exposure to an inert gas at a fixed high pressure equals the time required to raise the pressure of that gas in all of the body's tissues to the same level, no more gas can be dissolved in the tissues regardless of the duration of further exposure. The diver is then said to be saturated. Once a diver has achieved a saturated condition, the amount of time required for decompression remains the same, regardless of the time spent at that depth.

There are a variety of problems encountered in saturation diving that are not present to the same extent in bounce diving. Saturation diving involves prolonged day and night exposure to high pressures in a closed-system gas environment. Under such circumstances, the atmosphere can easily become inhospitable, oxygen levels becoming too high or too low, carbon dioxide or carbon monoxide build up, or contamination by other noxious gases such as solvents or plasticizers. Other environmental factors that need close control are temperature and humidity. Due to the higher thermal conductivity of helium, the range of temperatures in which divers are comfortable is smaller than in air. As the pressure increases this band of temperatures become narrower until at 300 msw (1000 fsw) only 1°C separates too hot from too cold. Humidity has to be controlled as high humidity leads to ear infections, as well as jungle rot, which will prevent diving. On the other hand too dry an environment leads to dehydration and respiratory ailments.

5.2 BREATHING GASES

When saturation diving, adequate gas supplies are vital. Sufficient supplies of helium and oxygen must be available, properly analysed and stored for use before diving begins. A broad range of helium–oxygen mixtures for each dive planned must be readily available, sufficient for bottom mix, chamber pressurization, lock usage, decompression and treatment gas mixtures. Also, sufficient quantities of all gases are to be available for each dive phase, from initial compression to final decompression. Adequate reserves must be maintained for mixing, re-supply and emergencies.

The helium–oxygen mixtures used must be non-toxic over the working depth range containing sufficient oxygen to support the normal range of activities at depth.

5.3 TREATMENT GAS

If a diver experiences decompression sickness during the saturation dive, treatment must not be delayed. For adequate treatment, helium–oxygen gas mixtures must be available at all times to the system for administration via the BIBS to provide a high-level oxygen partial pressure normally in the range of 1.5–2.5 ATA. The mixtures shown in Table 5.1 (which provide the required partial pressure range), must be ready for decompression sickness treatment.

Table 5.1

Operating depth range	Percentage composition
0–180 msw (600 fsw)	10% O_2: 90% He 20% O_2: 80% He 35% O_2: 65% He 50% O_2: 50% He
180 msw (600 fsw) to 360 msw (1200 fsw)	Above plus 7.5% O_2: 92.5% He

Table 5.2 Chamber atmosphere limits

Atmosphere control	Limitations
Oxygen partial pressure	0.30–0.50 ATA
Carbon dioxide partial pressure	Less than 0.005 ATA or 0.5% (3.6 mm Hg)
Carbon monoxide	Less than 10 ppm
Helium	Balance of total pressure
Temperature	85–95°F regulated to diver comfort (*Note*: As helium content increases with depth, the comfortable temperature range narrows and temperature increases.)
Relative humidity	50–70% (As required for diver comfort.)

5.4 ATMOSPHERE CONTROL

During a saturation dive, the oxygen monitoring and controlling devices require calibration daily and are to be checked at each watch change at the life-support station. Once at saturation depth, it is essential for diver safety and comfort that the hyperbaric atmosphere in the chamber complex is carefully controlled, and the gaseous components limited as shown in Table 5.2.

5.5 DIVER AND GAS HEATING

During deep saturation diving the diver must be maintained at a comfortable temperature throughout the operation. The high thermal conductivity of helium (six times that of air) rapidly draws heat away from the diver. The colder the surrounding water and the deeper the dive, the more severe the problem. At depth a diver's respiratory heat loss is also increased. To protect the diver, hot-water wet suits are to be worn and respiratory-gas heat exchangers used in accordance with government regulations.

5.6 PRE-DIVE PREPARATIONS

5.6.1 Equipment Checks

All operating and control equipment is run to ensure it is functioning correctly.

5.6.2 Personnel Checks

The current physical health of diving personnel is checked to ensure absence of even minor disorders that might cause difficulties during a long stay under pressure.

5.6.3 Pressurization of the Deck Complex

The unmanned deck complex is pressurized with air to 5 msw (14 fsw) and then with helium to the holding depth required. Oxygen is added to the chamber atmosphere with scrubbers running to provide an oxygen partial pressure of 0.30 to 0.35 ATA. All life support, analysis and control equipment is checked for correct operation and its ability to maintain the required environment at depth.

5.7 DIVER PRESSURIZATION

5.7.1 Method 1

Divers enter the DDC transfer lock and are pressurized using helium with direct oxygen addition (0.30–0.35 ATA) to holding depth, using the diving company's recommended compression rates. The SDC is mated to the transfer lock and pressurized with pre-mixed gas, containing 1.0 ATA oxygen, to holding depth. The working divers enter the SDC, seal the inboard hatch, blow down to working depth and are deployed to the work site.

5.7.2 Method 2

The DDC transfer lock is pressurized with air to 5 msw (14 fsw) then with helium with direct oxygen addition (0.30–0.35 ATA) to holding depth. The working divers enter the SDC at one atmosphere, the hatches are sealed and the SDC is deployed to the work site. Subsequently, the SDC is pressurized to the working depth, at the diving company's recommended compression rates, using pre-mixed gas containing 1.0–1.2 ATA oxygen.

5.8 SATURATION LIVING

Topside personnel continuously monitor the divers' environment and well being.

The working diver and the tender in the SDC normally breathe a helium–oxygen mixture containing between 0.5 and 1.0 ATA oxygen.

Before each entry into the water when the dive is completed, and after showering, divers should carry out prophylactic treatment of their ears to prevent infection.

While under saturation in the deck complex, the divers receive food and supplies through the provision lock.

5.9 DECOMPRESSION

All personnel in the deck complex for decompression should wait a minimum of 4 hours after returning from the last dive to ensure stabilization of tissue gas loadings before beginning decompression.

Upon completion of any initial ascent, oxygen is added to the atmosphere to bring the partial pressure to 0.5 ATA. This oxygen level is maintained throughout the helium–oxygen phase of decompression unless the schedule being used specifies a different level.

Decompression to the surface follows the routine prescribed in the diving company's table of standard saturation decompression rates.

Upon surfacing, the divers' well being is checked, and the deck complex is thoroughly cleaned for the next operation.

5.10 PLANNED SATURATION DIVE SEQUENCE

The pre-dive preparations are to be carried out and the divers pressurized using Method 1 (section 5.7.1) or Method 2 (section 5.7.2).

The SDC is positioned at the shallowest depth of the work site consistent with the normal umbilical length of 31 metres (100 feet). Descent excursions should not exceed the limits of the USN Unlimited Duration Saturation/ Excursion Tables. If work is to be done over a range of depths and the SDC is moved deeper for the next phase of the work, a deeper saturation depth is established. If the SDC is moved to a shallower depth, a saturation decompression to the new depth is required in the deck complex.

On completion of the work cycle, the hatches are secured and the SDC is returned to the deck and mated to the habitat entrance lock. The working diving team transfers to the living chamber via the entrance lock, for their rest period. The second team enters the SDC and the cycle is repeated.

5.11 PLANNED SATURATION/EXCURSION DIVE SEQUENCE

The use of saturation/excursion will normally be limited to operations involving a few hours of work when the advantages of reduced decompression time outweigh the additional gas consumption associated with cycling the SDC between holding and working depths. The following sequence applies to the use of the unlimited duration saturation/excursion tables for short excursions.

The pre-dive preparation should be carried out and the divers pressurized using Method 2 (section 5.7.2).

When using the USN Unlimited Duration Saturation/Excursion Tables excursions must be limited to those prescribed by the tables. Diver excursion distance is limited to the length of the normal umbilical of 31 metres (100 feet).

If work is to be done over a range of depths exceeding either the ascent or descent limit on the initial dive, pick a holding depth that is advantageous for the first phase of the work. When completed, move the SDC to a deeper holding depth (pressurizing the deck complex accordingly) and begin the next phase of the operation.

Alternatively, if several excursion dives are contemplated it may save time to begin the operation at the deepest holding depth contemplated. On completion of work at that depth, decompress the deck complex to the next shallower holding depth using the unlimited duration saturation/excursion ascent limit and saturation decompression table (if required). Stabilize at the new holding depth for 24 hours before initiating diving if ascent excursions will be used. If descent excursions will be undertaken from the new holding depth, diving may begin immediately.

On completion of the work cycle, the hatches are secured and the SDC is returned to the deck and mated to the entrance lock. The working diving team transfers to the living chamber via the entrance lock for their rest period. The second team enters the SDC and the cycle is repeated.

5.12 UNPLANNED SATURATION AND SATURATION/EXCURSION DIVE SEQUENCE

Sometimes in the conduct of a short-term, non-saturation dive, due to the nature of the work, the time required exceeds the time limits of the schedules being used. In depths down to 150 msw (500 fsw) the work is usually completed by making a second or third dive because the overall decompres-

sion time is less than it would be if the operation were switched to saturation or saturation/excursion.

In deeper diving, the advantages of multiple dives are often eliminated because of the lengthy decompression involved in deep, non-saturation dives. In this situation, if the job will take longer than schedules allow, a switch to saturation or saturation/excursion is made.

On switching to saturation or saturation/excursion, the pre-dive preparations are to be carried out. The SDC is mated to the DDC transfer lock and the SDC pressure adjusted.

If the SDC has not yet been depressurized to the holding depth, decompress the SDC in accordance with the tables originally being used. When holding pressure is reached, transfer the divers into the DDC main chamber.

If the divers have already been transferred to the DDC main chamber, or if the SDC is at a lower pressure than holding depth, pressurize using helium and maintain the oxygen partial pressure at 0.35–0.40 ATA.

5.13 NOMINAL CHAIN OF EVENTS—Systems Diving (Saturation)

5.13.1 Planning and Preparation—Overall

a Meeting with client to define scope of project. This should provide an indication of the amount of diving required and order in which the individual tasks are completed.

b Briefing of divers. Discussion of tasks to be done and methods of doing them. Further definition of order in which they are approached. Reviewing of dive profiles and abort procedures.

c Briefing of all personnel on contingency plans. Evacuation under pressure, fire on site, rig abandonment.

d Environment evaluation. Analysis of long-term weather forecasts, tidal/current profiles to determine when diving can be done and whether proposed tasks can be completed within maximum period that the divers can remain under pressure.

e Analysis of gas requirements, breathing, compression, and emergency gases.

f Selection of compression schedule and technique.

g Review of decompression sickness treatment procedures with chamber operators.

5.13.2 Pre-Saturation System Checks

a Divers
- Understanding of tasks to be done.
- Understanding of compression protocol and procedures.
- Check of SDC.
- Check of the diving equipment that they will be using.
- Check that emergency supplies are in the chambers.
- Check that their personal gear is stowed in the chambers and that items left outside are stored.

b Surface crew
- Deck chambers.
- Launching system.
- HP compressors.
- SDC umbilical.
- Standby diver's gear.
- Life-support units.
- Sanitary system.
- Heating system.
- Fire suppression system.

c Supervisor
- Check that divers have passed pre-saturation physical.
- Analyse gas in quads, checking against requirements of schedules to be used.
- Determine whether enough gas is on hand for the operation and if not when further gas must be delivered, being certain to have sufficient back-up to abort the drive.
- Checks the control van.
- Ensures that the divers and surface crew have completed their checks.
- Necessary documents (decompression schedules, company manual, report sheets, watches, etc.) are on hand.
- Chambers and SDC ready.
- Dive team briefed and stations assigned with tasks understood.

5.13.3 Saturation Compression

a Pressurize chambers to be used, with the exception of the entry lock, using air, oxygen, and helium to obtain the desired atmosphere at the saturation depth.

b When the chamber environment has been stabilized at the desired temperature, pressure, humidity, and gaseous composition, the divers enter the entry lock and prepare for compression.

c After verifying communications compression commences at the discretion of the supervisor.

d Compression is to be conducted at the rates specified in the saturation schedule as limited by the diver's ability to tolerate the compression rate.

e On arrival at the saturation depth the divers transfer to the main chambers. Chamber operators monitor and maintain the interior environment.

5.13.4 Planning and Preparation for Working Dive

a Meeting with client to define task or tasks to be accomplished.

b Briefing of diving personnel. Discussion of best method to accomplish tasks, assignment of positions for the dive.

c Briefing of support personnel; i.e. crane operator, vessels in the area, site management, medical support. This ensures that the personnel that may be required, outside the diving team, know what is required and that possible safety hazards have been recognized and reduced to a minimum.

d Environmental evaluation. The supervisor examines the tide/current/sea state, weather forecast, and water conditions. Final evaluation is made just prior to beginning of the operation and takes into account the extended period of time that the SDC may be in the water. This is a primary factor in determining whether the dive can be conducted.

5.13.5 Pre-working Dive Checks

a Divers
Full understanding of the tasks to be done.
Full understanding of the dive protocol, especially any compression and decompression phases.
Checks the equipment that they will be using.
Checks that they know which tools they will be using for the task, and that they have been listed for inclusion in the tool box.
Check SDC interior.
Check that emergency tools are in the SDC and in good working order.

b Standby diver
Full understanding of emergency procedures that he may be required to use.
Understands surface orientated diving protocol, especially the descent and decompression procedures.
Checks the equipment that he will be using.
Checks that emergency tools are available and in good condition.

c Surface crew
Check external SDC.
Launching system.
SDC umbilical.
Tools for task are in SDC tool box and are in good working order.
LP compressor.
Standby diver's umbilical.
Deck decompression chamber or lock for surface decompression procedure.

d Supervisor
Analyse gas in quads to be used, checking against requirements for the depth at which the divers will be working.
Determine whether enough gas is on hand for the dive plus decompression to the surface.
Checks control van.
Checks communications: to SDC; masks; support personnel; standby diver and his station.
Ensures divers, standby diver, and surface crew have completed their checks.
Necessary documents are on hand.
Dive team briefed and stations assigned with tasks understood.
Support personnel ready and understand tasks.
Standby boat advised of impending dive and in position.
Environmental conditions suitable for diving.

5.13.6 Transport to Depth

a Guide wire system placed in position and left slack for connection to SDC.

b Divers enter SDC, upper hatch of transfer lock closed and inner hatch of SDC closed. Trunk between SDC and transfer lock vented to surface, taking care to ensure that both hatches are sealed.

c Guide wires connected to SDC and SDC lifted clear of chambers. Outer hatch of SDC closed and SDC swung outboard. The guide wire system is then tensioned.

d SDC lowered to 15 msw (50 fsw) and umbilical support chain stoppers put on. Descent continues in 15 msw (50 fsw) increments, with addition of stoppers to within 3–5 msw (10–15 fsw) of work site.

e Divers survey work area and pre-rigging. If all correct they inform the supervisor and prepare for lockout. Divers check all internal SDC valve positions, communications to both masks, and complete dressing except for mask. They then report to supervisor that they are ready for lockout.

5.13.7 Lock Out

a Divers equalize pressure between inner and outer SDC hatches.

b If deeper than saturation depth divers open main blow-down valve.

c Blow-down rate dictated by diver comfort, but should not exceed 30 msw/min (100 fsw/min).

d When outer hatch opens, divers close the blow-down valve and inform the supervisor that the hatch is open.

5.13.8 Bottom

a SDC diver puts on mask/helmet and reports diver leaving the bell.

b Diver informs supervisor when at the work site and beginning task.

c Supervisor informs divers when to change over and when to return to the SDC for return to the chamber system.

d Diver informs supervisor when leaving the work site.

e Diver informs supervisor when he is back at the SDC.

f Tender diver assists diver into SDC, removes his mask/helmet, and with diver closes outer hatch. they then report to supervisor that the SDC is ready to leave the bottom.

5.13.9 In-water Decompression

a Supervisor controls ascent rate of SDC to match decompression rate. Stops winch to remove chain stops.

b On arrival at the saturation depth the supervisor stops the winch and the divers close the inner hatch, making certain first that the outer hatch is not tightly dogged.

c Divers then pressurize the SDC 1–2 msw (3–5 fsw) to ensure seal.

d After seal checked positive, SDC is winched to the surface. Stopping every 15 msw (50 fsw) to remove chains.

5.13.10 Return to Saturation Chamber

a When SDC reaches the surface and on the handling system, the guide wire system is slackened and disconnected from the SDC.

b The SDC is mated with the transfer lock, the trunk between them is equalized with the transfer lock and the upper hatch opened.

c The SDC then vents through its inner hatch until it is equalized with the transfer lock.

d Divers transfer from SDC to transfer lock, and then close upper hatch.

e Divers remove wet gear and move to the main lock, servicing the masks and any tools that require it.

5.13.11 Post-working Dive De-briefing and Checks

a Supervisor talks with divers to determine the extent of the work accomplished and any comments regarding the dive or task.

b Surface crew check and refill oxygen and emergency cylinders, repairing and servicing any gear locked out of the chambers.

c Supervisor briefs client on the work that was done and determines what work will be done next or whether further dives are required.

d Supervisor completes dive and equipment logs, check that any gear or equipment requiring it has been repaired and that the tools have been serviced.

5.13.12 Saturation Decompression to Surface

a Decompression is conducted by the chamber operators under the supervisor's instruction according to the schedules provided by the company.

b On reaching the surface, if the chamber environment has not been switched to air, the divers remain in the chamber for 5 minutes while air is blown through the chamber, so that they are not subjected to an instantaneous change of gases.

5.14 SINGLE FAILURE SITUATIONS—Systems Diving (Saturation)

These are failures which, if they happen, will affect either the safety of the diver or the successful completion of the assigned task. Where the failure can occur in more than one phase the additional phases are indicated with the first mention. An analysis of the failures is included in Chapter 7.

5.14.1 Planning and Preparation—Overall

a Incorrect or insufficient equipment on hand.

b Insufficient personnel.

c Inadequate briefing.

d Lack of standby boat.

e Environmental conditions.

5.14.2 Pre-Saturation Systems Checks

a Lack of correct checklists.

b Lack of supervision of checklist checking.

c Failure of equipment during checkout.

d Insufficient gas, air, mix, or oxygen, to do the saturation with a proper margin of safety.

5.14.3 Saturation Compression

a Loss of compression supply (Section 5.14.7, 5.14.9, 5.14.10, 5.14.12).

b Leakage (5.14.6, 5.14.9, 5.14.10, 5.14.12).

c Explosion (5.14.6, 5.14.9, 5.14.10, 5.14.12).

d Failure of life support system (5.14.10, 5.14.12).

e Communications failure (5.14.6, 5.14.7, 5.14.8, 5.14.9, 5.14.10, 5.14.12).

f Loss of power (5.14.6, 5.14.7, 5.14.8, 5.14.9, 5.14.10, 5.14.12).

g Failure of heating system (5.14.6, 5.14.7, 5.14.8, 5.14.9, 5.14.10, 5.14.12).

h Contamination of compression supply (5.14.7, 5.14.8, 5.14.9, 5.14.10, 5.14.12).

i Inability to equalize middle ear (5.14.7).

j Micro-organism contamination of chambers (5.14.10, 5.14.12).

k Failure of exhaust system (5.14.9, 5.14.10, 5.14.12).

l Loss of oxygen make-up (5.14.10, 5.14.12).

m Failure of sanitary system (5.14.10, 5.14.12).

n Failure of medical lock (5.14.10, 5.14.12).

o Failure of gas analysis system (5.14.10, 5.14.12).

5.14.4 Planning and Preparation for Working Dive

a Incorrect or insufficient equipment on hand.

b Insufficient personnel.

c Inadequate briefing.

d Lack of standby boat.

e Environmental conditions (Section 5.14.6, 5.14.7, 5.14.8, 5.14.9).

f Failure to shut off electrical field currents.

5.14.5 Pre-working Dive Checks

a Lack of correct checklists.

b Lack of supervision of checklist checking.

c Failure of equipment during checkout.

d Insufficient gas to complete the dive with proper safety margin.

5.14.6 Transport to Depth

a Failure of guide wire system (Section 5.14.7, 5.14.8, 5.14.9).

b Main umbilical failure (5.14.7, 5.14.8, 5.14.9).

c Main lift wire failure (5.14.7, 5.14.8, 5.14.9).

d Main winch failure (5.14.7, 5.14.8, 5.14.9).

e Inability to submerge.

f Implosion.

g Loss of drop weights (5.14.7, 5.14.8, 5.14.9).

h Inability to locate job site (5.14.8).

5.14.7 Lockout

a Inability to equalize space between hatches.

5.14.8 Bottom

a Incorrect tools/equipment for specific tasks.

b Loss of breathing mixture.

c Contamination of breathing mixture.

d Failure of diver's umbilical.

e Loss of mask/helmet.

f Failure of faceplate.

g 'Blow-up'.

h Injury to diver—external cause.

i Injury to driver—medical cause.

j Damage to SDC.

k Entanglement of SDC.

l Entrapment of diver.

5.14.9 In-water Decompression

a Barotrauma (Section 5.14.12).

b Decompression sickness (5.14.12).

5.14.10 Return to Saturation Chambers

a Fire in chamber (Section 5.14.12).

b Inability to mate SDC and transfer lock.

5.14.11 Post-working Dive De-briefing and Checks

a Inaccurate reporting of work completed.

b Failure to service and repair requipment requiring it.

5.14.12 Saturation Decompression to Surface

a Oxygen convulsions.

b Failure of oxygen dump system.

5.15 PRE-DIVE CHECKS

The following pre-dive checklists are representative of the type of checks that should be conducted prior to each dive. The actual checklists supplied by the individual diving company should be used.

5.15.1 Habitat (Interior)

This check should be carried out by the surface crew.

Item	Action
1 Soda-sorb canisters	Ensure filled and sealed in plastic bags.
2 Communications to CV Temperature/humidity readouts Dogs and valves on hatches Trunk hatches Standby sound powered communications	Check for correct operation.
3 Bedding supplies	Ensure available in correct quantities.
4 Medical kit	Ensure correct contents.
5 All hatch 'O'-ring seal	Ensure no excess lubricant.
6 Medical lock 'O'-ring seal	Ensure spare available.
7 Bottom drain plugs (both sides)	Ensure fitted.
8 Dry-powder fire extinguisher	Ensure serviceable.
9 Dump system	Ensure masks clean and tested.
10 Medical lock	Ensure dogged correctly.
11 Life support valves Gas sample line valve to CV CV depth gauge line valve Hull valve to exterior relief valve CV pressurization valve Helium purge to blower Motor valve Trunk hatch equalizing valve Valve on H/C coils Internal depth gauge valve to CV CV exhaust Metabolic oxygen valve	Ensure open.

12	Equalizing valves on sealed hatches Medical lock equalizing valve Hull valve for oxygen to BIBS Hull valve for helium–oxygen to BIBS Sprinkler valve Bilge drain valve Valve on BIBS manifold Hull valve for dump system exhaust Diver's exhaust valve Equalizing valve between habitat and entrance lock	Ensure closed.

5.15.2 Habitat (Exterior)

This check should be carried out by the surface crew.

Item		Action
1	Medical lock 'O'-ring seal	Ensure clean and lightly coated with silicone grease.
2	Life support valves Pressurization valve Exhaust valve to CV Diver's exhaust valve Depth gauge line valve to CV Fire main valve Medical lock equalizing valve Metabolic oxygen line valve Equalizing line valve to entrance lock Helium line to scrubber	Ensure open.
3	Medical lock hatch Chamber H/C valve (normal) Oxygen line valve to BIBS Treatment line to BIBS Dump exhaust valve Bilge drain valve	Ensure closed.

5.15.3 Deck Decompression Chamber (Transfer Lock Interior)

This check should be carried out by the surface crew.

Item		Action
1	All hatch 'O'-ring seals	Ensure no excess silicone grease.
2	Soda-sorb canister	Ensure filled and stowed in a sealed plastic bag.
3	Bottom drain plugs (both sides)	Ensure fitted.
4	Hatch to SDC trunk	a Ensure in required position. b Check for correct operation.
5	Communications to CV Standby sound powered communications Life support	Check for correct operation.
6	Life support valves Pressurization piston valve for overhead hatch H/C coil valve (normal) Fresh water supply valve Internal equalization valve to habitat Equalization valve on SDC trunk hatch line to CV Pure helium/air line to scrubber valve Pressurization valve Inside depth gauge valve from habitat to entrance lock Metabolic oxygen valve	Ensure open.
7	Bilge drain valve Toilet valve Internal equalization valve to main chamber Trunk equalizing valve to SDC Equalizing valve entrance lock to habitat	Ensure closed.

5.15.4 Deck Decompression Chamber (Transfer Lock Exterior)

This check should be carried out by the surface crew.

Item	Action
1 Chamber bottom plug	Ensure fitted.
2 Life support valves	Ensure open.
Fresh water valve	
Transfer lock pressurization from CV	
Bilge drain	
Pressure valve to hatch piston	
Internal depth gauge line to CV	
SDC to transfer lock trunk equalizing valve to CV	
Entrance lock to habitat trunk equalizing valve	
Toilet flushing valve on transfer lock	
Metabolic oxygen valve	
3 Oxygen to transfer lock	Ensure closed.
BIBS valve	
Treatment mix to transfer lock BIBS valve	
H/C coil supply valve (normal)	
Sanitary collecting tank valve	

5.15.5 Deck Decompression Chamber (Main Chamber Interior)

This check should be carried out by the surface crew.

Item	Action
1 Soda-sorb canisters	Ensure filled and sealed in plastic bags.
2 Temp/humidity probes	Inspect for damage.
3 All hatch 'O'-ring seals	Ensure no excess silicone grease.
4 Medical lock 'O'-ring seal	Ensure spare available.
5 Fire extinguisher	Ensure serviceable.
6 Bedding supplies	Ensure available in correct quantities.
7 BIBS masks	Ensure fitted and operating correctly for oxygen.
8 Scrubber	Check for correct operation.
Hatches	
Communications to CV	
Standby sound powered phone	
9 Pressurization valve from CV	Ensure open.
Exhaust valve to CV	
Valve to relief valve	
Life support valves	
Oxygen supply manifold line valve	
Gas sample lines to CV	
Depth gauge line to CV	
Metabolic oxygen line valve	
10 Hull valve to treatment manifold	Ensure closed.
Hull dump valve exhaust	
Medical lock equalizing valve	
Bilge drain valve	
Fire sprinkler valve	
Equalizing valve on hatches	

5.15.6 Deck Decompression Chamber (Main Chamber Exterior)

This check should be carried out by the surface crew.

Item	Action
1 Medical lock	a Ensure no excess silicone grease on outer 'O'-ring seal. b Check for correct operation.
2 Life support valves Pressurization valve from CV CV exhaust valve Oxygen supply from CV Treatment supply from CV Bilge drain valve Medical lock equalizing valve Fire sprinkler valve Gas sample line valve to CV Depth gauge line valve to CV Metabolic oxygen supply valve	Ensure open.
3 Dump line valves H/C coil supply valves (normal)	Ensure closed.

5.15.7 Submersible Decompression Chamber (Interior)

This check should be carried out by the surface crew.

Item	Action
1 Towel Hatch 'O'-ring (spare)	Ensure available.
2 First aid kit	Ensure correct contents.
3 Emergency tool kit and recovery tackle	Ensure complete and in good condition.

4 Torches (2)	a Inspect for corrosion and damage. b Check for correct operation.
5 Weight belts (2)	a Inspect for corrosion and damage. b Ensure correct number of weights.
6 Diver's gloves (2 pairs) Safety harness	Inspect for damage and correct fit.
7 Masks/helmets (2)	Inspect for corrosion and damage.
8 Bail out bottle	Check air/gas mixture and pressure.
9 All hatch 'O'-ring seals	Ensure no excess silicone grease.
10 Interior ports	Ensure clean.
11 Ballast release	Check for correct operation by operating twice.
12 Scrubber	a Ensure new soda-sorb fitted. b Check for correct operation.
13 Emergency gas to manifold	Ensure minimum pressure 2100 psi or 145 Bar.
14 Oxygen to oxygen manifold	Ensure minimum pressure 2000 psi or 138 Bar.
15 Communications bullhorn to CV Communication divers 1 and 2 Thru-water communication (if fitted)	Check for correct operation.
16 CV exhaust Kluge line to CV Kluge inside valve Kluge outside valve	Ensure open.
17 Diver's exhaust valve Oxygen valve Emergency gas valve Pressurization valve Equalization valve on inner hatch Bilge drain valve	Ensure closed.

5.15.8 Submersible Decompression Chamber (Exterior)

This check should be carried out by the surface crew.

Item	Action
1 External ports	Ensure clean.
2 Main lift wire terminal Umbilical termination	Inspect for corrosion and damage.
3 Guide wire guides	Ensure freedom of movement.
4 Drop weight Electrical connector to transformer Electrical connector from transformer to penetrator	Ensure secure.
5 HP gauges on emergency oxygen bottles	Ensure visible through port.
6 Emergency oxygen bottle	Ensure correct pressure.
7 Outside hatch and seal	Check for correct operation.
8 Thru-water transducer	Ensure fitted.
9 External lights	Check for correct operation.
10 Diver's breathing gas valve Pressurization valve Bilge drain valve Diver's exhaust valve	Ensure open.

5.15.9 HP Compressor (Air Charge)

This check should be carried out by the surface crew every 15 minutes.

Item	Action
1 Electric motor	Inspect visually.
2 Oil level	Check and replenish if necessary.
3 Cooling cylinders	Drain off condensate.

4 Air inlet valves on each compressor Air filter valve Outlet valve to air quad Inlet valve on air quad and bottle valve	Ensure open.
5 Gas inlet valves on each compressor	Ensure closed.
6 Electric motor	Start.

5.15.10 HP Compressor (Gas Charge)

This check should be carried out by the surface crew.

Item	Action
1 Electric motor	Inspect visually.
2 Oil level	Check and replenish if necessary.
3 Cooling cylinders	Drain off condensate.
4 Gas inlet valve on each compressor By-pass to filter (for equalizing pressure) Gas supply and quad to be transferred to valves Valve to regulator	Ensure open.
5 Air inlet valve on each compressor Air filter valve Gas supply valve to regulator	Ensure closed.
6 By-pass valve	After equalization, ensure closed.
7 First regulator	Set to 150 psi.
8 Second regulator	Set to 75 psi.
9 Electric motor	Start.