

EDOCS OPERATING INSTRUCTIONS

COMMENTS ON INSTRUCTIONS

1. The information is still in a draft form and requires any comments on any possible issues within the instruction.
2. The pressure and gauge units cannot be confirmed at present, due to equipment not being completed. The information will be added once technical inspections have been carried out.
3. Medical input is still required on vacuuming pressure and the required standards for analysers and a confirmation process. These are currently being investigated and analyser procured, for this reason comments on medical issue must be return by Wednesday 5 march 2003.
4. Please pass all comments on these instruction to the following location by the fastest possible means, to arrive by Monday 10 march 2003:

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Please mark all correspondence concerning EDOCS, for the attention of SSgt Dowdall 528 STRE (Util).

5. E-mailed to the following:
  - a. [bpoole@pci-intl.com](mailto:bpoole@pci-intl.com)
  - b. [bcundiff@pci-intl.com](mailto:bcundiff@pci-intl.com)
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SITE SELECTION

1. The site selection should be carried out by a clerk of works responsible for the hospital infrastructure, this will allow the EDOCS to be position in the optimum position. Extra attention must be paid to the point at which the power is taken from the distribution system.
2. The area should be flat and firm, with sufficient space around the unit and the HOBS manifold for operation and maintenance. The unit and HOBS should have a good escape route to allow operators to evacuate the area should an incident occur.
3. The equipment should be located away from any roads, vehicle parks or similar source of hydrocarbons.
4. The equipment should be enclosed and secured from free access by unauthorised personnel.
5. No open flames or smoking should be allowed within 50 metres of the unit.
6. The area should be kept clean and free from rubbish due to the increased fire hazard.
7. The unit should be connected to a power supply that can be remotely shut off in case of a unit fire. The power supply and means of isolation should be clearly marked.
8. The route on which cylinders are to be transported should be as smooth as possible to reduce the chance of dropping cylinder. If the ground is uneven or has a loose surface a walkway should be laid.
9. The site should have ample ventilation to ensure fresh air is drawn into the unit on each cycle.
10. The unit should be shade if high temperatures are expected, this should not reduce the air circulation around the unit.

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OPERATING PROCEDURES - WARNINGS

1. Due to the nature of EDOCS, the atmosphere around the unit could have an increased level of oxygen. For this reason clothing must be clean and free from hydrocarbons due to the risk of combustion, combustible materials should not be carried during EDOCS operation.
2. The handling of oxygen cylinders is a potentially dangerous operation and should be carried out with care and attention. Cylinder should not be dragged or dropped as this could weaken the cylinders and cause a release of high pressure gas. If a high pressure cylinder is punctured the area must be evacuated immediately and no attempt must be made to restrain the cylinder.
3. The release of oxygen into the atmosphere increases the chance of combustion and can result in some materials becoming self combustible. No hydrocarbons or flammable materials should be stored within 10 metres of the EDOCS.
4. Any tools use on the EDOCS should be specifically for the EDOCS and no other tools should be used. Tools contaminated with hydrocarbons can ignite if exposed to high concentration of oxygen, this could occur during maintenance and therefore should not be carried out by operators. Ensure any tools are of oxygen grade and all equipment is designed to be exposed to oxygen (no oil filled gauges).
5. The release of high pressure gases can cause an environment with propelled particles, which can cause serious harm. The high pressure gas jet should not be aimed at any personnel within 10 metres.
6. Only use cylinders marked for oxygen. Filling non oxygen cylinders could result in a catastrophic explosion. All cylinders must be inspected to ensure they are undamaged and within there hydrostatic inspection date. Only use cylinders specifically marked for EDOCS use, to avoid cross contamination of cylinders.
7. Do not use any form of solvents (unless specifically cleared for use with EDOCS) as a cleaning agent as this may cause an explosion when the EDOCS is operated.

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SETTING OUT PROCEDURE

1. The unit should be delivered to site with all cylinders empty and minimal pressure within the unit.
2. Once the site has been selected the unit should be placed using a forklift with sufficient space for operation and maintenance.
3. A trained maintenance engineer should inspect the EDOCS internally to ensure the unit has no sign of damage. This will require the opening of the side panel, the silencer should not be removed unless damage is suspected within the unit.
4. Once the unit is in position the power cable should be checked for length but NOT connected.
5. The HOBS should be position with ease of access for cylinder changes and should not block the escape route from the unit.
6. The HOBS should be erected and ensure all locking pins are in position. The length of the supply hose from EDOCS to HOBS should be checked to ensure the hose will not cause a trip hazard. The hose should NOT be connected at this point. The HOBS erection procedure is as follows:
  - a. Remove the hold down pins inside the crate.
  - b. Using the lifting bars at either end, remove the HOBS and place on the ground, use packing to ensure the HOBS is not resting on any regulators, valves or hoses.
  - c. Locate the numbers on the frame and identify the corresponding legs.
  - d. Lift the D cylinder filling end of the unit and position the legs in place and secure with the quick release pin. Ensure the HOBS is not pivoting on any regulators, valves or hose when lifted.
  - e. Lift second end and position the legs in place and secure with the quick release pin.
  - f. Adjust the legs until square, then connect the cross members with the quick release pins.
  - g. Fit the centre crossbar and secure with the quick release pins.
  - h. Place the D cylinder holding frame onto the HOBS. This is achieved by lowering over the outsides of the support legs, ensure the D cylinder holding frame is level and secure.
7. The 4 cylinders that are to form the reservoir on the HOBS are to be moved into position and secured in place with the supplied chains. The cylinder should be placed on the four corners to assist with stability of the HOBS. The cylinder should NOT be connected at this point.
8. Any shading should be erected and moved into place, the shading should be checked to ensure the unit is covered through the hottest part of the day. Once the shading is in the correct position it should be firmly secured in place.

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PRE START CHECKS

1. The setting out procedure should have been completed.
2. The unit should be inspected for any signs of damage, if any is found the maintenance team should be contacted to make a decision on the serviceability of the equipment.
3. Check all gauges to establish the EDOCS condition and to ensure all gauges are serviceable.
4. All switches should be in the off position this includes the main contact breaker.
5. Insert the designated power supply cable into the plug and secure, ensure the cable does not cause a trip hazard.
6. Ensure all valves on the caboose are in the closed position, these should have all been closed on the previous shut down.
7. Inspect the high pressure armoured oxygen hose for damage and ensure both quick release couplings are in place and undamaged. Connect the high pressure armoured oxygen hose to the EDOCS using the quick release coupling QC-4.
8. Inspect the vacuum hose for damage and ensure both quick release couplings are in place and undamaged. Connect the vacuum hose to the EDOCS using the quick release coupling QC-3. Connect the other end of the vacuum hose to the HOBS vacuum connection, ensuring the hose is straight and does not cause a trip hazard.
9. Ensure all valves on the HOBS are in the closed position, DO NOT adjust the PRV's at the rear of the HOBS manifold.
10. Slowly open the vent valve on the HOBS manifold to vent any pressure within the manifold. Once vented, close the vent valve.
11. Check all gauges on the HOBS are serviceable.
12. Connect the cylinders that will form the HOBS reservoir to the four corner manifold couplings, ensure the valves on the cylinders are closed. Before fitting the hose, inspect the connection threads are serviceable and undamaged. Slightly open the cylinder valve to clear the nozzle of any possible debris, be aware of the hazard caused by the high pressure gas and particles.

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START PROCEDURE

1. The pre start check should have been completed.
2. Turn on the main contact breaker CB1, ensure the reverse power light does not illuminate. If the reverse power light illuminates contact the maintenance team. The heat exchanger fans should be heard to be running.
3. Turn on the vacuum pump using switch SW - 1, the pump should be heard running near the silencer. The vacuum pump should now be switched off using switch SW - 1.
4. Ensure the purity override switch is not illuminated using switch PB - 3.
5. Turn on the blower using switch SW - 3, the blower should start in the vacuum mode. The scroll compressor should start automatically after 5 cycles of the VSA unit.
6. The purity of the oxygen will below specification upon starting of the unit and this will be shown by the illumination of the low purity light. The low purity oxygen will be vented to atmosphere until the purity rises to the correct specification.
7. Once the low purity light goes out the EDOCS is ready to start producing oxygen for cylinder filling. This could take up to 1 hour depending on when the unit was last used.

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COMMISSIONING PROCEDURE

1. This procedure should be carried out by the maintenance personnel on initial set up of the EDOCS and at regular intervals to ensure the oxygen being produced by the unit is of an acceptable standard.
2. The EDOCS should have been position and sited in accordance with the site selection procedure. The EDOCS should have be running and the EDOCS run until the low purity light has gone out. The oxygen being produced should be on specification, this must now be confirmed by using a gas analyser.
3. The test will carried out by filling a D cylinder directly from the EDOCS using the connections on the HOBS. The procedure for filling the cylinder is as follows:

TEST CYLINDER FILLING PROCEDURE

4. The procedure for filling the test cylinder requires the cylinder to be vacuumed down to @@ inches of mercury. The procedure for vacuuming the test cylinder is as follows:
  - a. Isolate the HOBS reservoir cylinders by closing the HOBS manifold valves and the cylinder valves, high pressures will destroy the vacuum gauges and vacuum pump.
  - b. Ensure all HOBS valves are closed, DO NOT adjust the PRV's at the rear of the HOBS manifold.
  - c. Remove all cylinders not requiring vacuuming (leave the previously isolated HOBS reservoir cylinders connected).
  - d. The test cylinders that requires vacuuming, slightly open the cylinder valve to clear the nozzle of any possible debris, be aware of the hazard caused by the high pressure gas and particles. Ensure the test cylinder has a seal and that it is serviceable condition. Connect the test cylinders requiring vacuuming to the HOBS valve V - 3D, the cylinder should be stored within the D cylinder holding frame.
  - e. Open the cylinder valve on the test cylinders that requires vacuuming.
  - f. Open HOBS valves V - 1 and V - 6 this will open the manifold to atmosphere.
  - g. Slowly open HOBS manifold valve V - 3D, until the test cylinder has been vented to atmosphere. The pressure must be fully release before going any further.
  - h. Open HOBS manifold valve V - 4.
  - i. Start the vacuum pump using switch SW - 1, the vacuum pump should be heard by the silencer.
  - j. The vacuum pump should be drawing air through HOBS manifold valve V - 6, to start drawing a vacuum on the cylinders close HOBS manifold valve V - 6.
  - k. Observe the vacuum strength on the PI - 04, this measures the vacuum in inches of mercury.
  - l. Once the vacuum reaches @@ inches of mercury, the vacuum pump should be stopped using switch SW - 1.

- m. Isolate the test cylinder by closing the cylinder valve, HOBS manifold valve V - 3D and HOBS manifold valves V - 4.
5. The procedure for filling the test cylinder is as follows:
    - a. The test cylinder will be filled by a direct feed from the EDOCS.
    - b. Ensure all HOBS valves are closed, DO NOT adjust the PRV's at the rear of the HOBS manifold.
    - c. Connect the high pressure armoured oxygen hose to HOBS fill - high pressure.
    - d. Start the booster compressor using switch SW - 2. The compressor will start automatically and cut off once PI - 9 reads 2250 Psi, the compressor will automatically restart when the pressure drops to 1800 Psi.
    - e. Slowly open HOBS manifold V - 3C, this will allow the oxygen to be purged from all the manifolds and hoses. The HOBS manifold valve V - 3C should be closed after 1 minute of purging.
    - f. Open the test cylinder stop valve.
    - g. Slowly open HOBS manifold valves V - 3D, this will allow the cylinder to fill. The valve should be slowly opened to control the rate of fill, as no restricting orifice is located within the line. Test the seal around the connection using oxygen leak detector fluid (if not available use a mild solution of water and detergent), if leaking tighten by hand, if the leak continues contact the maintenance team.
    - h. Monitor the cylinders pressure on the pressure gauge PI - 6.
    - i. Once 2000 Psi is reached close open HOBS manifold valves V - 3D and the test cylinder stop valve. The cylinder is now ready for testing with the gas analyser.
  6. The cylinder should now be tested with the supplied gas analyser following the analyser test procedure. The analyser must be checked to ensure that the calibration date has not been exceeded.
  7. The required analyser results are as follows:
    - a. Oxygen (O<sub>2</sub>) - minimum level 90%
    - b. Carbon dioxide (CO<sub>2</sub>) -
    - c. Carbon Monoxide (CO) -
  8. A representative of the medical unit must confirm the results of the analyser, BEFORE the oxygen is used for any purpose. The printed test sheet should be attached to the daily report sheet and retained with the EDOCS records.

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CYLINDER FILLING - PREPARATION

1. The start procedure should have been completed.
2. The EDOCS should be running and the low purity light should have gone out.
3. Before cylinder filling can take place the back up 'M' cylinders within the EDOCS and the HOBS reservoir cylinders must be filled.
4. The 'M' cylinder within the EDOCS should have been left at a pressure of 50 Psi, this will insure the oxygen within the back up cylinders has not become contaminated. If the 'M' cylinder have less than 50 Psi they will required vacuuming down, this is explained in CYLINDER FILLING – VACUUMING CYLINDERS.
5. Ensure caboose valves V - 6 and V - 5 are closed.
6. The booster compressor should be started using switch SW - 2. The compressor will start automatically and cut off once PI – 9 reads 2250 Psi, the compressor will automatically restart when the pressure drops to 1800 Psi.
7. The 'M' cylinders within EDOCS can be filled by opening the cylinder shut off valve V - 4 on the caboose.
8. The 'M' cylinders will fill at a rate of 66 litre per minute, therefore the 4 'M' cylinders could take up to 6 hours to fill.
9. Once the 'M' cylinders within the EDOCS are full, valve V – 4 on the caboose should be closed. This will allow the oxygen stored in these cylinders to act as an isolated back up if the EDOCS was to fail.
10. The EDOCS is now prepared for filling of the HOBS reservoir cylinders.
11. The cylinders should be fitted to the four corner connections of the HOBS. The pressure within the should be a minimum of 50 Psi, this can be checked as follows:
  - a. Ensure HOBS manifold valves V – 1, V – 2, V – 4, V – 5, V – 7 and V- 8 are closed. This isolates the manifolds from each other and from the supply.
  - b. Ensure all manifold valves (V - 3A to F) are closed.
  - c. For each cylinder in turn:
    - (1) Open cylinder valve.
    - (2) Open manifold valve for cylinder.
    - (3) Test the seal around the connection using oxygen leak detector fluid (if not available use a mild solution of water and detergent), if leaking tighten by hand, if the leak continues contact the maintenance team.
    - (4) Read cylinder pressure from manifold pressure gauge.
    - (5) Close manifold valve and cylinder valve.

- (6) Vent the pressure in manifold by opening a manifold valve for a central connection that is open to atmosphere.
  - (7) Once the manifold pressure is released, close the manifold valve and repeat with the next cylinder.
12. If any cylinder has less than 50 Psi, it will required vacuuming down, this is explained in CYLINDER FILLING – VACUUMING CYLINDERS.
13. If all the cylinders have more than 50 psi they can be filled from the EDOCS. First the cylinder pressures must be equalised, this is achieve by the following:
  - a. Open all the cylinder valves
  - b. Slowly open the HOBS manifold valves (with cylinders attached) one at a time and allow the cylinders on each manifold to equalise, once the pressure has equalised, open the HOBS manifold valves (with cylinders attached) fully. Test the seal around the connection using oxygen leak detector fluid (if not available use a mild solution of water and detergent), if leaking tighten by hand, if the leak continues contact the maintenance team.
  - c. Once both manifold have been equalised they must be joined to allow cross equalisation. This is achieved by opening HOBS manifold valve V – 2 fully, and then slowly opening HOBS manifold valve V – 1. Once the pressure has equalised, fully open HOBS manifold valve V – 1.
14. Once the cylinder pressures have been equalised they can be filled by connecting the high pressure armoured oxygen hose to HOBS fill – high pressure.
15. The HOBS cylinders will fill at a rate of 66 litre per minute, therefore the HOBS reservoir cylinders could take up to 24 hours to fill.
16. Once the cylinders on the HOBS are filled, they will give a reservoir that can be used to decant oxygen into other cylinders, the procedure for this is explained in CYLINDER FILLING.

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CYLINDER FILLING - VACUUMING CYLINDERS

1. Cylinders will require vacuuming when they have less than 50 Psi when returned for refilling, this is to ensure that the oxygen within the cylinder has not become contaminated.
2. The cylinders must be fully vented to atmosphere before being vacuuming, as any pressure can cause damage to the vacuum pump. The cylinders must be vented in a controlled manner to control the enrichment of the atmosphere and to control the amount of valve outlet icing (ice formation on the valve outlet due to the reduction in pressure and temperature at the valve outlet).
3. Only cylinders marked for use with EDOCS should be vacuumed using the EDOCS. 100 % oxygen cylinders should not be vacuumed with the EDOCS. Never vacuum cylinders that are not designed and marked for oxygen storage.
4. The vacuuming of cylinders cannot be carried out at the same time as cylinders are filled from the same manifold. For this reason it is recommended that vacuuming of cylinders should be carried out as a central task as it is a lengthy process. The only exception to this is the vacuuming of 'D' cylinders, this can be achieved by using the caboose connections for vacuuming whilst cylinder filling from the HOBS.

CABOOSE D CYLINDER VACUUMING PROCEDURE

5. The procedure for vacuuming 'D' cylinders using the caboose is as follows:
  - a. Ensure caboose valves V - 4, V - 5, V - 6, V - 7, V - 8, V - 9, V - 10, V - 11, V - 12, V - 13 and V - 14 are closed.
  - b. For the cylinders that require vacuuming, slightly open the cylinder valve to clear the nozzle of any possible debris, be aware of the hazard caused by the high pressure gas and particles. Ensure all cylinders have a seal in place and that it is serviceable. Connect the cylinders that require vacuuming (maximum of 3) to the connections within the caboose, and then open all cylinder valves.
  - c. Open the caboose valves connected to the cylinder valves and allow the pressures to equalise.
  - d. Vent all the cylinders to atmosphere by slowly opening the remaining caboose cylinder valve.
  - e. Once the cylinders have vented to atmosphere fully, open caboose valve V - 6.
  - f. Start the vacuum pump using switch SW - 1, the vacuum pump should be heard by the silencer.
  - g. The vacuum pump should be drawing air through the open caboose cylinder valve, to start drawing a vacuum on the cylinders close the caboose cylinder valve open to atmosphere.
  - h. Observe the vacuum strength on PI - 13, this measures the vacuum in inches of mercury.

- i. Once the vacuum reaches @@ inches of mercury, the vacuum pump should be stopped using switch SW - 1.
- j. Isolate each cylinder by closing the cylinder valves, the caboose cylinder valves and caboose valve V - 6.

#### CABOOSE M CYLINDER VACUUMING PROCEDURE

6. The procedure for vacuuming 'M' caboose cylinders is as follows:
  - a. Ensure caboose valves V - 4, V - 5, V - 6, V - 7, V - 8, V - 9, V - 10, V - 11, V - 12, V - 13 and V - 14 are closed.
  - b. Vent the caboose M cylinders to atmosphere by slowly opening Caboose Valve V - 5.
  - c. Once the cylinders have vented to atmosphere fully, open caboose valves V - 6, V - 7, V - 8, V - 9 and V - 10.
  - d. Start the vacuum pump using switch SW - 1, the vacuum pump should be heard by the silencer.
  - e. The vacuum pump should be drawing air through caboose valve V - 5, to start drawing a vacuum on the M cylinders close the caboose valve V - 5.
  - f. Observe the vacuum strength on PI - 13, this measures the vacuum in inches of mercury.
  - g. Once the vacuum reaches @@ inches of mercury, the vacuum pump should be stopped using switch SW - 1.
  - h. Close caboose valves V - 6, V - 7, V - 8, V - 9 and V - 10.

#### HOBS VACUUMING PROCEDURE

7. The procedure for vacuuming cylinders using the HOBS manifold is as follows:
  - a. Isolate the HOBS reservoir cylinders by closing the HOBS manifold valves and the cylinder valves, high pressures will destroy the vacuum gauges and vacuum pump.
  - b. Remove the high pressure armoured oxygen hose from the HOBS using the quick release coupling.
  - c. Ensure all HOBS valves are closed, DO NOT adjust the PRV's at the rear of the HOBS manifold.
  - d. Remove all cylinders not requiring vacuuming (leave the previously isolated HOBS reservoir cylinders connected).
  - e. For all cylinders that require vacuuming, slightly open the cylinder valve to clear the nozzle of any possible debris, be aware of the hazard caused by the high pressure gas and particles. Ensure all cylinders have a seal and that it is serviceable, or the sealing threads are in a serviceable condition. Connect all cylinders requiring vacuuming to the relevant connection points.
  - f. Open all cylinder valves on cylinders that require vacuuming.

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- g. Open HOBS valves V - 1, V - 2 and V - 6 this will open the manifold to atmosphere.
- h. Slowly open HOBS manifold valve for each cylinder to be vacuumed, until all cylinders have been vented to atmosphere. The pressure must be fully release before going any further.
- i. Open HOBS manifold valve V - 4 and V - 5.
- j. Start the vacuum pump using switch SW - 1, the vacuum pump should be heard by the silencer.
- k. The vacuum pump should be drawing air through HOBS manifold valve V - 6, to start drawing a vacuum on the cylinders close HOBS manifold valve V - 6.
- l. Observe the vacuum strength on the PI - 04, this measures the vacuum in inches of mercury.
- m. Once the vacuum reaches @@ inches of mercury, the vacuum pump should be stopped using switch SW - 1.
- n. Isolate each cylinder by closing the cylinder valves, the HOBS manifold valves and HOBS manifold valves V - 4 and V - 5.

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CYLINDER FILLING PROCEDURE

1. The cylinder filling preparation procedure should have been completed.
2. Any cylinders with a pressure under 50 Psi should have been vacuumed following the cylinder filling vacuuming cylinders procedure. Once cylinder vacuuming is completed the high pressure armoured oxygen feed should be reconnected to the HOBS.
3. Only cylinders marked for use with EDOCS should be filled using the EDOCS, 100 % oxygen cylinders should not be filled with the EDOCS. Never fill cylinders that are not designed and marked for oxygen storage.
4. The cylinders should be inspected to insure that the cylinders are still within there hydrostatic inspection date, if this date has expired the cylinder should not be refilled.
5. The cylinders should be filled until they contain 2000 Psi, this will allow for decanting from the storage reservoirs within the EDOCS and the HOBS.
6. The cylinder filling speed must be controlled to ensure valve icing does not occur due to the rapid expansion of gas. This will be especially important when filling a vacuumed cylinder, as this will have a pressure differential of 2300 Psi.

D CYLINDER PRESSURE TESTING PROCEDURE

7. The D cylinder pressure should be checked using the EDOCS caboose manifold. The pressure within the cylinders should be a minimum of 50 Psi(if below the cylinder must be vacuumed using the cylinder vacuuming procedure), this can be checked as follows:
  - a. Ensure caboose valves are closed.
  - b. Slightly open the 'D' cylinder valve to clear the nozzle of any possible debris, be aware of the hazard caused by the high pressure gas and particles. Ensure the cylinder has a seal and that it is serviceable. Connect the D cylinder to one of the caboose couplings
  - c. Open the test cylinder stop valve. Test the seal around the connection using oxygen leak detector fluid (if not available use a mild solution of water and detergent), if leaking tighten by hand, if the leak continues contact the maintenance team.
  - d. Open the relevant caboose valve V - 11 to V - 14, observe the pressure on PI - 12. If above 50 Psi the cylinder can be refilled, if below the cylinder requires vacuuming using the cylinder vacuuming procedure.
  - e. Close cylinder stop valve and the relevant caboose valve V - 11 to V - 14. Remove the cylinder and place in the location for vacuuming or filling.
  - f. Vent the pressure from caboose using a caboose connection open to atmosphere, for the selected caboose connection slowly open caboose valve V - 11 to V - 14. Once vented close caboose valve V - 11 to V - 14.

NON D CYLINDER PRESSURE TESTING PROCEDURE

8. All other cylinder pressure should be checked using the HOBS. The pressure within the cylinders should be a minimum of 50 Psi (if below the cylinder must be vacuumed using the cylinder vacuuming procedure), this can be checked as follows:

- a. Ensure HOBS valves are closed. Ensure HOBS reservoir cylinders are isolated using the cylinder stop valves.
- b. Slightly open the cylinder valve to clear the nozzle of any possible debris, be aware of the hazard caused by the high pressure gas and particles. Ensure the cylinder has a seal and that it is serviceable, or the sealing threads are in a serviceable condition. Connect the cylinder to the central HOBS manifold connection.
- c. Open the test cylinder stop valve. Test the seal around the connection using oxygen leak detector fluid (if not available use a mild solution of water and detergent), if leaking tighten by hand, if the leak continues contact the maintenance team.
- d. Open the HOBS manifold valve V - 3B, C, F or G. Observe the pressure on PI - 6 or PI - 7. If above 50 Psi the cylinder can be refilled, if below the cylinder requires vacuuming using the cylinder vacuuming procedure.
- e. Close cylinder stop valve and the relevant HOBS manifold valve V - 3B, C, F or G. Remove the cylinder and place in the location for vacuuming or filling.
- f. Vent the pressure from HOBS manifold using a HOBS manifold connection open to atmosphere, for the selected HOBS manifold connection slowly open caboose valve V - 3B, C, F or G. Once vented close caboose valve V - 3B, C, F or G.

CABOOSE D CYLINDER FILLING PROCEDURE

9. The procedure for filling 'D' cylinders from the caboose is as follows:

- a. The 'D' cylinders will be filled by decanting oxygen from the 'M' reserve cylinders. As the oxygen is decanted from the 'M' cylinders the pressure will drop, once the pressure drops below 2000 Psi the 'M' cylinders will require refilling by the EDOCS. 'D' cylinder decanting can continue during the refilling of the 'M' cylinders.
- b. Ensure all caboose valves are closed.
- c. Slightly open the 'D' cylinder valve to clear the nozzle of any possible debris, be aware of the hazard caused by the high pressure gas and particles. Ensure all cylinders have a seal and that it is serviceable. Connect the 'D' cylinders onto the caboose couplings CC - 1 to CC - 4. Open all the cylinders stop valves. Test the seal around the connection using oxygen leak detector fluid (if not available use a mild solution of water and detergent), if leaking tighten by hand, if the leak continues contact the maintenance team.
- d. Ensure all caboose couplings not being used are isolate using caboose valves V - 11 to V - 14.
- e. Open the caboose valves V - 11 to V - 14 (only the ones connected to cylinders) and allow the pressure to equalise.

- f. Slowly open caboose valve V - 7, monitor the 'D' cylinder pressure on the pressure gauge PI - 12.
- g. Once 2000 Psi is reached close caboose valve V - 7, allow the gauge to settle and ensure the cylinder contains 2000 Psi.
- h. Close the open caboose valves V - 11 to V - 14. Close the 'D' cylinders stop valves. The 'D' cylinders are now refilled and can be removed from the caboose connection CC - 1 to CC - 4.

HOBS D CYLINDER FILLING PROCEDURE

- 10. The procedure for filling 'D' cylinders from the HOBS is as follows:
  - a. The 'D' cylinders will be filled by decanting oxygen from the HOBS reserve cylinders. As the oxygen is decanted from the HOBS reservoir cylinders the pressure will drop, once the pressure drops below 2000 Psi the HOBS reservoir cylinders will require refilling by the EDOCS. 'D' cylinder decanting can continue during the refilling of the HOBS reservoir cylinders. 'D' cylinders can only be filled from the HOBS in banks of 5.
  - b. Ensure HOBS valves V - 7 and V - 8 are closed.
  - c. Slightly open the 'D' cylinder valve to clear the nozzle of any possible debris, be aware of the hazard caused by the high pressure gas and particles. Ensure all cylinders have a seal and that it is serviceable. Connect the 5 'D' cylinders onto the HOBS couplings. Open all the cylinders stop valves and allow the pressure to equalise. Test the seal around the connection using oxygen leak detector fluid (if not available use a mild solution of water and detergent), if leaking tighten by hand, if the leak continues contact the maintenance team.
  - d. Slowly open HOBS valve V - 7 or V - 8, monitor the 'D' cylinder pressure on the pressure gauge PI - 6 or PI - 7.
  - e. Once 2000 Psi is reached close HOBS valve V - 7 or V - 8.
  - f. Close the all 'D' cylinder stop valves. The 'D' cylinders are now refilled and can be removed from the HOBS connection.

HOBS MANIFOLD CYLINDER FILLING PROCEDURE

11. The procedure for filling cylinders from the main HOBS manifolds is as follows:
  - a. The cylinders will be filled by decanting oxygen from the HOBS reserve cylinders and by direct feed from the EDOCS. The initial fill will be decanted from the HOBS reservoir cylinders and then the final pressure will be achieved by directly filling the cylinder from the EDOCS.
  - b. The cylinders will be filled from the centre two connections on each manifold.
  - c. Ensure empty HOBS manifold valves V - 3 (B, C, F and G) are closed.
  - d. Slightly open the cylinder valve to clear the nozzle of any possible debris, be aware of the hazard caused by the high pressure gas and particles. Ensure all cylinders have a seal and that it is serviceable, or the sealing threads are in a serviceable condition.
  - e. Connect the cylinders onto the HOBS manifold couplings. Open all the cylinders stop valves. Test the seal around the connection using oxygen leak detector fluid (if not available use a mild solution of water and detergent), if leaking tighten by hand, if the leak continues contact the maintenance team.
  - f. Ensure HOBS manifold valves V - 3 (A, D, E, and H) are open.
  - g. Slowly open HOBS manifold valves V - 3 (B, C, F and G, only valves with cylinders attached), allow pressures to equalise.
  - h. Monitor the cylinders pressure on the pressure gauge PI - 6 or PI - 7. To reduce the fill time for a single cylinder complete the following:
    - (1) Allow initial pressure equalisation to complete.
    - (2) Isolate all other HOBS manifold valves except the cylinder that is required quickly. This will direct all the EDOCS output into the required cylinder, whilst this is happening no other cylinders will be filled.
  - i. Once 2000 Psi is reached close open HOBS manifold valves V - 3 (B, C, F and G, only valves with cylinders attached).
  - j. Close the cylinder stop valve on the refilled cylinder. The cylinders are now refilled and can be removed from the HOBS manifold couplings.

EDOCS OPERATING INSTRUCTIONS

SHUT DOWN PROCEDURE

1. The shut down procedure can be split down into 3 procedures as follow:
  - a. Temporary shut down. An EDOCS shut down due to the EDOCS not being used for a short period.
  - b. Maintenance shut down. An EDOCS shut down required before carry out maintenance or inspections, followed by the EDOCS coming back into operation.
  - c. Complete shut down. An EDOCS shut down before an EDOCS is moved to another location.

TEMPORARY SHUT DOWN PROCEDURE

2. The EDOCS booster compressor will automatically cycle on and off as the system pressure drops from 2250 Psi to 1800 Psi.
3. The blower on the VSA will continue to operate even when the booster compressor is not in operation.
4. During periods of low use or when the EDOCS is on standby, the reserve cylinders should be charged and the unit shut down, this is achieved by the following:
  - a. Allow the EDOCS to continue to run until the 'M' cylinders in the caboose and the HOBS reservoir cylinders are charged to 2250 Psi.
  - b. Ensure caboose valve V - 4 is closed so that the reserve 'M' cylinders are isolate from the HOBS.
  - c. Switch the booster compressor off using switch SW - 2.
  - d. Allow the unit to run for 5 minutes to cool down.
  - e. Switch the blower off using switch SW - 3.
  - f. Allow the heat exchanger cooling fans to run for 5 minutes to cool down.
  - g. Switch off the EDOCS using CB - 1.
5. To restart the EDOCS carry out the start procedure.

MAINTENANCE SHUT DOWN PROCEDURE

6. The maintenance shut down procedure will be used when the unit is to be withdrawn from service for a short period to allow maintenance or inspections to be carried out. The operator will carry out the shut down procedure but trained maintenance personnel should carry out all maintenance and inspections.
7. The shut down procedure is as follows:
  - a. Allow the EDOCS to continue to run until the 'M' cylinders in the caboose and the HOBS reservoir cylinders are charged to 2250 Psi.
  - b. Ensure caboose valve V - 4 is closed so that the reserve 'M' cylinders are isolate from the HOBS.
  - c. Switch the booster compressor off using switch SW - 2.
  - d. Disconnect the high pressure armoured oxygen hose from the HOBS not the EDOCS.
  - e. Switch off the vacuum pump using switch SW - 1.
  - f. Disconnect the vacuum hose from the HOBS not the EDOCS.
  - g. Allow the unit to run for 5 minutes to cool down.
  - h. Switch the blower off using switch SW - 3.
  - i. Allow the heat exchanger cooling fans to run for 5 minutes to cool down.
  - j. Inform the maintenance team that the unit is ready of maintenance to take place.
8. The EDOCS will be restarted by the maintenance personnel once maintenance is complete, and then it will be handed back to the operators.

COMPLETE SHUT DOWN PROCEDURE

9. The complete shut down procedure will be carried out when the unit is to be moved to another location. Under this situation the EDOCS must be made safe to move and the HOBS collapsed into its storage case.
10. The shut down procedure is as follows:
- a. Ensure caboose valve V - 4 is closed so that the reserve 'M' cylinders are isolate from the HOBS.
  - b. Slowly open caboose valve V - 5 to vent the reserve 'M' cylinders, once PI - 11 reads 50 Psi close caboose valve V - 5.
  - c. Allow the EDOCS to continue to run until HOBS reservoir cylinders are charged to 2250 Psi.
  - d. Switch the booster compressor off using switch SW - 2.
  - e. Disconnect the high pressure armoured oxygen hose from the HOBS and the EDOCS.
  - f. Switch off the vacuum pump using switch SW - 1.
  - g. Disconnect the vacuum hose from the HOBS and the EDOCS.
  - h. Allow the unit to run for 5 minutes to cool down.
  - i. Switch the blower off using switch SW - 3.
  - j. Allow the heat exchanger cooling fans to run for 5 minutes to cool down.
  - k. Switch off the EDOCS using CB - 1.
  - l. Close all HOBS manifold valves and all HOBS cylinder valves.
  - m. Remove all HOBS cylinders and store in a secure place. The full HOBS reservoir cylinders can be transported with the EDOCS to reduce the setting up time at the next location (having full HOBS reservoir cylinders can save 24 hours of operating time).
  - n. Open HOBS manifold valve V - 1, V - 2, V -6, V - 7and V - 8 to vent the manifold of all pressure.
  - o. Repack the HOBS into container, ensuring the manifold is the correct way in the container and that it is secured using the quick release pins.
  - p. Isolate the dedicated power supply and remove the power supply cable from the EDOCS.
11. The EDOCS is now ready for transportation any further work to reduce the size of the EDOCS for transport should be carried out by trained maintenance personnel. The requirement for any maintenance to be carried out before transportation and possible storage should be accessed by trained maintenance personnel.

**EDOCS DAILY REPORT SHEET**

Sheet ..... of ..... Date: ..... Location : ..... EDOCS No: ..... HOBS No: .....

Ser	Cylinder No / Cylinder size	Initial pressure Bar	Vacuum pressure Inches of Mercury	Final pressure Bar	Operator	Time filled	Remarks
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							