

**DEPARTMENT OF THE ARMY  
HEADQUARTERS, US ARMY MEDICAL DEPARTMENT ACTIVITY  
Fort Carson, Colorado 80913-4604**

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MEDDAC Regulation  
No. 40-61-3

Medical Services  
**MEDICAL GAS CYLINDERS AND BULK LIQUID OXYGEN**  
Supplementation of this publication is prohibited

**History.** This regulation was originally published as MEDDAC Reg 40-15, 10 Nov 93. This printing supersedes all previous editions.

**Summary.** This regulation establishes policy, guidance and procedures of medical gas cylinders and bulk liquid oxygen.

**Applicability.** The information contained within applies to all staff of MEDDAC, both military and civilian.

**Proponent and exception authority.** The proponent agency for this regulation is the Materiel Management Branch (MMB), Logistics Division. The proponent has the authority to approve exceptions to this regulation that are consistent with controlling directives.

**Army management control program.** This regulation is not subject to the requirements of AR 11-2, as it contains no internal management control provisions.

**Suggested improvements.** Users are invited to send comments and improvements on DA Form 2028 (Recommended Changes to Publications) to the Commander, MEDDAC, ATTN: MCXE-LOG-MB, Fort Carson, CO 80913-4604.

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1. **PURPOSE.** To provide a comprehensive medical gas management document that prescribes policies, responsibilities, and procedures in the storage, handling, quality assurance, and surveillance of compressed or liquefied gases and gas cylinders.

2. **REFERENCES.**

- a. JCAHO Accreditation Manual For Hospitals.

b. AR 385-10, The Army Safety Program, 23 May 1988.

c. AR 385-30, Safety Color Code Markings and Signs, 15 October 1985.

d. AR 700-68, Storage and Handling of Compressed Gases and Gas Cylinders, 16 January 1990.

e. MEDCOM Supplement 1 to AR 385-10, 19 October 1989.

3. **SCOPE.** This regulation applies to all activities and personnel assigned to this MEDDAC/DENTAC.

4. **RESPONSIBILITIES.**

a. The Chief, Materiel Management Branch is responsible for the receipt, storage, quality assurance, surveillance, security, and issue of medical gases required for use in MEDDAC.

b. Using activity personnel are responsible for storage, security, handling, turn-in, and administration of medical

gases following issue from the MMB. Users will assure compatibility of gas line regulation connectors, and compressed gas cylinder connections each time cylinders are used. Users will also ensure the quality of gas prior to administration and that the gas is only used for its intended purpose.

c. The Chief, Anesthesiology Service is responsible for the development and implementation of usage procedures for medical gases administered to inpatients.

d. The Chief, Medical Maintenance Branch is responsible for quarterly calibration of oxygen analyzer instruments used by Materiel Branch personnel.

## 5. PROCEDURES.

### a. General:

(1) The MMB will request, receive, test, issue, and store medical gases for use in EACH. Customer request, issue and turn-in procedures for medical gas cylinders are outlined in Appendix A of this regulation.

(2) Tags will not be removed by using personnel and all caps will be reinstalled prior to cylinder turn-in.

### b. Storage, Handling, and Quality Assurance/ Surveillance of Gas Cylinders:

(1) All free standing cylinders, whether empty or full, will be properly chained. Free standing cylinders will never be secured to a portable or movable apparatus such as a bed or oxygen tent. Small cylinders of gas, required during patient transport, may be used when safely and securely affixed to the patient bed, litter, wheel chair, etc.

(2) Empty cylinders shall be so identified, and stored separately from full or partially full cylinders, (except in Rooms 0611 & 0612). ALL COMPRESSED GAS CYLINDERS WILL BE CAPPED WHEN NOT IN USE OR WHEN NOT CONNECTED TO A DELIVERY SYSTEM. Cylinders will never be lifted by grasping the valve or the protection cap. At no time, even when empty, will gas cylinders be used for any purpose other than that intended. Empty cylinders will be immediately returned to the MMB by using personnel when spent. Cylinders will always be considered full for handling purposes. All gas cylinders will be transported utilizing a hand truck and chain or the appropriate gas cylinder cart.

(3) All gas cylinder storage areas will be kept free of combustible materials, except for shipping cartons retained to assure stability and separation of small cylinders. Gas cylinders will not be positioned nor stored near flame or heat sources. Smoking is strictly prohibited in any area where gases are in use or storage; "NO SMOKING" signs will be posted in all of these areas. Cylinders will be protected from dampness, extremes in temperature, and the direct rays of the sun, however, oxygen cylinders will never be draped with any materials

such as hospital gowns, masks, or caps. All cylinders will be properly marked and segregated while in storage. Medical gases classified as flammable or toxic will be stored in a separate location from oxidizing gases.

(4) No activity, other than the MMB, will store in excess of 2,000 cubic feet of compressed gas in their respective working area, (see Page C-5, Appendix C for specific gas cylinder capacities).

(5) Pressure gauges and alarms will be continuously monitored by using activities, the Communications Center, and storage personnel.

(6) Hydrostatic test dates expressed by month - year, are stamped on the shoulder of the cylinder each time the cylinder is retested. The hydrostatic test date is considered as having expired if the latest date stamped on the cylinder precedes the current date by more than the period indicated in paragraph 3.6, AR 700-68. This latest date applies only to refilling empty cylinders. Filled cylinders are considered serviceable regardless of the last hydrostatic test date. Gas will never be transferred, from one cylinder to another regardless of the hydrostatic test date.

(7) All pin indexed compressed gas container valves will be inspected for condition and proper indexing for that type gas. Index yokes will be inspected to ensure that pins are secure and not missing, each time a container is installed.

(8) Prior to installing the regulator, the cylinder valve will be turned approximately 1/4 turn for a few seconds to remove any dust and debris that would enter the regulator, and then immediately closed. Always point the valve opening away from the body and never in the direction of any personnel. Only nonferrous wrenches will be used on cylinders and their components. Compressed gas from cylinders will not be used or tested with out first reducing the pressure through a regulator that was designed for that purpose. Regulator threads will be compatible with the threads on the valve. AT NO TIME WILL OIL, GREASE, OR ANY OTHER TYPE LUBRICANT BE USED ON GAS CYLINDER VALVES OR CAP THREADS. During use, all cylinder valves will be opened fully and closed one half turn. This will ensure the valve is free for quick operation should the need arise. If a valve leak is discovered the valve will be immediately closed. If the leak persists, notify the MMB. Prior to removal of the regulator, the cylinder valve will be closed and all gas released from the regulator. Serviceable cylinders will never be completely emptied of their contents. A positive internal pressure will always be maintained.

(9) Nitrous oxide (N2O) cylinder manifolds, (2 sets of 14 outlets), are located in Room 0612; Nitrogen (N2) cylinder manifolds, (2 sets of 10 outlets), are located in Room 0611. Gas cylinders in both rooms will always be secured to the wall utilizing ratchet strapping or chain devices. Each manifold room contains an automatic, bank

switching mechanism to ensure continuous gas flow. only full Oxygen (O2) cylinders will be stored in Room 0603A; empty gas cylinders of any type will be stored in Room 0603B. All rooms are under the direct control and responsibility of the Materiel Management Branch.

(10) Full gas cylinders received from the vendor will be delivered to the Service Dock located on the South side of Bldg 7500. Storage and Distribution personnel will receipt and store the full cylinders in the appropriate room and return the empty cylinders, less tags, to the vendor. Received cylinders will be allowed to attain room temperature (15 to 20 minutes) prior to any testing. All oxygen cylinders will require a purity test. The oxygen analyzer will be calibrated to 21% for this altitude and a sample secured. If the correct purity (99% OR GREATER) is obtained, the information will be recorded on DD Form 1191 (Tag) with over-print as reflected on Page A-2, Appendix A and attached to the cylinder. Oxygen cylinders with unacceptable rates of purity, (LESS THAN 99%), will be tagged with that information and placed in Room 0603B. Oxygen cylinders in both rooms will also be secured with ratchet strapping or chain device. Only ACCEPTABLE OXYGEN CYLINDERS will receive a DD 1191 Tag.

(11) Room 0603A will contain "H" size oxygen cylinders that have been pretested for purity. These cylinders will be used in the event of an emergency or extensive disruption in the Bulk Liquid Oxygen System.

c. Bulk Liquid Oxygen (LOX) Storage, Handling, and Quality Assurance/Surveillance:

(1) Evans Army Community Hospital is equipped with central service oxygen, that is supplied by a bulk liquid oxygen cryogenic container system, located on the South side of the Powerhouse, Bldg #P7501. (The Powerhouse is located on the South side of the hospital, Bldg #7500, directly behind the Service Dock.) The bulk oxygen system consists of a 6000 gallon US, LOX cryogenic storage container as the primary, and a 525 gallon US, LOX cryogenic storage container as the reserve. In the event of a pressure loss in the primary LOX container, the reserve system will automatically come into service. When on the reserve system the alarm panel in the Communications Center (Room 1966) will reflect "OXYGEN RESERVE IN USE". See Appendix D for alarm and shutoff valve instructions and locations.

(2) The requirement to refill the primary storage container will be indicated by the volume/pressure gauge located on the system, the indication of a visual/audible alarm on the Communications Center alarm panel, and/or a scheduled delivery. Storage and Distribution personnel from the MMB will be physically present at the refill site and will observe the entire refilling procedure.

(3) Upon arrival of the LOX delivery truck, the bulk storage system will be switched from primary to reserve, (see Appendix B for detailed instructions). The

reserve storage container will be in service during the total time the primary storage container is being filled. Storage and Distribution personnel will sample the vehicle's contents through the gaseous sampling port, utilizing the appropriate oxygen analyzer, and CERTIFY THAT THE TRANSFER VEHICLE CONTAINS 99% OXYGEN PRIOR TO ANY COUPLING OR INTRODUCTION OF LOX INTO THE PRIMARY CONTAINER. Following successful testing and receipt of the Certificate of Compliance from the vendor, the contents of the vehicle will be transferred to the primary container. When the container is filled, receiving personnel will authenticate and secure a copy of the vendor's receiving report and the Certificate of Compliance. This same information will also be entered on the Bulk LOX System Log Sheet (see Appendix B). Upon assurance of oxygen quality, the primary LOX container will be placed into service and the reserve container returned to the automatic mode. CAUTION MUST BE EXERCISED NOT TO CONFUSE A LIQUID SAMPLING PORT FOR A GASEOUS SAMPLING PORT EITHER ON THE VEHICLE OR THE CONTAINER. SEVERE INJURY COULD RESULT FROM SUCH AN ERROR.

(4) Quality assurance and surveillance of the Bulk LOX System will be performed on a weekly and daily basis respectively, by Storage and Distribution personnel from the Materiel Management Branch. Oxygen samples will be obtained on a weekly basis; quantity checks will be made on a daily basis. Results of these checks will be recorded on the Bulk LOX System Log Sheet, see page B-2, Appendix B. Log Book entries will be kept on file for two years.

## APPENDIX A

### GAS CYLINDER PROCEDURES

1. Notification to exchange gas cylinders connected to the manifolds will generally be received telephonically from the Communications Center (Room 1966), after they have interpreted the Central Alarm System.

2. Manifolds are located in Rooms 0611 & 0612. Room 0611 contains two banks of 10 manifolds each, (20 total). This room is generally for compressed Nitrogen cylinder gas, (Note: Only D, E, H, & M size cylinders of Nitrogen, Carbon Dioxide, and Compressed Air will be stored in Room 0611). Room 0612 contains two banks of 14 manifolds each, (28 total). This room is STRICTLY for compressed Nitrous Oxide cylinder gas, (Note: Only D, E, & M Nitrous Oxide cylinders will be stored in Room 0612).

3. Manifold connections are specific for each type cylinder and gas, and are standardized throughout the industry. Manifolds in both rooms will only accommodate " M " size cylinders, and only Nitrogen (Room 0611) and Nitrous Oxide (Room 0612) can be connected to their-manifold system. NO OTHER SIZE OR TYPE CYLINDER WILL EVER BE CONSIDERED FOR-MANIFOLD CONNECTION IN THESE ROOMS.

4. Upon acceptance, the full cylinder will be moved to its respective room (0611 or 0612) and connected to the manifold or placed in the storage area. If the cylinder is to be connected to the manifold, ensure that the respective bank is not in operation. This is accomplished by making a visual check of the gas flow control meter located between the left and right bank of the manifold system and determining which side is in operation. A pressure gauge and light located on the control meter will indicate which side is in operation and which side is not. A manifold shutoff valve located to the left and right side of the meter activates that side of the system. This valve will be shut off (turned clockwise) prior to disconnecting any cylinders from the bank to be exchanged. Finally, each cylinder valve on that respective side will be closed. Upon completion of the above, carefully remove the manifold connection from the cylinder, reinstall the cap, unchain the cylinder, and place it in the storage area. Connection of a full cylinder is simply a matter of reversing the appropriate steps above.

Extreme care will be used at all times to ensure that manifold threads are not stripped nor gas allowed to escape. (NOTE: A strip of Antiseize Tape may be required to seal any gas leaks between the manifold and cylinder connection.)

5. Empty cylinders of Nitrogen and Nitrous Oxide may be stored in Rooms 0611 & 0612 respectively, provided that each cylinder is identified as empty, dated, and initialed.

6. Full oxygen cylinders, regardless of size, that have passed the purity test will be stored in Room 0603A. THIS ROOM IS STRICTLY FOR FULL OXYGEN CYLINDERS OF ANY SIZE THAT HAVE BEEN PURITY TESTED. ABSOLUTELY NO OTHER TYPE CYLINDERS, EMPTY OR FULL WILL EVER BE STORED IN ROOM 0603A. ANY ISSUE OF OXYGEN WILL ALWAYS BE MADE FROM ROOM 0603A, WITHOUT EXCEPTION. Cylinders received from the vendor that have not yet been tested for purity will be temporarily stored in Room 0603B until accepted, and then relocated to Room 0603A. Each oxygen cylinder tested and accepted will have a DD Form 1191 (Tag), with Overprint completed with the date tested, percent purity, pressure, and the individuals initials attached to the cylinder neck.

7. Turn-in and Issue Procedures. Cylinders will be exchanged by the MMB, for authorized personnel only, and generally on a one for one basis. A DA Form 1687, Notice of Delegation of Authority - Receipt for Supplies, will be provided to the MMB by the customer designating those personnel and type gas (O2, N2O, CO2, N2, AIR, and/or ETO) to be received. Customers will return their empty cylinders to the Materiel Branch and receive a full one, of the same size and type gas, at that time. The turn-in and issue of Nitrous Oxide (N2O) gas cylinders will be controlled. The Gas Cylinder Log Sheet (see page A-3) will be completed by MMB personnel and the customer for all issues and turn-ins of Nitrous Oxide. Keys to all of the MMB's cylinder storage rooms will be stored in the MDS key box and issued to authorized personnel only. N2O stored in user's areas will always be kept under lock and key.

CYLINDER ISSUE LOG SHEET

<u>DATE</u>	<u>QTY &amp; TYPE TURNED-IN</u>	<u>QTY &amp; TYPE ISSUED</u>	<u>REC ACT</u>	<u>RANK NAME</u>	<u>RECEIVERS SIGNATURE</u>	<u>ISSUERS INITIALS</u>
#1	#2	#3	#4	#5	#6	#7

LEGEND:

#1 Julian Date of issue and/or turn-in.

#2 Quantity and Type of gas cylinder turned-in, i.e.:

Oxygen = 02  
 Nitrous Oxide = N20  
 Carbon Dioxide = C02  
 Nitrogen = N2  
 Compressed Air = CA  
 Ethylene Oxide = ETO

#3 Quantity and Type of gas cylinder issued, i.e.:

Oxygen = 02  
 Nitrous Oxide = N20  
 Carbon Dioxide = C02  
 Nitrogen = N2  
 Compressed Air = CA  
 Ethylene Oxide = ETO

#4 Receiving Activity.

#5 PRINT receivers rank and name.

#6 Receiver's signature.

#7 Issuer's initials.

## APPENDIX B

### BULK LOX PROCEDURES

1. Storage and Distribution Section personnel will draw Key Tag # 4 from Warehouse Supervisor. This tag contains the key that will allow entry to the bulk storage container gate and the hose access port. Prior to any introduction of LOX into the hospital containers, Storage and Distribution personnel from the Materiel Branch, will sample the contents of the vehicle, from the gaseous port, and ensure that the LOX meets the 99% parts per million (PPM) requirement. Receiving personnel will also obtain the Certificate of Compliance from the vendor prior to making any connections.

2. Following successful testing, the vendor will connect the cryogenic pump on the vehicle to the main container's Fill Connection (C-1) via the vendor's distribution hose. At that time Materiel Branch personnel will discontinue the supply from the main container to the hospital and place the reserve container into operation by closing the Gas Use Valve (V-7). The Bottom Fill Valve (V-2) will then be slowly opened and LOX delivery initiated. As the Liquid Level Contents Gauge (LL-1) approaches 75% fill, open the Trycock Valve (V-3). When liquid spurts from the Trycock Valve, stop fill at the supply source and close the

Trycock and the Bottom Fill Valves. Drain residual liquid in the hose by opening the Drain Valve (V-11). Upon exhaustion of all LOX from the hose, loosen the hose at the Fill Connection, then, disconnect the hose. Place the container into service by opening the Gas Use Valve. See pages B-2 through B-7 for further descriptions and locations of all critical valves and gauges. NOTE: All valves, gauges, and regulators are identified on a placard affixed to the front of each cryogenic container.

3. Upon completion of fill, MMB personnel will complete the LOX Log Sheet IAW page B-2.

4. Daily Pressure and Volume checks will be made for both containers by viewing their respective Pressure Gauge (G-1) and their Liquid Level Gauge (LL-1) and recording their readings on the LOX Log Sheet IAW page B-2. Monthly purity checks will be accomplished utilizing the external access valve (T Valve) and also recorded on the LOX Log Sheet IAW page B-2. Weekly purity checks will also be recorded on the LOX Log Sheet from the In-Line Oxygen Monitor located in Medical Maintenance Room 0701.

BULK LOX PROCEDURES

LOX LOG SHEET

<u>JULIAN</u> <u>DATE</u>	<u>VENDOR</u> <u>INVOICE #</u>	<u>VENDOR</u> <u>QUALITY</u>	<u>AMT</u> <u>REC</u>	<u>VCS</u> <u>QUALITY</u>	<u>525</u> <u>VOL&amp;PRS</u>	<u>6000SP</u> <u>VOL&amp;PRS</u>	<u>S&amp;D</u> <u>INIT</u>
#1	#2	#3	#4	#5	#6	#7	#8

LEGEND:

- #1 Julian Date of acceptance and/or test.
- #2 Vendor's Invoice Number of LOX delivery.
- #3 Purity of oxygen gas from vendor's vehicle.
- #4 Amount of LOX received from vendor, (GAL & SCF).
- #5 Purity of oxygen gas in VCS cryogenic container during acceptance and/or test , (2 entries: 525 & 6000SP Tank).
- #6 Volume and pressure (in IN's of water & PSI) of LOX for 6000SP VCS container at acceptance and/or test; 2 entries.
- #7 Volume and pressure (in IN's of water & PSI) of LOX for 525 VCS container at acceptance and/or test; 2 entries.
- #8 Initials of Storage & Distribution personnel performing acceptance and/or testing.

## APPENDIX C

### GAS AND CYLINDER CHARACTERISTICS

1. A compressed gas cylinder is any tube, bottle, or other type of pressure cylinder larger than 3 inches in diameter by 6 inches in length, which contains a pressure that exceeds 104 PSI at 130 degrees Fahrenheit, (55 degrees Celsius), or any flammable material having a vapor pressure exceeding 40 PSI absolute, at 100 degrees Fahrenheit, (38 degrees Celsius).

2. A Primary Color warning is the color assigned to the class into which a material is classified in accordance with its primary hazard from a safety point. A Secondary Color warning is the color assigned as a warning of a secondary hazard possessed by a material having a type of hazard distinctly different from that indicated by its Primary Color warning. (A cylinder may have many Secondary Color warnings.) These colors appear as the main body, top, or band on compressed gas cylinders. (See page C-4 for bottle type cylinder color locations.) COLOR CODING IS PROVIDED AS A HAZARD WARNING ONLY, AND WILL NOT BE USED BY ITSELF TO IDENTIFY THE CONTENTS OF A CYLINDER.

3. Common Gas and Cylinder Descriptions used in EACH:

a. Air, Compressed - Compressed Air is generally inert; however, it does contain about 20% oxygen and should be used and handled carefully due to its ability to support and intensify combustion. Cylinder marking for Compressed Air, Breathing Top: Black, 1st Band: Green, 2nd Band: Black, Body: Black.

b. Carbon Dioxide (CO<sub>2</sub>) - Carbon Dioxide is much heavier than air, it is nonflammable, and does not support combustion. Carbon Dioxide, if blown directly on the body, may cause a "Cold Burn". High concentrations in a confined area will replace normal air and cause suffocation. Cylinder marking for Carbon Dioxide - entire cylinder is Gray.

c. Ethylene Oxide (C<sub>2</sub>H<sub>4</sub>O) - Ethylene Oxide is toxic. It is particularly dangerous because exposure to even very low concentrations tends to dull the senses. In its container Ethylene Oxide exists as a liquid under its own low pressure. This liquid will cause severe burns on contact with skin. DUE TO ITS TOXICITY, HANDLERS WILL NOT ALLOW ANY GAS TO ESCAPE THE CYLINDER WHEN PERFORMING A PRESSURE TEST. Cylinder marking for Ethylene Oxide Medical - Top: Yellow, remainder of cylinder: Blue.

d. Nitrogen (N<sub>2</sub>) - Nitrogen has approximately the same density as air, is nonflammable, does not support combustion, and is classified as a simple asphyxiant. Under high pressure this gas may produce narcosis even though an adequate oxygen supply sufficient for life is

present. Oil tolerant nitrogen will never be used in conjunction with oxygen. High concentrations of Nitrogen in a confined area can displace air and cause suffocation. Cylinder marking for Nitrogen (Oil Free) - Top: Gray, Bands: 2 Black, Body: Gray.

e. Nitrous Oxide (N<sub>2</sub>O) - Nitrous Oxide is generally not considered as a hazardous gas. However, since it is an effective anesthetic, concentrations of 35% and above will cause unconsciousness and may produce rapid suffocation. When subject to electrical arcing or open flame, it may become an oxidizing agent and will support combustion. N<sub>2</sub>O is for use only by or under the supervision of a licensed practitioner who is experienced in its use and administration, is familiar with the indications, effects, methods, and frequency/duration of administration, and cognizant of the hazards, contraindications, side effects, and precautions to be taken. NOTE: FEDERAL LAW PROHIBITS DISPENSING WITHOUT A PRESCRIPTION. Cylinder marking for Nitrous Oxide - entire cylinder is Blue.

f. Oxygen (O<sub>2</sub>) - Oxygen is nonflammable but supports combustion intensely. It must not be stored or used near flammable materials or gases. Oil or grease must never be allowed to come into contact with oxygen cylinders, valves, regulators, gauges, or fittings. Cylinder marking for Oxygen, Medical - Top: White, remainder of cylinder: Green.

g. Liquid oxygen (LOX) possesses a normal temperature (boiling point) of approximately -297.4 degrees Fahrenheit (-183.0 degrees Celsius). This type of characteristic warrants a great deal of respect. The light blue liquid will instantly freeze any part of the body that it contacts and render it useless forever. If cryogenic liquid or cold boil-off gas contacts a worker's skin or eyes, the affected tissues should be promptly flooded or soaked with tepid water (105-115 degrees Fahrenheit, 41-46 degrees Celsius). DO NOT USE HOT WATER. Cryogenic burns, which result in blistering or deeper tissue freezing, warrant immediate examination by a physician. If clothing should be splashed with LOX or otherwise saturated with the gas, immediately air out the clothing. Such clothing will be highly flammable and easily ignited while concentrated oxygen remains, and should not be considered safe for at least 30 minutes.

4. Oxygen Enriched and Deficient Atmospheres and their effects.

a. Oxygen Enriched Atmospheres. An oxygen enriched atmosphere occurs whenever the normal oxygen content of air is allowed to rise above 23%. While oxygen is NONFLAMMABLE, ignition of combustible materials

can occur more readily in an oxygen-rich atmosphere than in air; and combustion proceeds at a faster rate although no more total heat is released. Easily ignitable materials are not compatible with such an atmosphere. Compatibility involves combustibility and ease of ignition. Materials that burn in air may burn violently in pure oxygen at normal pressure and explosively in pressurized oxygen. In addition, many materials that do not burn in air may do so in pure oxygen, particularly when under pressure. Similarly, materials that can be ignited in air have lower ignition energies in oxygen. Many such materials may be ignited by friction or by adiabatic compression produced when oxygen at high pressure is rapidly introduced into a system initially at low pressure.

b. Oxygen Deficient Atmospheres. The normal oxygen content of air is approximately 21%. Depletion of oxygen content in air, either by combustion or displacement with inert gas, is a potential hazard and users should exercise suitable precautions. One aspect of this possible hazard is the response of humans when exposed to an atmosphere containing only 8 to 12% oxygen. In this environment, unconsciousness can be immediate with virtually no warning. When the oxygen content of air is reduced to about 15 or 16%, the flame of ordinary combustible materials, including those commonly used as fuel for heat or light, may be extinguished. Somewhat below this concentration, an individual breathing the air is mentally incapable of diagnosing the situation because the onset of symptoms such as sleepiness, fatigue, lassitude, loss of coordination, errors in judgement, and confusion can be masked by a state of euphoria, leaving the victim with a false sense of security and well being. Human exposure to an atmosphere containing 12% or less oxygen leads to rapid unconsciousness. Unconsciousness can occur so rapidly that the user is rendered essentially helpless. This can occur if the condition is reached by an immediate change of environment, or through the gradual depletion of oxygen.

## APPENDIX D

### ALARM AND SHUTOFF VALVES

1. As previously noted, Evans Army Community Hospital is equipped with a centralized Oxygen, Compressed Air, Vacuum, Nitrous Oxide, and Nitrogen system. The supply lines for these systems are located throughout the hospital and are ZONE controlled and monitored. This Appendix identifies the locations of the alarms, shutoff valves, types of lines, and what rooms they control.

2. Area alarm panels are located throughout the hospital, usually in the vicinity of the shutoff valves. The alarm provides an audio and visual signal during a malfunction. A malfunction is indicated when the Red Light is ON. WHEN AN ALARM ACTIVATES, THE USER WILL IMMEDIATELY NOTIFY THE COMMUNICATIONS CENTER, ROOM 1966, EXTENSION 6-7000 INCLUDE TYPE OF SYSTEM EFFECTED. THE COMMUNICATION CENTER OPERATOR WILL NOTIFY THE MAINTENANCE CONTRACTOR AT 6-7699. To silence the alarm, press that Red Indicator Light. The Green Indicator Light should always be ON; if the Green Light is out, press the Test Indicator to test the circuit and check for a light bulb failure. Report light bulb failures directly to the maintenance contractor at 6-7699.

3. The alarm panels located in the Communications Center, Room 1966, monitor all lines in the hospital. These panels detect the following conditions:

#### FIRST PANEL

Oxygen Pressure  
Low Liquid Oxygen  
Abnormal Nitrogen  
Oxygen Reserve in Use  
Medical Vacuum Low  
Medical Compressed Air  
Low  
Nitrous Oxide Low  
Anesthesia Evacuation Low  
Nitrogen Oxide Reserve in Use

#### SECOND PANEL

Dental Air Low  
Lab Air Low  
Nitrogen Reserve Low  
Nitrous Oxide Pressure  
Abnormal \*  
Nitrogen Reserve in Use

If panel lights identified above activate, Communication Center personnel will immediately notify the maintenance contractor, ext 6-7699. If ANY panel light is activated during non-duty hours, Communications Center personnel will also notify the AOD, ext 6-7001/7002. Wards and clinics will contact the Communications Center if the panel lights in their zone are activated.

Although the above panels monitor all gas lines, they do not detect the location or ZONE of a malfunction in the Oxygen, Compressed Air, Vacuum, Nitrous Oxide, or Nitrogen systems. This responsibility rests with the user and their requirement to notify the Communications Center in the event of a malfunction in their area as stated in paragraph 2.

4. Shutoff valves are wall mounted and located behind the ringed plastic covers. Each cover identifies the type line and the rooms that it serves. To operate, grasp the ring and pull off the plastic cover. Identify the desired line and pull the valve handle towards you. CAUTION: THIS ACTION WILL TURN OFF THAT LINE TO ALL ROOMS IDENTIFIED ON THE PLAQUE LOCATED ABOVE/BELOW THE COVER.

LOCATION	DEVICE TYPE	MEDGAS TYPE AREA CONTROLLED	
SERVICE LEVEL R0105 SUPERVISOR'S OFFICE	MASTER ALARM	02. MED AIR, VAC, N2O, ANES, EVAC, LAB VAC, LAB AIR, N2	ENTIRE HOSPITAL & CLINIC
C030 AT R0300 C050 AT R0701	SHUTOFF VALVES SHUTOFF VALVES	02. MED AIR, VAC 02. MED AIR, VAC	R0328 R0701 & R0701B
GROUND FLOOR HOSPITAL R1735A X-RAY NIGHT DESK C173 AT R1760 R1820 AT ENTRANCE C199 R1950 AT R1953	SHUTOFF VALVES & ALARM PANEL SHUTOFF VALVES & ALARM PANEL SHUTOFF VALVES SHUTOFF VALVES & ALARM PANEL	02. MED AIR, VAC 02. MED AIR, VAC 02. MED AIR, VAC 02. MED AIR, VAC	R1742 & R1744 R1760, R1762 & R1779 R1821, R1824 & R1836 R1950B, C, D, E, F, R1951 THRU R1956 & R1958
R1966 COMMUNICATIONS ROOM	MASTER ALARM	02. MED AIR, VAC, N2O, ANES, EVAC, LAB VAC, LAB AIR, N2	ENTIRE HOSPITAL & CLINIC
GROUND FLOOR CLINIC C102 AGRASS FROM R1385 C121 AT R1230 C123 AT R1271 C130 AT R1320 C131 AT R1330 C132 AT R1351 C134 AT R1387 C140 AT R1421 C103 AT R1441	ALARM PANEL SHUTOFF VALVES SHUTOFF VALVES SHUTOFF VALVES SHUTOFF VALVES SHUTOFF VALVES SHUTOFF VALVES SHUTOFF VALVES SHUTOFF VALVES	02. MED AIR, VAC 02. MED AIR, VAC 02. MED AIR, VAC 02. VAC 02. MED AIR, VAC 02. MED AIR, VAC 02. MED AIR, VAC 02. MED AIR, VAC 02. VAC	GROUND FLOOR CLINIC R1211 & R1230 R1271 & R1285 R1320 R1330 R1351 R1387 R1420 & R1421 R1441 & R1441C
2 <sup>ND</sup> FLOOR HOSPITAL R2717 AT 2707 R2717 O.R. NURSES DESK	SHUTOFF VALVES & ALARM PANEL ALARM PANEL	02. MED AIR, VAC 02. MED AIR, VAC, N2, N2O	R2705 & R2717 ALL OPERATING ROOMS, R2746 & R2764
C274 AT R2752 O.R. #1 C274 AT R2755 O.R. #2 C274 AT R2756 O.R. #3 C274 AT R2759 O.R. #4 C274 AT R2778 O.R. #5 C274 AT R2775 O.R. #6 C274 AT R2774 O.R. #7	SHUTOFF VALVES SHUTOFF VALVES SHUTOFF VALVES SHUTOFF VALVES SHUTOFF VALVES SHUTOFF VALVES SHUTOFF VALVES	02. MED AIR, VAC, N2, N2O 02. MED AIR, VAC, N2, N2O	R2752 O.R. #1 R2755 O.R. #2 R2756 O.R. #3 R2759 O.R. #4 R2778 O.R. #5 R2775 O.R. #6 R2774 O.R. #7

C274 AT R2771 O.R. #8	SHUTOFF VALVES	02, MED AIR, VAC, N2, N20	R2771 O.R. #8
C273 AT R2767	SHUTOFF VALVES	02, MED AIR, VAC, N2, N20	R2765 O.R. #9
C273 AT R2764	SHUTOFF VALVES	02, MED AIR, VAC, N2, N20	R2764
R2740 AT NURSES DESK	SHUTOFF VALVES & ALARM PANEL	02, MED AIR, VAC	R2736, R2737 & R2740
C271 AT R2746	SHUTOFF VALVES	02, MED AIR, VAC, N2	R2746
C282 ACROSS FROM R2810	SHUTOFF VALVES	02, MED AIR, VAC, N2, N20	R2812, R2813 & R2816
C282 AT R2806	ALARM PANEL	02, MED AIR, VAC, N2, N20	R2812, R2813 & R2816
R2900A	SHUTOFF VALVES & ALARM PANEL	02, MED AIR, VAC	R2911, R2913, R2915, R2916, R2917, R2919 THRU R2923 & R2933
C292 AT R2952	SHUTOFF VALVES	02, MED AIR, VAC	R2953, R2955, R2957, R2959, R2961 & R2963
R2958 NURSES DESK	ALARM PANEL	02, MED AIR, VAC	R2953, R2955, R2957, R2959, R2961 & R2963
R2962 NURSES DESK	SHUTOFF VALVES & ALARM PANEL	02, MED AIR, VAC	R2965, R2967, R2969, R2971, R2973 & R2975 R2978
C285 AT R2978	SHUTOFF VALVES	02, MED AIR, VAC	
2 <sup>ND</sup> FLOOR CLINIC			
C220 AT R2229	SHUTOFF VALVES & ALARM PANEL	02, MED AIR, VAC	R2221, R2229 & R2240
C202 ACROSS FROM R2350	ALARM PANEL	02, MED AIR, VAC	2 <sup>ND</sup> FLOOR CLINIC EXCEPT R2221, R2229 & R2240 & R2364
C231 AT R2328	SHUTOFF VALVES	02, MED AIR, VAC	R2328
C232 AT R2330	SHUTOFF VALVES	02, MED AIR, VAC	R2330 THRU R2333, R2336 & R2337
C233 AT R2360	SHUTOFF VALVES	02, MED AIR, VAC	R2336, R2358, R2360 & R2361
C204 AT R2362	SHUTOFF VALVES	02, VAC	R2362
C204 AT R2364	SHUTOFF VALVES & ALARM PANEL	02, MED AIR, VAC, N2O, ANES, EVAC	R2364
C204 AT R2386	SHUTOFF VALVES	02, MED AIR, VAC	R2386
C202 AT R2371	SHUTOFF VALVES	02, MED AIR, VAC	R2371
C235 AT R2390	SHUTOFF VALVES	02, MED AIR, VAC	R2390
C241 AT R2450	SHUTOFF VALVES	02, MED AIR, VAC	R2450
C205 AT R2465	SHUTOFF VALVES	02, MED AIR, VAC	R2464, R2464A & R2465
C242 AT R2477	SHUTOFF VALVES	02, VAC	R2477
C243 AT R2490	SHUTOFF VALVES	02, MED AIR, VAC	R2414, R2473, R2490, R2491, R2492, R2493, R2494 & R2495
C244 AT R2519A	SHUTOFF VALVES	02, MED AIR, VAC	R2519A

3<sup>RD</sup> FLOOR HOSPITAL  
R3813 NURSES DESK

SHUTOFF VALVES & ALARM PANELS O2, MED AIR, VAC, N2O

R3808, R3810, R3812, R3814,  
R3816, R3818, R3820, R3821  
R3822 & ALARM PANEL FOR R3841,  
R3843 & R3846

R3840 AT R3842  
R3840 AT R3843  
R3840 AT R3846  
R3837 AT R3836  
R3900 AT R3900A & R3900B

SHUTOFF VALVES  
SHUTOFF VALVES  
SHUTOFF VALVES  
SHUTOFF VALVES & ALARM PANEL  
SHUTOFF VALVES & ALARM PANEL  
O2, MED AIR, VAC, N2O  
O2, MED AIR, VAC, N2O  
O2, MED AIR, VAC, N2O  
O2, MED AIR, VAC  
O2, MED AIR, VAC

R3841 DELIVERY ROOM #1  
R3843 DELIVERY ROOM #2  
R3846 DELIVERY ROOM #3  
R3850, R3873, R3874 & R3874B  
R3909, R3910, R3912, R3913,  
R3914, R3916, R3917, R3918,  
R3920, R2922 & R3924  
R3954 THRU R3972 & R3890

R3979 AT R3979A & R3979B

SHUTOFF VALVES & ALARM PANEL O2, MED AIR, VAC

4<sup>TH</sup> FLOOR HOSPITAL  
R4900 AT R4900A & R4900B

SHUTOFF VALVES & ALARM PANEL O2, MED AIR, VAC

R4906, R4907, R4909, R4911,  
R4913, R4915, R4917, R4919,  
R4921, R4922, R4924 THRU  
R4929, R4931, R4933, R4935  
& R4837  
R4808, R4810, R4812, R4814,  
R4816, R4818, R4820, R4821,  
R4822, R4824, R4834, R4835,  
R4837, R4839, R4840 THRU  
R4844 & R4846

R4811 AT R4811A & R4811B

SHUTOFF VALVES & ALARM PANEL O2, MED AIR, VAC

5<sup>TH</sup> FLOOR HOSPITAL  
R5827 AT R5827A & R5827 B

SHUTOFF VALVES & ALARM PANEL O2, MED AIR, VAC

R5830, R5832, R5834, R5836,  
R5837, R5838, R5842 THRU R5851