KINGDOM OF SAUDI ARABIA

Ministry Of Health

General directorate of Health Affairs
AL-Baha

المملكة العربية السعودية
وزارة الصحة
المديرية العامة للشئون الصحية بمنطقة الباحة
مجمع ميارا الطبي العام

☐ ADMINISTRATIVE POLICY & PROCEDURE (APP)	☐ INSTITUTIONAL POLICY & PROCEDURE (IPP) ☐ INTERDEPARTMENTAL ☐ INTERNAL

TITLE		POLICY NUMBER/V#
HANDLING THE VARIOUS TYPES OF COMPRESSED GASES POLICY		MMC – FMS – 06 (01)
INITIATED DATE	**EFFECTIVE DATE**	**REVISED DATE**
02/08/2025	01/09/2025	01/08/2028
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N\A		6

APPLIES TO	RESPONSIBILITY
All Clinic Staff	Biomedical Contractor Nursing

1. PURPOSE:

1.1 To provide guidelines concerning the safe handling and use of compressed gas cylinders.

1.2 Compressed gases are unique in that they represent a physical and potential chemical hazard depending on the particular gas). The gases contained in these cylinders vary in chemical properties, ranging from inert and harmless to toxic and explosive. The high pressures of the gases constitute a serious hazard in the event that the cylinders sustain physical damage and/or exposed to high temperatures.

2. DEFINITION:

2.1 **Compressed Gas:** A gas or mixture of gases having an absolute pressure exceeding 40 psi at 0ºF (21.1ºC); or, a gas or mixture of gases having an absolute pressure exceeding 104 psi at 130ºF (54.4ºC) regardless of the pressure at 70ºF; or a liquid having a vapor exceeding 40 psi at 100ºF (37.8ºC).

2.2 **Flammable Gas** A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit; or, one for which the United States DOT requires their red flammable gas label.

2.3 **Toxic Gas** A gas that has a median lethal concentration in air of 2,000 parts per million or less by volume of gas; or, a gas which the DOT requires the white poison label.

2.4 **MGPS** Medical Gas Pipelines System

2.5 **O2** Oxygen

2.6 **N2O** Nitrous Oxide

2.7 **CO2** Carbon Dioxide

3. POLICY:

3.1 All compressed gases and cylinders shall be safely transported, distributed, handled, and stored.

3.2 This policy is intended for use by all staff involved with MGPS at the clinic

4. PROCEDURE:

4.1 Medical Gases Supply:

4.1.1 Oxygen and Nitrous Oxide gases are supplied to the clinic from the respective Main Manifolds System, located in the Medical Manifold's Department in the basement.

4.1.2 Oxygen Main Manifold has Right and Left Cylinder Banks consisting Of 15 quantity of 40-50 liters cylinders with auto-switching function between the two banks. There is 60 quantity of oxygen cylinders readily available in the medical gas store room to serve as a backup for this main manifold as a backup to ensure a 24x7 supply.

4.1.3 Nitrous Oxide Main Manifold has Right and Left Cylinder Banks Consisting of 6 quantity of 40 liters cylinders with auto-switching function between both banks. There are 6 quantities of additional N2O Cylinders as a backup to ensure a 24x7 supply.

4.1.4 In addition to these Main manifolds, there are Emergency Manifolds with 5 quantities of O2 cylinders (40 liters.) and 2 quantities of N2O cylinders (40 liters.) available in event of the main manifold gas supply getting interrupted.

4.1.5 Vacuum is supplied from the Vacuum Pumps and medical gas exhaust from Operation Rooms is operated by the AGSS plant. Suction machines are available in several clinics, to serve as a backup in event of vacuum pumps going offline.

4.1.6 Clinics s being supplied by the medical gases from the pipeline systems includes clinic#1, Clinic#2. Clinic#3.

4.1.7 Each of these locations has dedicated Emergency Shut-Off Valves and Medical Gases Alarm Panels with pressure control switches to monitor the in-line gas pressures. In event of any pressure drop or rise, these alarm panels, including the Main Alarm Panel located in BMS the office will trigger audible and visual alarms indicating the type of faults.

4.2 Handling Cylinders:

Below are Precautions that must be observed while handling cylinders:

4.2.1 Smoking and naked lights are prohibited in the vicinity of cylinders.

4.2.2 Cylinders must only be handled by personnel who understand the hazards involved and who have received appropriate training.

4.2.3 Cylinders should not be used as rollers or be permitted to strike together violently or be dropped.

4.2.4 Each cylinder must be labeled with Gas name, Type, and Checked Date. Any cylinders with a checked date beyond 6 months have to be re-checked to update the label.

4.2.5 Cylinder valves must always be closed after use and when cylinders are empty.

4.2.6 Cylinders in the public area should be protected against tampering.

4.3 Transporting

During the transportation of the Cylinders it should be followed:

4.3.1 The protective cap must be in place.

4.3.2 Avoid dropping and striking cylinders together. The cylinder should not be lifted by the cap.

4.3.3 Use a cradle for hoisting, never a lifting magnet or sling.

4.3.4 Use a suitable hand truck/trolley with the cylinder firmly secured. Avoid dragging, sliding, or rolling cylinders.

4.3.5 Cylinders must be secured in a position with straps or chains while being transported to and when in, motor vehicles.

4.4 Storing

Avoid storage of cylinders under the following conditions:

4.4.1 "Free-standing" even in trolleys without safety restraints. Cylinders laid on their sides are considered also to be 'freestanding' unless in a rack specifically designed for the purpose.

4.4.2 With the cylinder valve turned on while not in use.

4.4.3 In strong direct sunlight or any heat source.

4.4.4 All gas cylinders should be capped and secured when stored (Positioning them upright on the wall and secured by a chain).

4.4.5 The storage room should be well-ventilated and dry. Storage room temperature shall not exceed 130°F/54.40°C.

4.4.6 Do not store gas cylinders with pressure on the regulator.

4.4.7 In the Medical Gas Cylinder Store Room, cylinders should be grouped by types of gases with wall labels.

4.4.8 Cylinders should not be stored near flammable substances, such as gasoline or waste, corrosive chemicals, and fumes or near radiators.

4.4.9 Cylinders should not be stored nearby any moving equipment or in the gangways.

4.4.10 Cylinders should be protected from the Ground to prevent bottom corrosion

4.5 REFILLING:

4.5.1 Refilled medical gases cylinders are supplied to the clinic from Medical Gases Supplying Vendor, Company name.

4.5.2 Refilling of Cylinders located in the Main Manifolds and Medical Gases Store Rooms is handled by the Position.

4.5.3 Empty cylinders from the manifold room or cylinders collected from various clinics are stored in Medical Gas Store Room in their designated place.

4.5.4 On a daily basis, the Position checks the quantities of various sizes and types of empty cylinders and notifies the company to dispatch the refilled cylinders for their replacement. Oxygen and Nitrous Oxide refilled cylinders shall be supplied within 48 hours' maximum by the vendor.

4.5.5 The refilled Medical Gases Cylinders, upon receiving from the company. Are checked for their physical condition and seal status, followed by Leak and pressure tests.

4.5.6 Acceptable pressures in the refilled cylinders:

- Oxygen 1500-2000 PSI,
- Nitrous Oxide 800-900 PSI,
- Medical Air 2000 PSI,
- CO2 800-1000 PSI,
- Nitrogen 2000 PSI,
- Nitric Oxide 1800-2000 PSI.

Gas content is identified by testing oxygen purity with Oxygen Analyzer as follows:

- Oxygen : 96-100%
- Air : 21-24%
- N2O/CO2 : <4%
- Argon/N2/He/NO : 0%

4.5.7 After the completion of these checks and tests, the cylinders are labeled with the date of checking and stored securely in the Medical Gas Cylinders Store Room.

4.5.8 These checks and tests are documented in the designated forms, which are reviewed and approved by the clinic director.

4.6 Preparation for Cylinders to be returned to Medical Gas Store or to Medical Gases Supplier:

4.6.1 End users can request refilled gas cylinders by contacting Position, once the cylinder pressure drops below 500 PSI, as seen from the regulator.

4.6.2 Empty cylinder valve should be closed and secured by the end users until replacement by the Position.

4.6.3 The Position should ensure that any gas in the equipment and regulator must be safely vented to the atmosphere and the equipment/regulator control valve closed.

4.6.4 Upon issuance of refilled cylinders, Position stores the empty cylinders in the designated Medical Gas Store Room, to be sent later to the medical gas supplying vendor.

4.7 Medical Gases Pipeline System Maintenance/Repairs/Alterations:

Types of MGPS maintenance:

4.7.1 High Hazard Work:

4.7.1.1 Any work on the MGPS, such as cutting or brazing, that will introduce hazards of cross-connection and pollution will be classified as High Hazard and as such will have a High Hazard Permit to work raised against Job.

4.7.1.2 In such events, the Biomedical Supervisor ensures that key Personnel for each and every ward or Department are informed; if necessary, holding a site meeting.

4.7.1.3 The charge nurse involved will be informed too about the date on which the work is due to take place.

4.7.1.4 The requirement for portable cylinders or vacuum units will be determined and notified by the charge nurse to the Biomedical Supervisor to make appropriate arrangements.

4.7.1.5 Work shall only be commenced when the charge nurse is satisfied that no patients will be put at risk by the shutdown of the medical gases.

4.7.2 Low Hazard Work:

4.7.2.1 Any work on the MGPS which will not introduce any hazard of cross-connection or pollution falls under Low Hazard Work.

4.7.2.2 Low hazard work on terminal units is normally the result of a leak on an individual terminal unit due to a faulty valve or seal but may also include work on the plant, which does not interrupt gas supplies. 2.3 This type of work is usually carried out with prior notice to the area nursing manager to make sure minimum disruption to patient care.

4.7.2.3 Upon repair completion, the Medical Gas Technicians will check the pipeline terminals for leaks and then notify the area nursing staff to proceed using the repaired terminal units.

4.8 Tests to be Carried Out after any MGPS Maintenance prior to Service:

The following tests must be done after any (MGPS) maintenance and before back to service by an authorized medical gas company under the supervision of BMED.

4.8.1 **Cross Connection Test**: To assure that the correct outlet provides the designated gas.

4.8.2 **Purity Test:** To assure that the medical gas is pure and safe according to the specified standards. Acceptable Purity Limits:

- Oxygen : 96-100%
- Air : 21-24%
- N2O/CO2 : < 4%
- Argon/N2/He/NO : 0%

4.8.3 **Leak Test:** To assure that no leakage occurs in the pipeline or the terminal units as it may risk patient health or may lead to fire hazards.
Specified limits:

- For 4bar lines like (O2, NO2, MA4): 0.2 /2H fail

- For 7bar lines like (SA7): 0.5 /2H fail 3.12.4
  Tests reports from the authorized vendor are submitted to Biomedical Supervisor for review and thereafter they are documented in the respective folder.

5. RESOURCES:

5.1 N/A

6. CROSS REFERENCE:

6.1 N/A

7. REFERENCES:

7.1 CBAHI National Standards for Ambulatory Care Centers, Effective Jan,2020. FMS.9

7.2 The Joint Commission International (JCI), 7th Edition, Effective Jan 2021.

8. FORMS & ATTACHMENT:

N/A

9. Approved:

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